Agricultural Potential Assessment Report for the proposed Richards Bay Combined Cycle Power Plant (CCPP) and associated infrastructure near Richards Bay KwaZulu-Natal Province, South Africa

February 2019

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Report Name	**Agricultural Potential Assessment Report for the proposed Richards Bay Combined Cycle Gas Turbine Power Plant (CCPP) and associated infrastructure near Richards Bay**	
Submitted to	**Afzelia Environmental Consultants**	
Survey/Report	**Wayne Jackson**	
Report Reviewer	**Andrew Husted (Pr. Sci. Nat. 40213/11)**	

EXECUTIVE SUMMARY

Afzelia Environmental Consultants (Pty) Ltd (Afzelia) were appointed by Savannah Environmental Consultants (Pty) Ltd (Savannah) to provide supporting specialist studies for the proposed development of a Combined Cycle Power Plant (CCPP) and associated infrastructure on a site near Richards Bay, KwaZulu-Natal Province. The intent of these specialist studies was to provide supporting information for the Environmental Impact Assessment (EIA).

The Biodiversity Company was commissioned by Afzelia to conduct specialist studies to supplement the abovementioned applications. This agricultural potential assessment was conducted from 25th January 2018 and the current state has not been altered (25th February 2019).

The project area is characterised by a relatively flat and uniform relief. The soils delineation is shown in Figure 11. The soil distribution is shown in Table 4. The soils in the project area are dominated by sandy alluvial soils. the areas with accumulated windblown sands were classified as Namib soils, which accounted for 27.6 ha (38.8 %) of the project area. The areas with moisture at depths greater than 30cm were classified as the Longlands soil form, which accounted for 3.3 ha (4.6 %) of the project area. The soil forms with moisture at or near the surface were classified as Katspruit / Westleigh soil forms, which accounted for 37.5 ha (52.8 %) of the area.

The climate capability for this region falls within the **C2 classification**. C2 (Slight limitation rating): Local climate is favourable for a wide range of adapted and a year-round growing season. Moisture stress and lower temperatures increase risks and decrease yields relative to C1.

The Land Capability for the project area is shown in Figure 12. The Namib soils were rated as having a Class III (Moderate Cultivation) land capability based on the flat topography and soils depth greater than 50 cm. The Class III land capability portions accounted for 19.2 ha of the project area. The Longlands soil forms were rated to have a Class IV (Light Cultivation/ Intensive Grazing) land capability based on the soil wetness being between 20cm and 50cm from the surface. The Class IV land capability accounted for 3.3 ha of the project area. The Katspruit and Westleigh soil forms were rated to be Class V (Wetland) land capability based on soil moisture being within 20cm from the surface. The Class V land capability accounted for 37.5 ha of the project area.

The Land Potential of the project area is shown in Figure 13 and the land potential groups are described previously in Table 2.

The land capability classes were rated to have the following land potentials:

Class III = L2 (High Potential);

Class IV = L3 (Good Potential);

Class V = Vlei (Wetland); and

Class VIII = L8 (Very Low Potential).

An impact assessment showed that the impact on the agricultural potential will be High pre- and post-mitigation due to the permanence of the structures to be developed. The impact on the soil resource as a valuable resource pre-mitigation is rated as High, due to the risk of erosion and incorrect stockpiling methods. Once the resource is lost it cannot be recovered. However, if mitigation is applied and the soil is handled correctly the impact is reduced to Medium. The same mitigation measures have been included into the agricultural potential impact assessment (Table 9) as a precautionary approach. These are incredibly important to protect the soil resource.

It is the opinion of the Agricultural Specialist that there is no reason why the proposed development should not proceed, this is based on the following reasons:

1. The areas rated as L2 and L3 are High to Good potential soils, however, these soils are either frequently inundated with water or are in the form of sand dunes. These are not as suitable as anticipated but are still arable if managed correctly.

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Declaration

I, Wayne Jackson declare that:

- I act as an independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant Acts, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Wayne Jackson

Soil Specialist

The Biodiversity Company

February 2019

1 Introduction

Afzelia Environmental Consultants (Pty) Ltd (Afzelia) were appointed by Savannah Environmental Consultants (Pty) Ltd (Savannah) to provide supporting specialist studies for the proposed development of a Combined Cycle Power Plant (CCPP) and associated infrastructure on a site near Richards Bay, KwaZulu-Natal Province. The intent of these specialist studies was to provide supporting information for the Environmental Impact Assessment (EIA).

The Biodiversity Company was commissioned by Afzelia to conduct specialist studies to supplement the abovementioned applications. This agricultural potential assessment was conducted from 25th January 2018 and the current state has not been altered (25th February 2019).

1.1 Project description

The Richards Bay Combined Cycle Power Plant (CCPP) involves the construction of a gas-fired power station which will provide mid-merit[1] power supply to the electricity grid. The weekly mid-merit power supply will be between a range of 20% to 70% of the total electricity supply produced by the Richards Bay CCPP. The power station will have an installed capacity of up to 3 000MW, to be operated on natural gas, with diesel as a back-up fuel. The natural gas is to be supplied by potential gas suppliers via a gas pipeline to the CCPP from the supply take-off point at the Richards Bay Harbour. The Liquefied Natural Gas (LNG) terminal infrastructure at the port and the gas supply pipeline to the boundary fence of the Richards Bay CCPP does not form part of the scope of this assessment as this project focuses only on the footprint activities inside Eskom's boundary fence on site 1D of the Richards Bay Industrial Development Zone (IDZ).

The main infrastructure associated with the facility includes the following:

- Gas turbines for the generation of electricity through the use of natural gas or diesel (back-up resource).
- Heat recovery steam generators (HRSG) to capture heat from high temperature exhaust gases to produce high temperature and high-pressure dry steam to be utilised in the steam turbines.
- Steam turbines for the generation of additional electricity through the use of dry steam generated by the HRSG.
- Bypass stacks associated with each gas turbine.
- Dirty Water Retention Dams.

[1] Mid-merit electricity generation capacity refers to the generation of electricity which is adjusted according to the fluctuations in demand in the national grid

- Exhaust stacks for the discharge of combustion gases into the atmosphere.
- A water treatment plant for the treatment of potable water and the production of demineralised water (for steam generation).
- Water pipelines and water tanks to transport and store water of both industrial quality and potable quality (to be supplied by the Local Municipality).
- Dry-cooled system consisting of air-cooled condenser fans situated in fan banks.
- Closed Fin-fan coolers to cool lubrication oil for the gas and steam turbines.
- A gas pipeline and a gas pipeline supply conditioning process facility for the conditioning and measuring of the natural gas prior to being supplied to the gas turbines. It must be noted however that the environmental permitting processes for the gas pipeline construction and operation will be undertaken under a separate EIA Process
- Diesel off-loading facility and storage tanks.
- Ancillary infrastructure including access roads, warehousing, buildings, access control facilities and workshop area, storage facilities, emergency back-up generators, firefighting systems, laydown areas and 132kV and 400kV switchyards.
- A power line to connect the Richards Bay CCPP to the national grid for the evacuation of the generated electricity. It must be noted however that the due environmental permitting processes for the development of the power line component are being undertaken under a separate EIA Process.

1.2 Aim and Objective

The aim of the assessment was to provide information to guide the proposed Richards Bay CCPP project with respect to the current agricultural potential in the area of study. As part of this assessment, the following objectives were established:

- A baseline review of the land type data obtained from the scoping phase.
- The delineation of soil types in the project area.
- The existing land capability.
- The current land uses.
- A detailed soil report describing all the above.
- An impact assessment report.

2 Description of the Project Area

The project area (Erf 2/11376 and Erf 4/11376) is located in Richards Bay on the north coast of KwaZulu-Natal, approximately 170 km north of Durban, in the uMhlathuze Local Municipality of the greater UThungulu District Municipality. A biodiversity offset area has been proposed for Erf 1/11376, which will also be considered for this assessment. A locality map of the project area is presented in Figure 1. Figure 2 presents the project and proposed biodiversity offset area on a local scale.

The project area lies approximately 5 km west of Richards Bay along the Western Arterial highway in the Industrial zone of Richards Bay, with Mondi Richards Bay bordering the study area on the east. Areas to the north and south are bordered by a railway line and associated service road. The area is approximately 71 ha in extent.

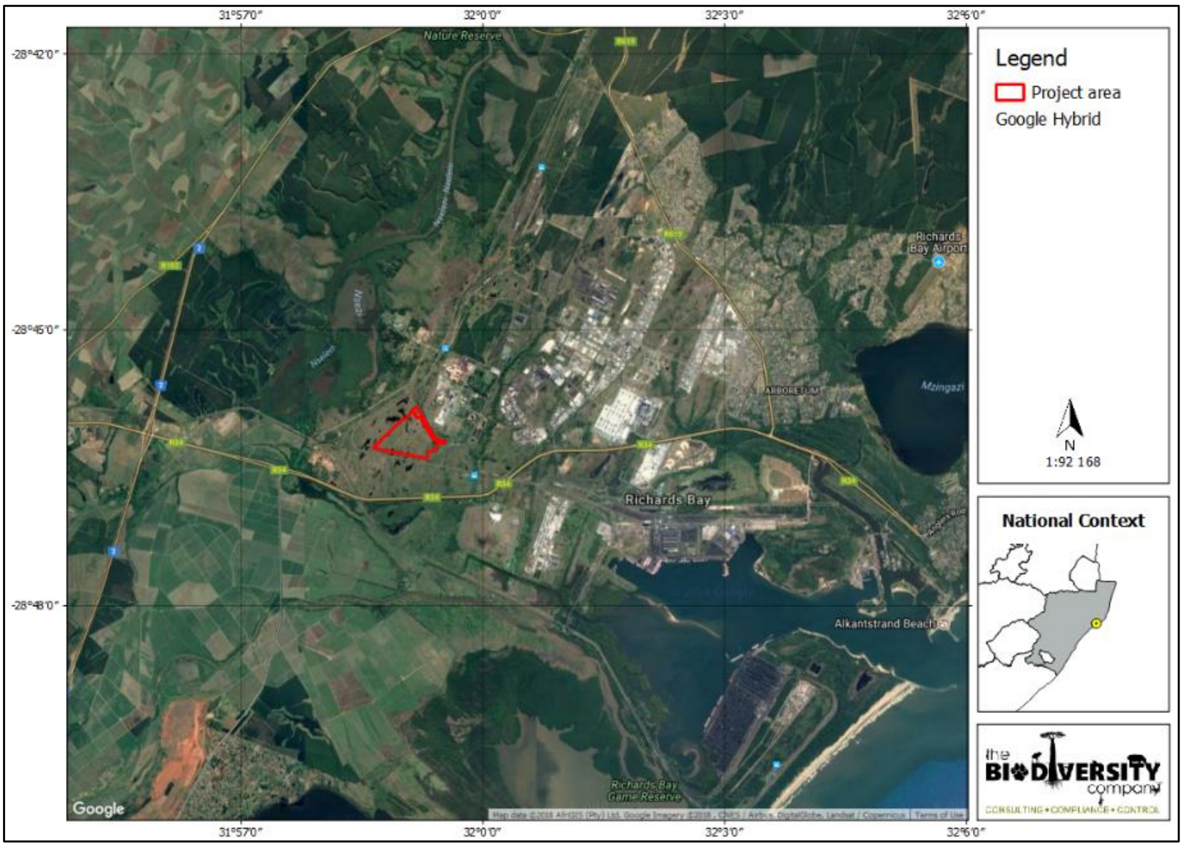


Figure 1: Location of the Richards Bay CCPP project area

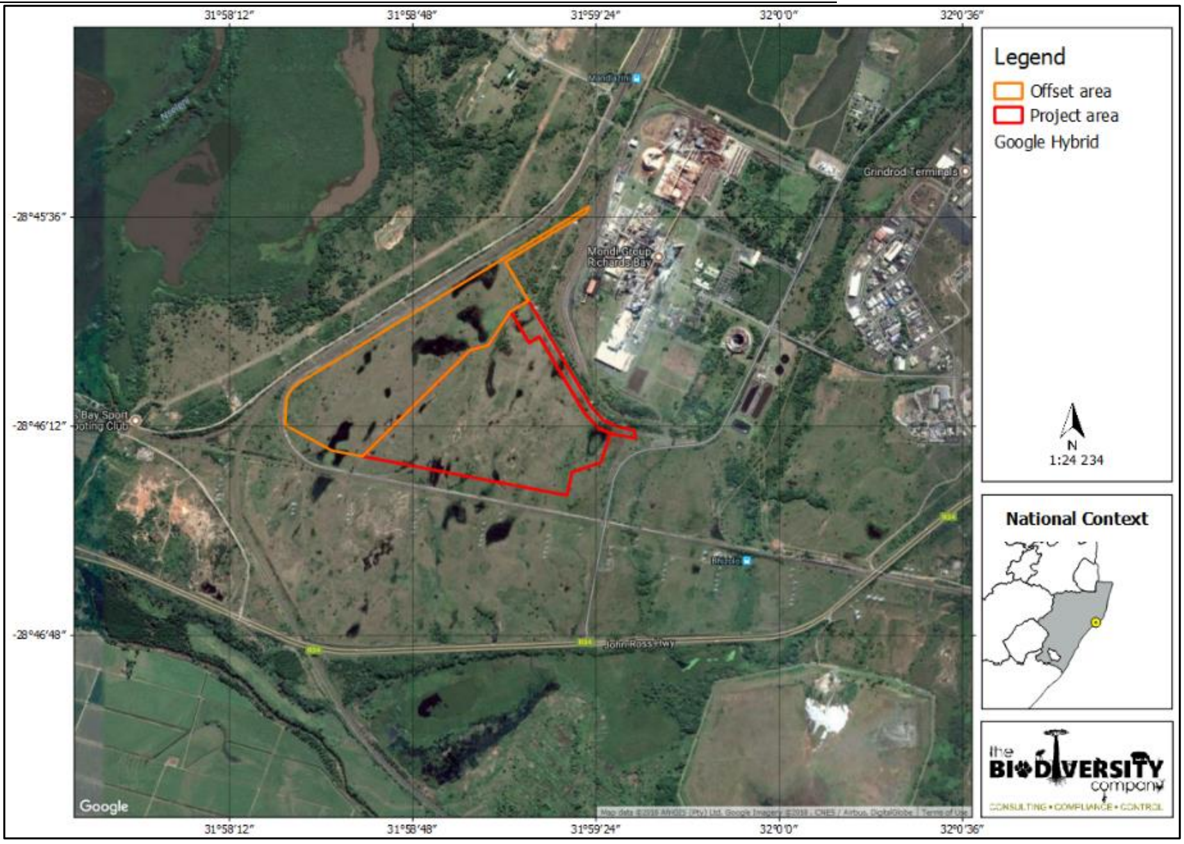


Figure 2: A closer locality map for the project area and proposed biodiversity offset area.

3 Methodology

The agricultural assessment was conducted using the Provincial and National Departments of Agriculture recommendations. The assessment was broken into two phases. Phase 1 was a desktop assessment to determine the following:

- Historic climatic conditions;
- The terrain features using 5m contours;
- The base soils information from the land type database (Land Type Survey Staff 1972 - 2006); and
- The geology for the proposed mining site.

Phase 2 of the assessment was to conduct a soil survey to determine the actual agricultural potential. During this phase the current land use was also surveyed.

3.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types.

3.2 Field Survey

A study of the soils present within the project area was conducted during field visit in January 2018 and the current state has not been altered (25th February 2019). The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1.5 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the "Soil Classification: A Taxonomic System for South Africa" (Land Type Survey Staff 1972 - 2006). Landscape features such as existing open trenches were also helpful in determining soil types and depth. The sampling locations are shown in Figure 3. Only areas that have not been disturbed could be sampled.

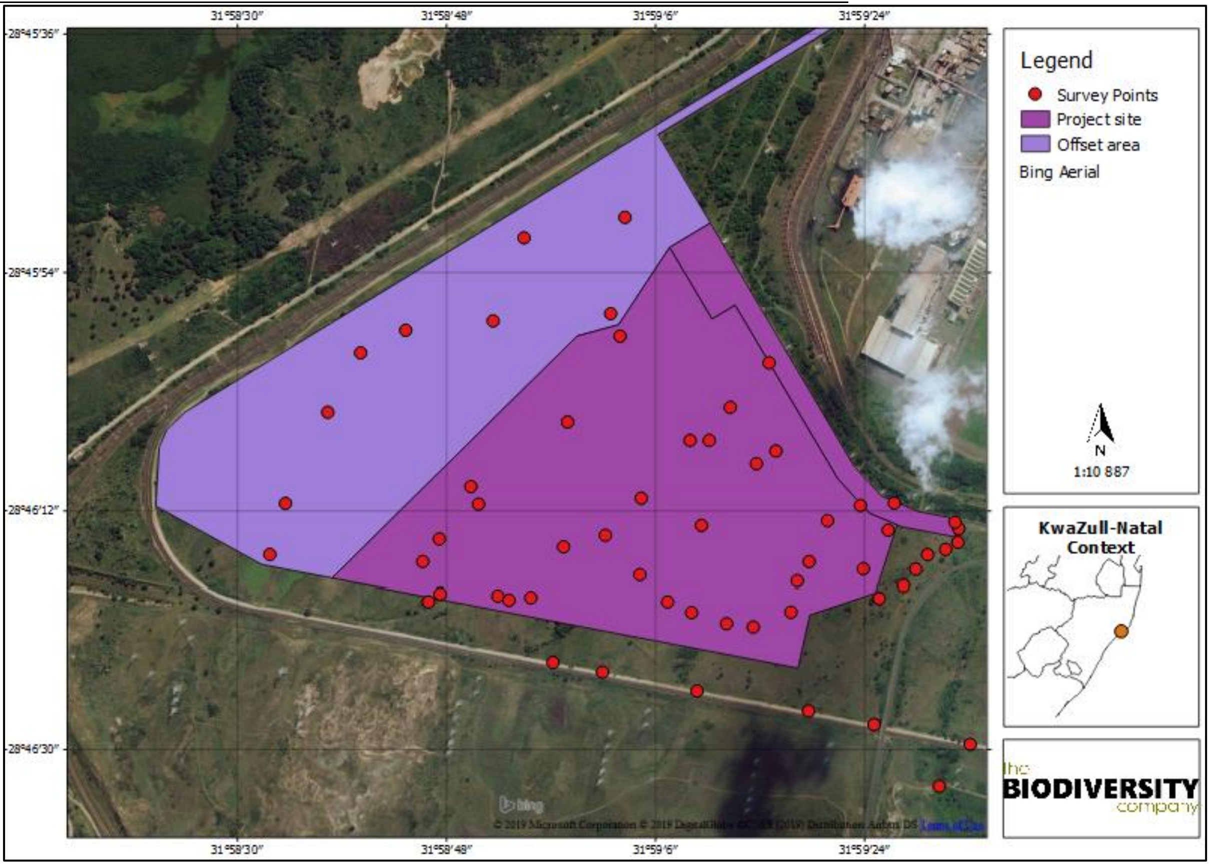


Figure 3: The sampling points for the agricultural potential assessment

3.3 Agricultural Potential Assessment

Land capability and agricultural potential is determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes (Smith 2006)

Land capability is divided into eight classes and these may be divided into three capability groups. Table 1 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

Table 1: Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				

V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		**MG - Moderate Grazing**			**MC - Moderate Cultivation**					
F- Forestry		**IG - Intensive Grazing**			**IC - Intensive Cultivation**					
LG - Light Grazing		**LC - Light Cultivation**			**VIC - Very Intensive Cultivation**					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 2. The final land potential results are then described in Table 3.

Table 2: The combination table for land potential classification

Land capability class	Climate capability class							
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 3: The Land Potential Classes.

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.

L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

3.4 Current Land Use

Land use was identified using aerial imagery and then ground-truthed while out in the field. The possible land use categories are:

- Mining;
- Bare areas;
- Agriculture crops;
- Natural veld;
- Grazing lands;
- Forest;
- Plantation;
- Urban;
- Built-up;
- Waterbodies; and
- Wetlands.

3.5 Impact Assessment

The impact assessment methodology was provided by Savannah Environmental. The EIA report has been compiled in line with the EIA Regulations of 2014, as amended on 07 April 2017. The broad approach to the significance rating methodology is to determine the environmental risk by considering the consequence of each impact (comprising Nature, Extent and Duration, Magnitude) and relate this to the Probability of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources have also been considered.

4 Limitations and Assumptions

- The GPS used for soil delineations is accurate to within five meters. Therefore, the soil delineation plotted digitally may be offset by at least five meters to either side.

5 Baseline Environment

5.1 Climate

The project area falls within the Maputuland Woodland Grasslands region (Cb 2) (Mucina and Rutherford 2006). Figure 4 shows the summarised climate data. The region has a strongly seasonal summer-rainfall. MAP is 964 mm. The coefficient of variation of MAP is 20%. There are no frost risks related to this area. The mean annual temperature is 21ºC. The mean annual evaporation is approximately 1902mm.

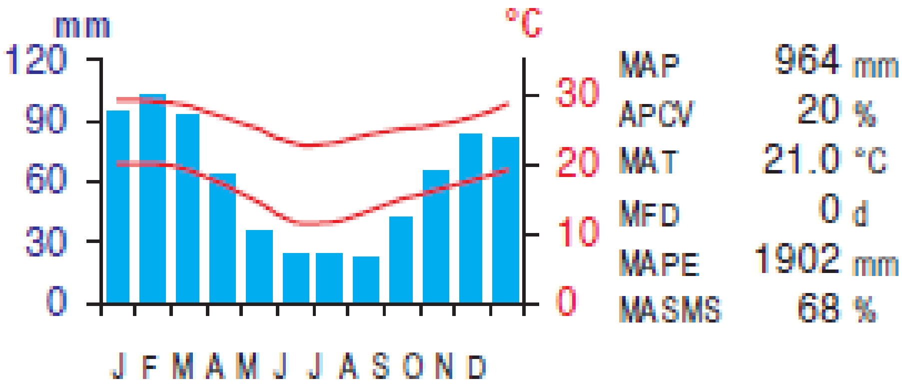


Figure 4: The climate summary for the Maputuland Woodland Grassland (Cb 2) region (Mucina and Rutherford 2006)

The climate capability for this region falls within the **C2 classification**. C2 (Slight limitation rating): Local climate is favourable for a wide range of adapted and a year-round growing season. Moisture stress and lower temperatures increase risks and decrease yields relative to C1.

5.2 Terrain

The project area was assessed by using 5m contour terrain data. The contours were used to create a digital elevation model (DEM). The DEM was then used to create a relief map (Figure 5), a slope percentage map (Figure 6), and a slope aspect map (Figure 7).

The relief map: The project area is relatively flat with the maximum and minimum elevations being between 25m and 35m above sea level.

The slope map: The project area is very flat with the slopes all being no more than 4%.

The aspect map: The map shows that the site is mostly south facing.

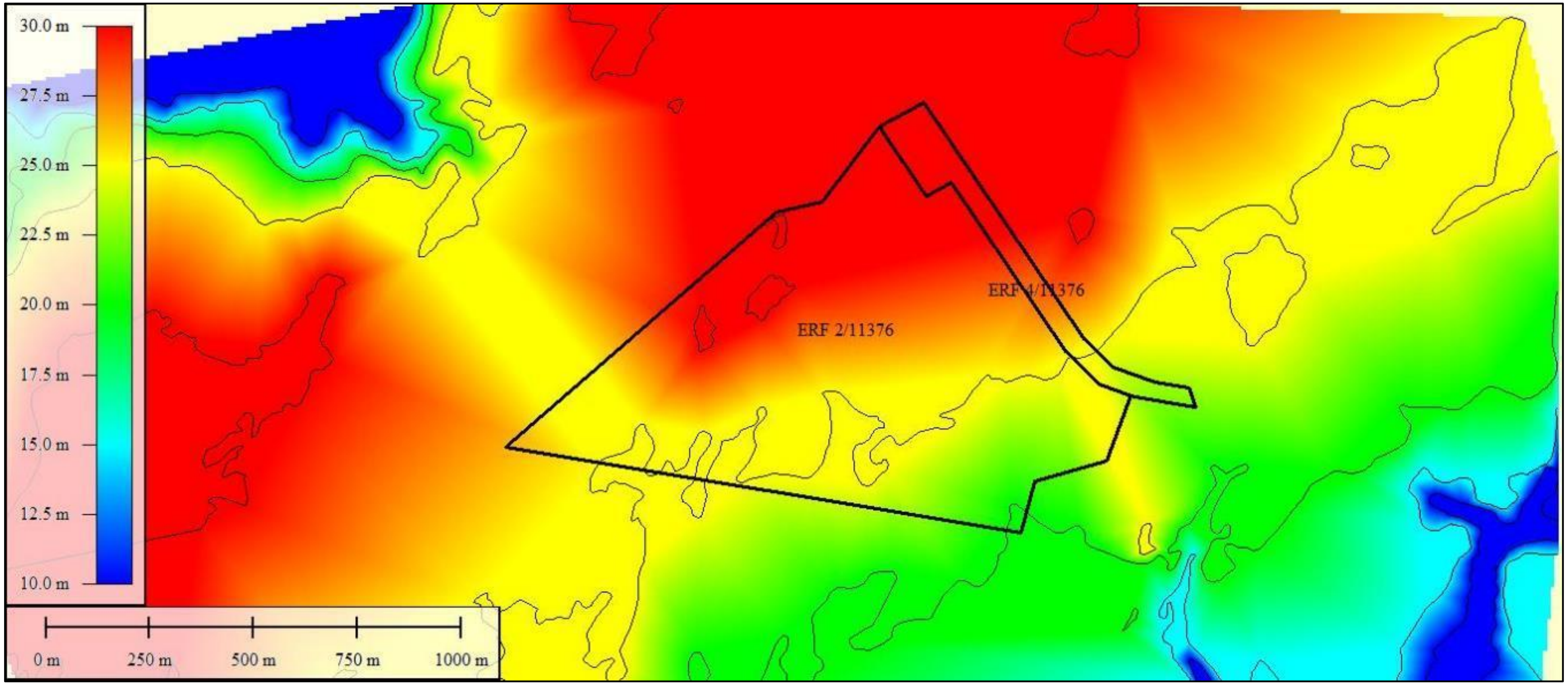


Figure 5: The relief map for the project area.

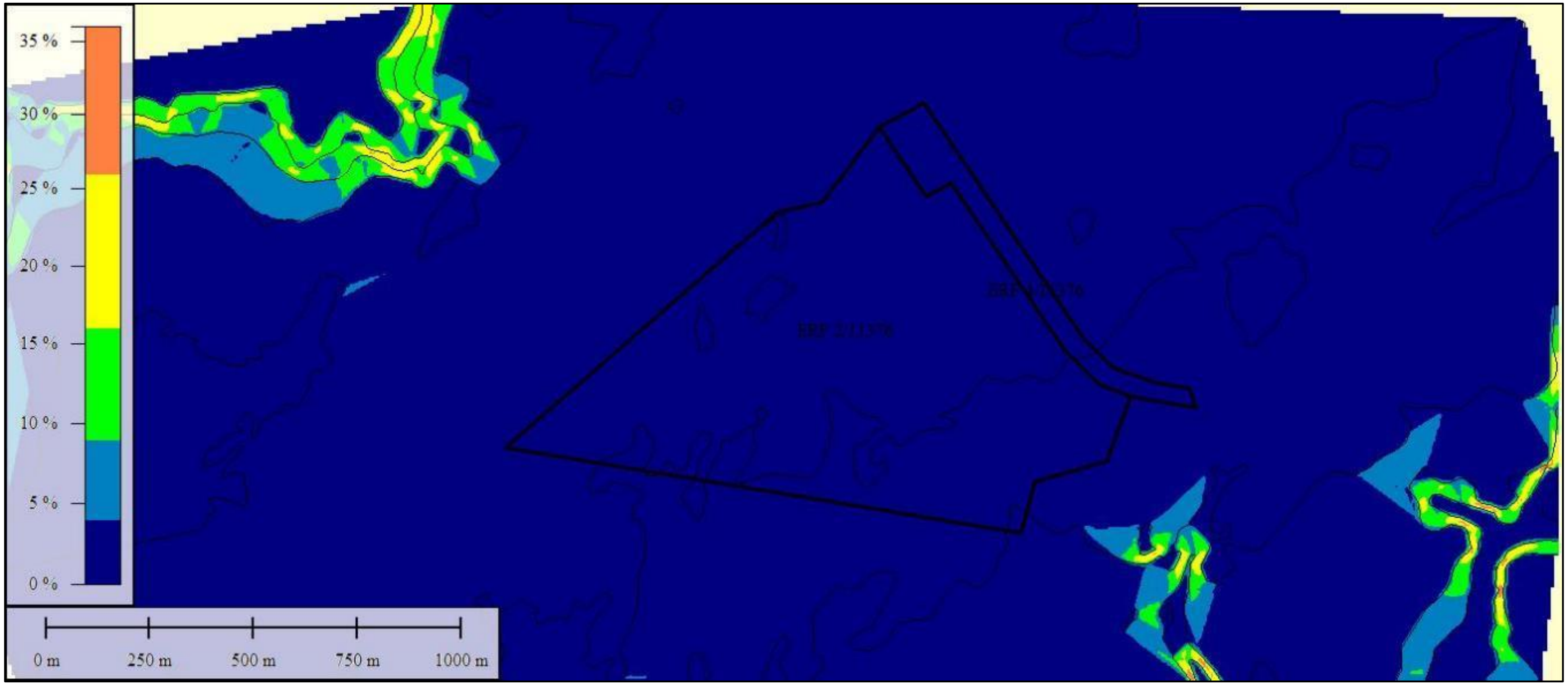


Figure 6: The Slope Percentage map for project area.

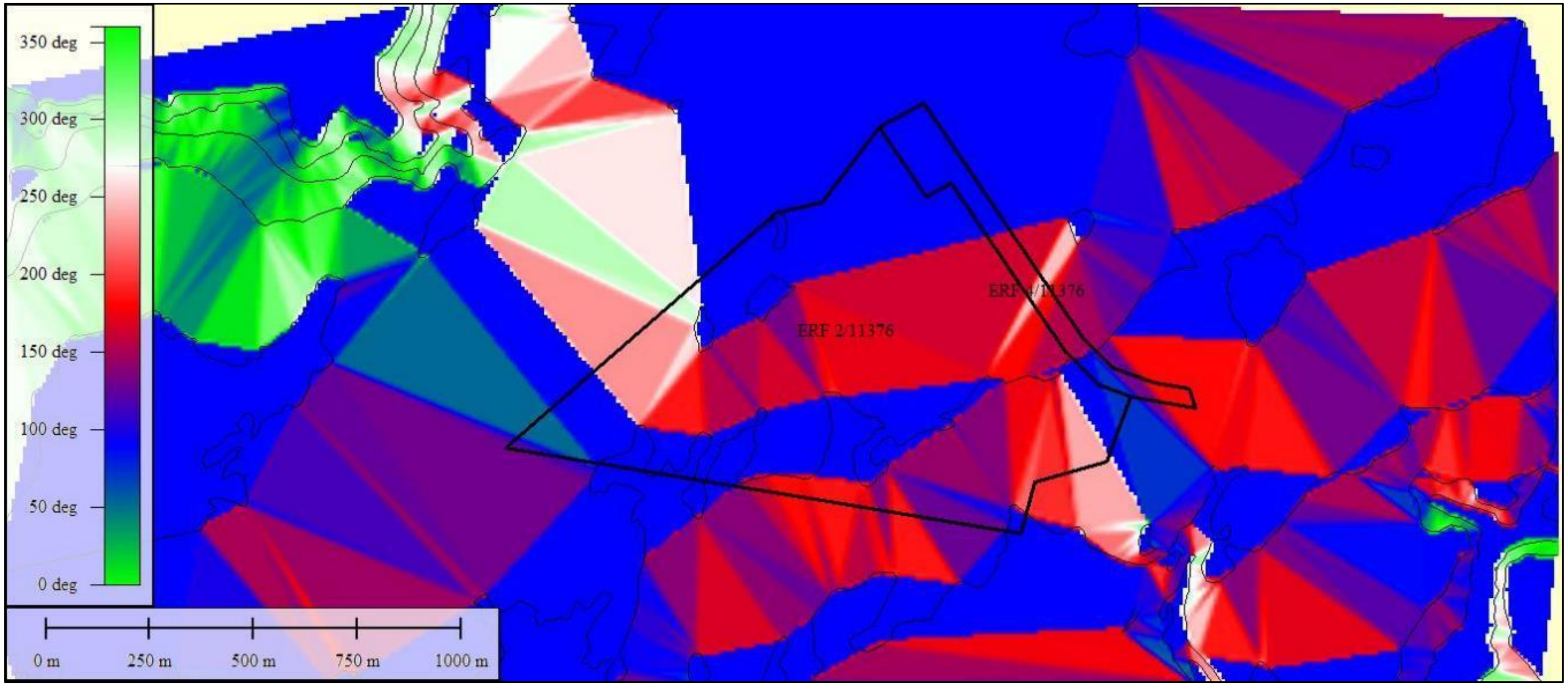


Figure 7: The Slope Aspect map for project area

5.3 Geology & Soils

The geology of the area is mainly yellowish redistributed sand, with small areas of alluvium.

According to the land type database (Land Type Survey Staff, 1972 - 2006) the project falls within the Hb75 land type (Figure 8). It is expected that, the dominant soils in the crest and midslope positions will be soils of the Fernwood and Villafontes forms. The soils that dominated the footslopes and the valley bottoms are the Fernwoods and Champagne soil form. The land type catena is shown in Figure 8.

The average land capability for the land type is Class III (moderate cultivation). Class III land would pose moderate limitations to agriculture with some erosion hazard and would require special conservation practice and tillage methods. The farming method for this capability would require the rotation of crops and ley (50%).

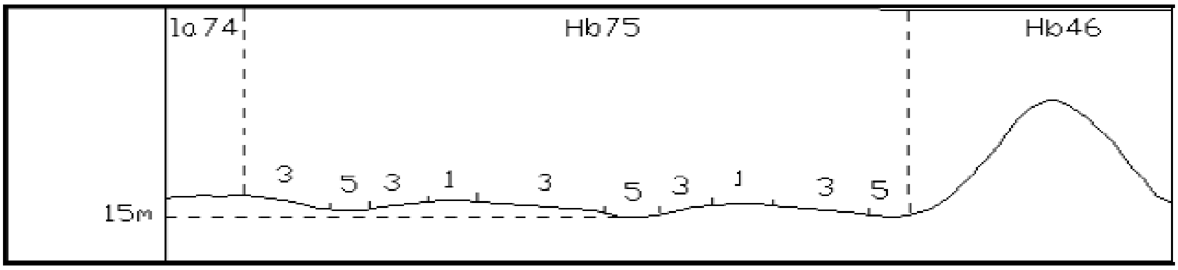


Figure 8: Land type HB75 terrain form

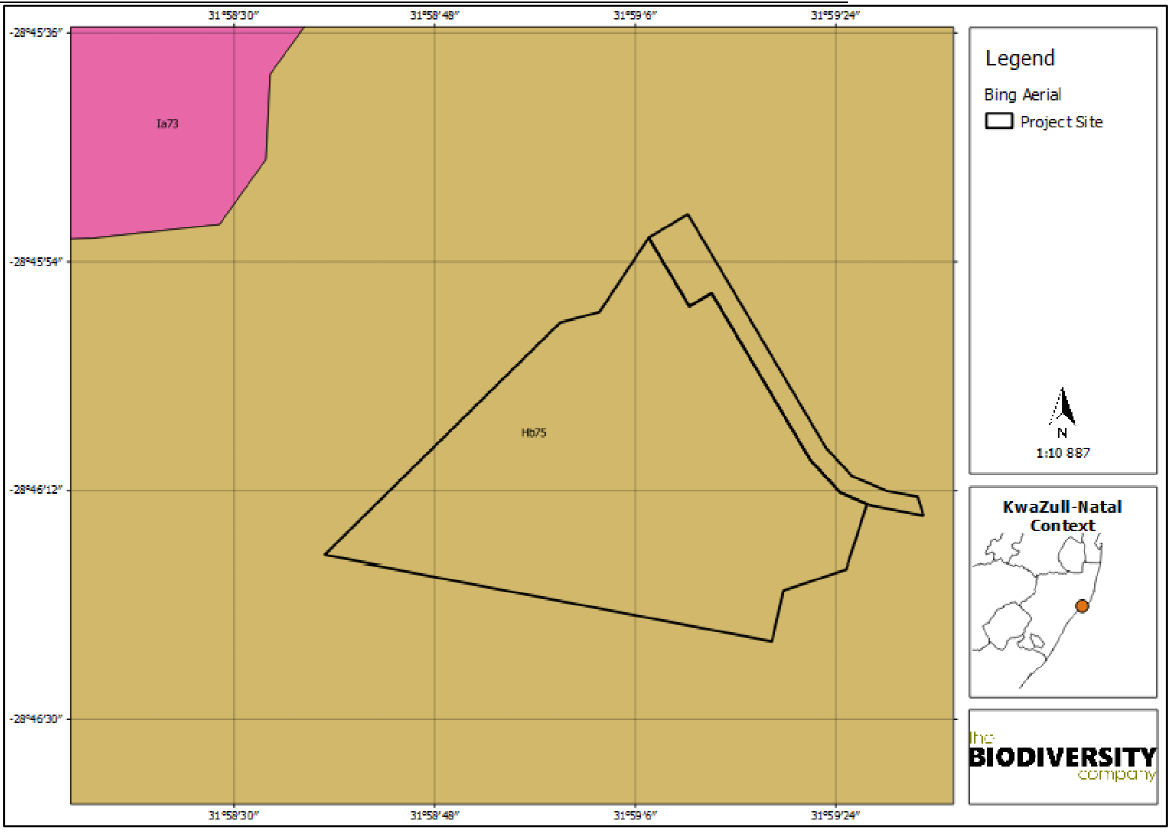


Figure 9: Land type map for the project area

5.4 Desktop Vegetation

The project area is situated within the following KZN vegetation biomes and vegetation types, namely Freshwater Wetlands and Maputaland Wooded Grassland. The Subtropical Freshwater Wetlands ordinarily occurred in low lying areas and were dominated by reeds, sedges, rushes and water-logged meadows dominated by grasses. The dominant vegetation type in the study area is Maputaland Wooded Grassland. This vegetation type typically supported coastal sandy grasslands rich in geoxylic suffritices, dwarf shrubs, small trees and very rich herbaceous flora (Rautenbach, A., 2019).

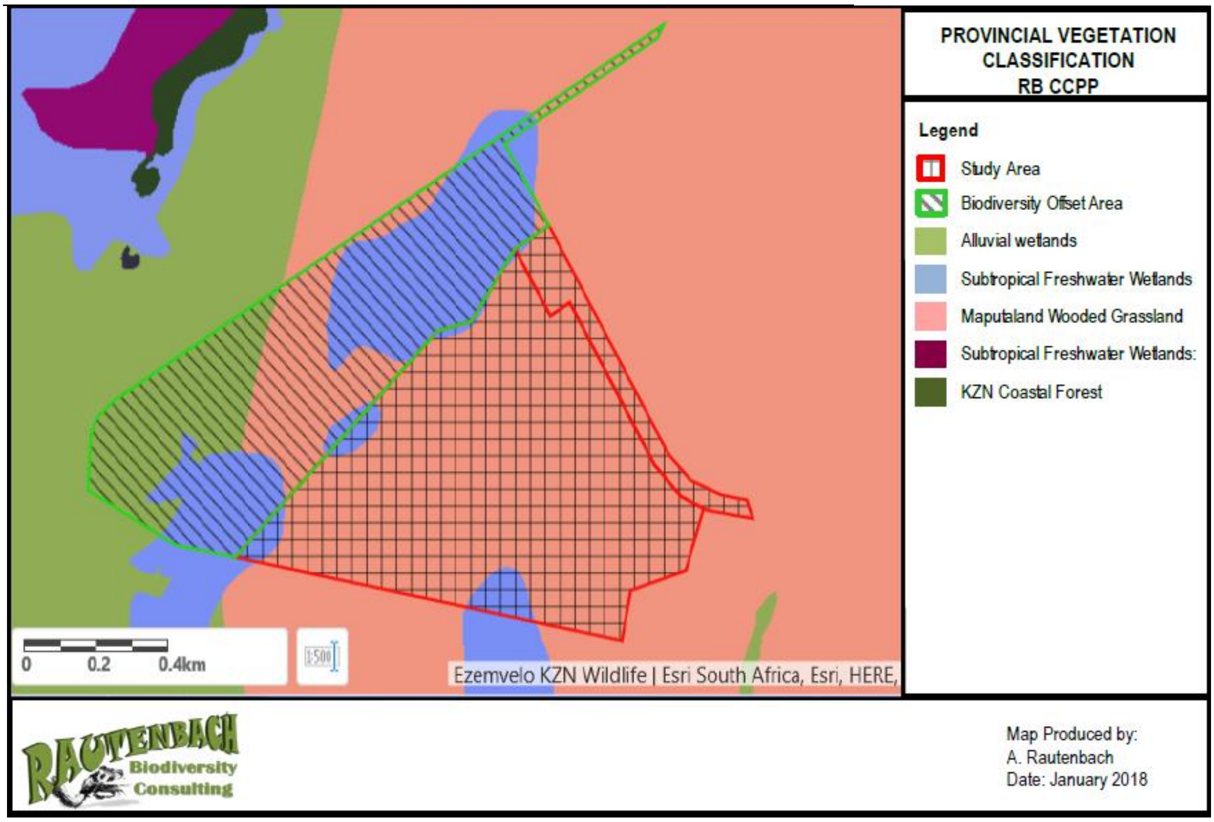


Figure 10: Vegetation types on the study area. Most of the study area falls within the Maputaland Wooded Grassland vegetation type. (Rautenbach, A., 2019)

6 Results and Discussion

6.1 Field Survey Findings

A detailed soil survey was conducted for the project site using a hand-held auger and a GPS to log all information in the field. The soils were classified to the family level as per the “Soil Classification - A Taxonomic System for South Africa” (Soil Classification Working Group 1991). The following information was recorded in the field:

- A horizon depth, colour and estimated clay percentage;
- B horizon depth, colour and estimated clay percentage;
- Signs of wetness;
- Rockiness of the profile;
- Surface crusting (if any); and
- Slope at the survey point.

6.1.1 Soil Summary

The project area is characterised by a relatively flat and uniform relief. The soils delineation is shown in Figure 11. The soil distribution is shown in Table 4 with the various summarised soil dashboards presented in Table 5 to Table 8. The soils in the project area are dominated by sandy alluvial soils. the areas with accumulated windblown sands were classified as Namib soils, which accounted for 27.6 ha (38.8 %) of the project area. The areas with moisture at depths greater than 30cm were classified as the Longlands soil form, which accounted for 3.3 ha (4.6 %) of the project area. The soil forms with moisture at or near the surface were classified as Katspruit / Westleigh soil forms, which accounted for 37.5 ha (52.8 %) of the area.

Table 4: Shows the distribution of the soils surveyed

Soil Forms	Total Area (ha)	Land Capability	Land Potential	Limitation
Namib	27.6 (38.8 %)	Class III	L2	Sandy, Rapid infiltration
Longlands	3.3 (4.6 %)	Class IV	L3	Wetness at depth
Katspruit / Westleigh	37.5 (52.8 %)	Class V	Vlei	Wetness at surface
Disturbed	2.6 (3.8 %)	Class VIII	L8	Disturbed
Total	71.0			

Table 5: Namib soils in the project area

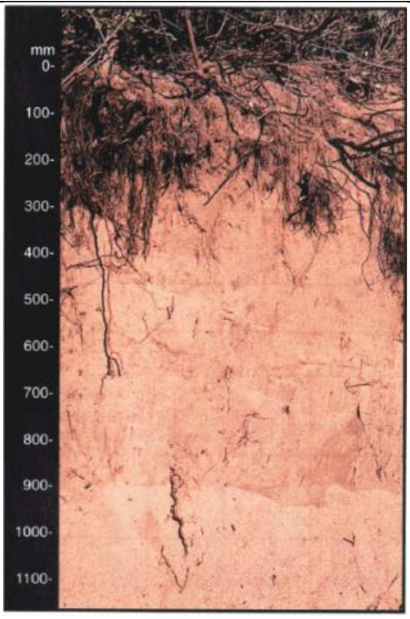
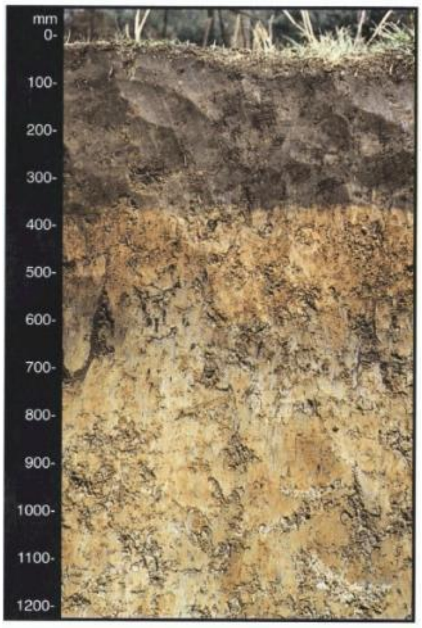
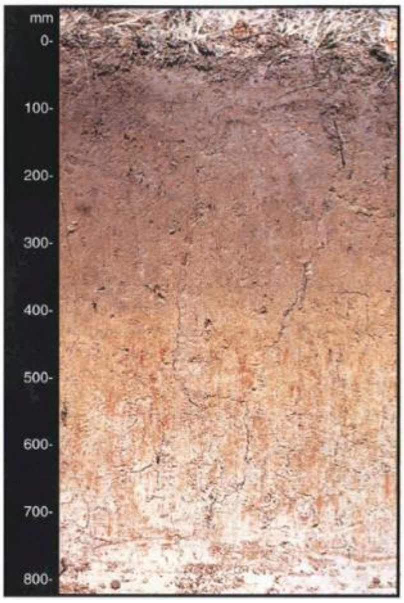
<table>
<tr><th colspan="3">Namib (Nortier 1100)</th></tr>
<tr><td rowspan="3">Horizons</td><td colspan="2">A typical cross section of a Namib soil (SASA, 1999).</td></tr>
<tr><td>Orthic A-Horizon</td><td rowspan="2">
</td></tr>
<tr><td>Regic sand B-Horizon</td></tr>
<tr><td>Description</td><td colspan="2">The Namib soil form is a relatively sandy soil form. The infiltration rates for these soils are high, depending on the structure and percentage clay. This soil form is moderately suited for agricultural purposes.</td></tr>
<tr><td>Site photos:
Sandy Orthic A-horizon topsoil (left), and Sandy topsoil with sparse vegetation (right).</td><td></td><td></td></tr>
</table>

Table 6: Katspruit soils in the project area

<table>
<tr><th colspan="3">Katspruit (Lammermoor 1000)</th></tr>
<tr><td rowspan="3">Horizons</td><td colspan="2">Typical Cross Section of a Katspruit soil (SASA, 1999).</td></tr>
<tr><td>Orthic A-Horizon</td><td rowspan="2">
</td></tr>
<tr><td>G-Horizon</td></tr>
<tr><td>Description</td><td colspan="2">The Katspruit soil form consists of an Orthic A-horizon on top of a saturated G-horizon. This soil form typically occurs at low lying areas where water tends to accumulate. A G-horizon is characterised by saturated conditions.</td></tr>
<tr><td>Site Photos:

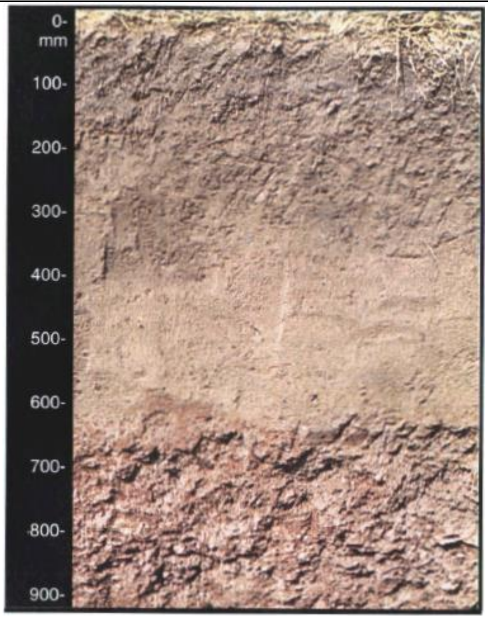
(left to right), Orthic A-Horizon and G-horizon.</td><td></td><td></td></tr>
</table>

Table 7: Westleigh soils in the project area

<table>
<tr><th colspan="3">Westleigh (Mareetsane 2000)</th></tr>
<tr><td rowspan="3">Horizons</td><td colspan="2">A typical cross section of a Westleigh soil (SASA, 1999).</td></tr>
<tr><td>Orthic A-Horizon</td><td rowspan="2">
</td></tr>
<tr><td>Soft Plinthic B-Horizon</td></tr>
<tr><td>Description</td><td colspan="2">The Westleigh soil is characterised by an Orthic A-horizon soil over a Soft Plinthic B-horizon. The B-horizon shows accumulation of mottling within 20cm of the surface.</td></tr>
<tr><td>Site Photos:

From left to right, Two variations in the Soft Plinthic B-horizon for the project area.</td><td></td><td></td></tr>
</table>

Table 8: Longlands soils in the project area

<table>
<tr><th colspan="3">Longlands (Ermelo 2000)</th></tr>
<tr><td rowspan="4">Horizons</td><td colspan="2">A typical cross section of a Longlands soil (SASA, 1999).</td></tr>
<tr><td>Orthic A-Horizon</td><td rowspan="3">
</td></tr>
<tr><td>E-Horizon</td></tr>
<tr><td>Soft Plinthic C-Horizon</td></tr>
<tr><td>Description</td><td colspan="2">The Longlands soil characterised by an Orthic A-horizon over a bleached E-horizon, with a Soft Plinthic C-horizon below that.</td></tr>
<tr><td>Site Photos:
From left to right, the bleached E-horizon and some mottling in the Soft Plinthic C-horizon.</td><td></td><td></td></tr>
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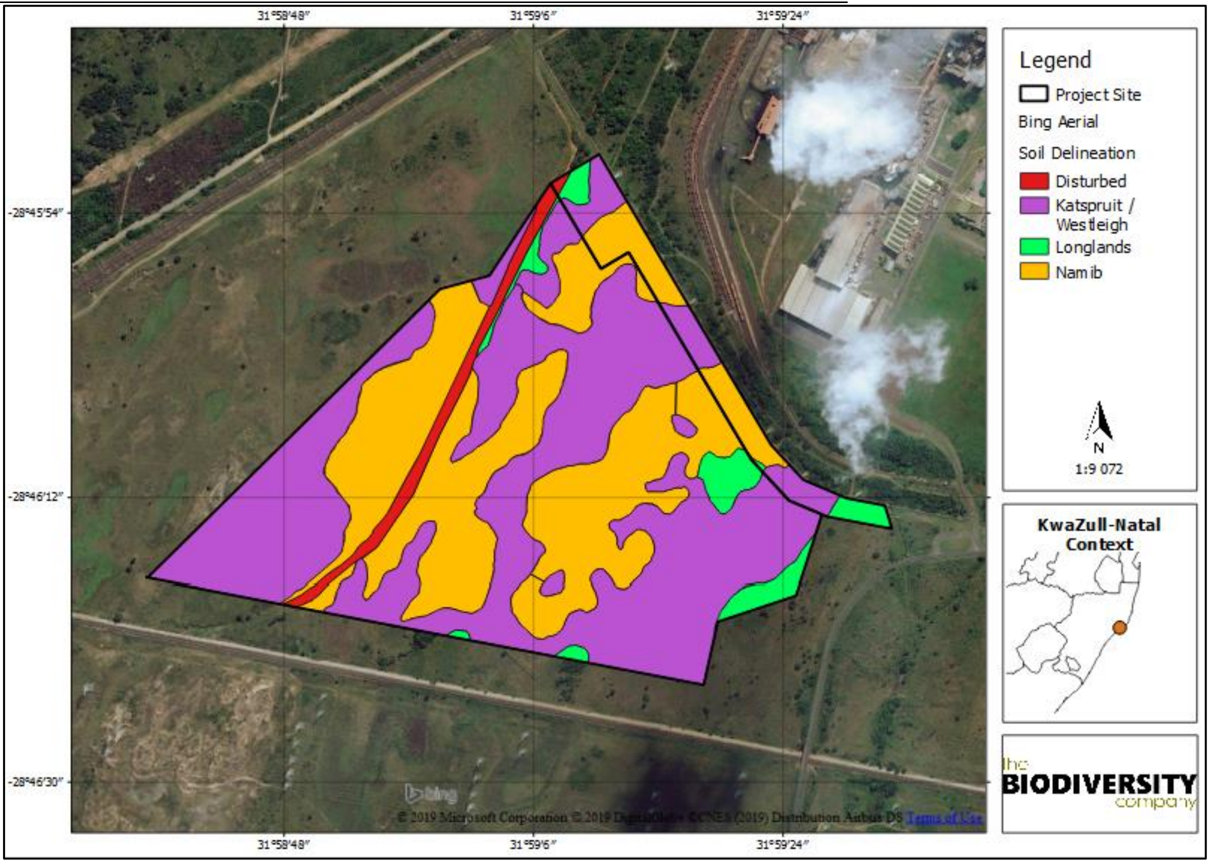

Figure 11: Soil forms for the project area

6.2 Agricultural Potential

Agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions.

The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region.

6.2.1 Current Situation

The project area is currently being utilised for grazing, no agriculture is possible due to the shallow water table and the sandy nature of the soils present. There are extensive pans across the site and the vegetation is sparse in places.

6.2.2 Verified Agricultural Potential

The climate capability for this region falls within the **C2 classification**. C2 (Slight limitation rating): Local climate is favourable for a wide range of adapted and a year-round growing season. Moisture stress and lower temperatures increase risks and decrease yields relative to C1.

The land capability was determined by using the guidelines described in "The farming handbook". A breakdown of the land capability classes is shown in Table 1: Land capability class and intensity of use (Smith, 2006).

The Land Capability for the project area is shown in Figure 12. The Namib soils were rated as having a Class III (Moderate Cultivation) land capability based on the flat topography and soils depth greater than 50 cm. The Class III land capability portions accounted for 27.6 ha of the project area. The Longlands soil forms were rated to have a Class IV (Light Cultivation/ Intensive Grazing) land capability based on the soil wetness being between 20cm and 50cm from the surface. The Class IV land capability accounted for 3.3 ha of the project area. The Katspruit and Westleigh soil forms were rated to be Class V (Wetland) land capability based on soil moisture being within 20cm from the surface. The Class V land capability accounted for 37.5 ha of the project area.

The Land Potential of the project area is shown in Figure 13 and the land potential groups are described previously in Table 2.

The land capability classes were rated to have the following land potentials;

Class III = L2 (High Potential);

Class IV = L3 (Good Potential);

Class V = Vlei (Wetland); and

Class VIII = L8 (Very Low Potential).

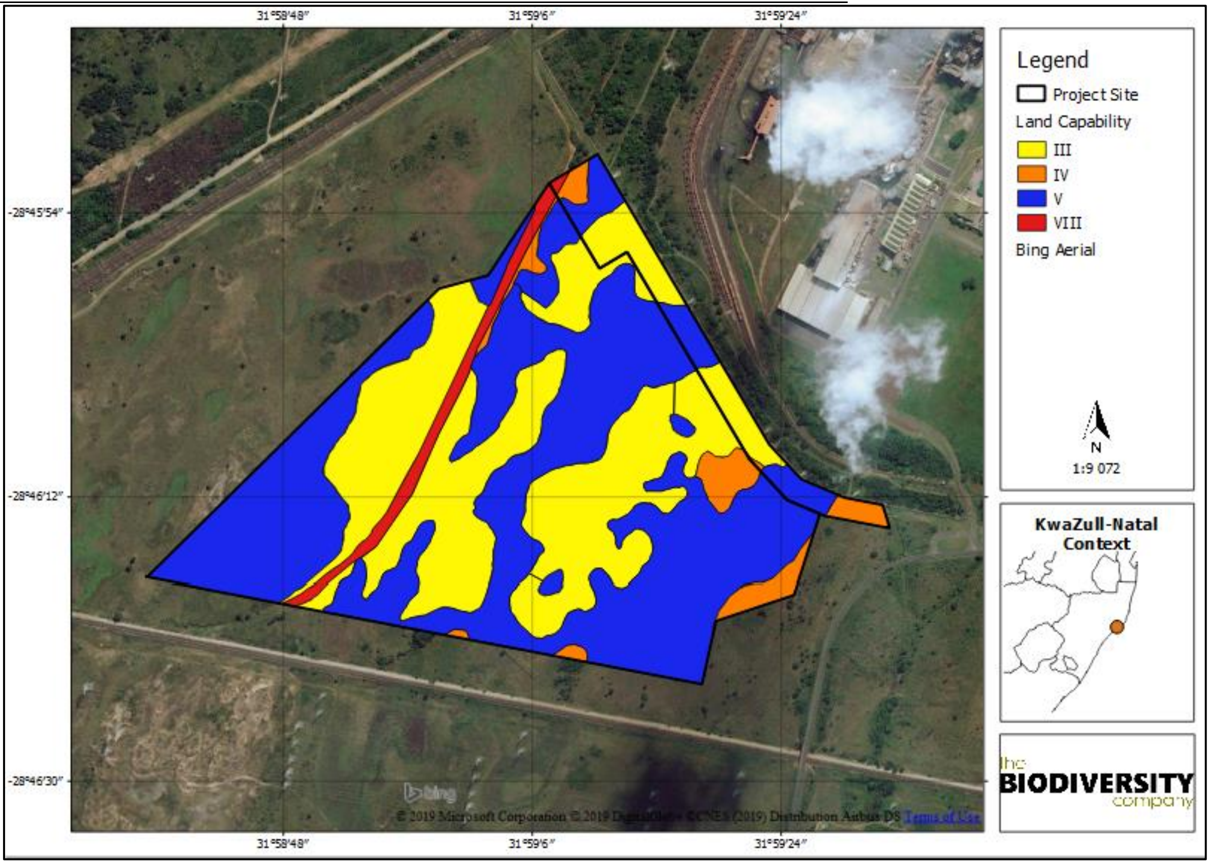

Figure 12: Land capability classes of different soil forms present within the project area

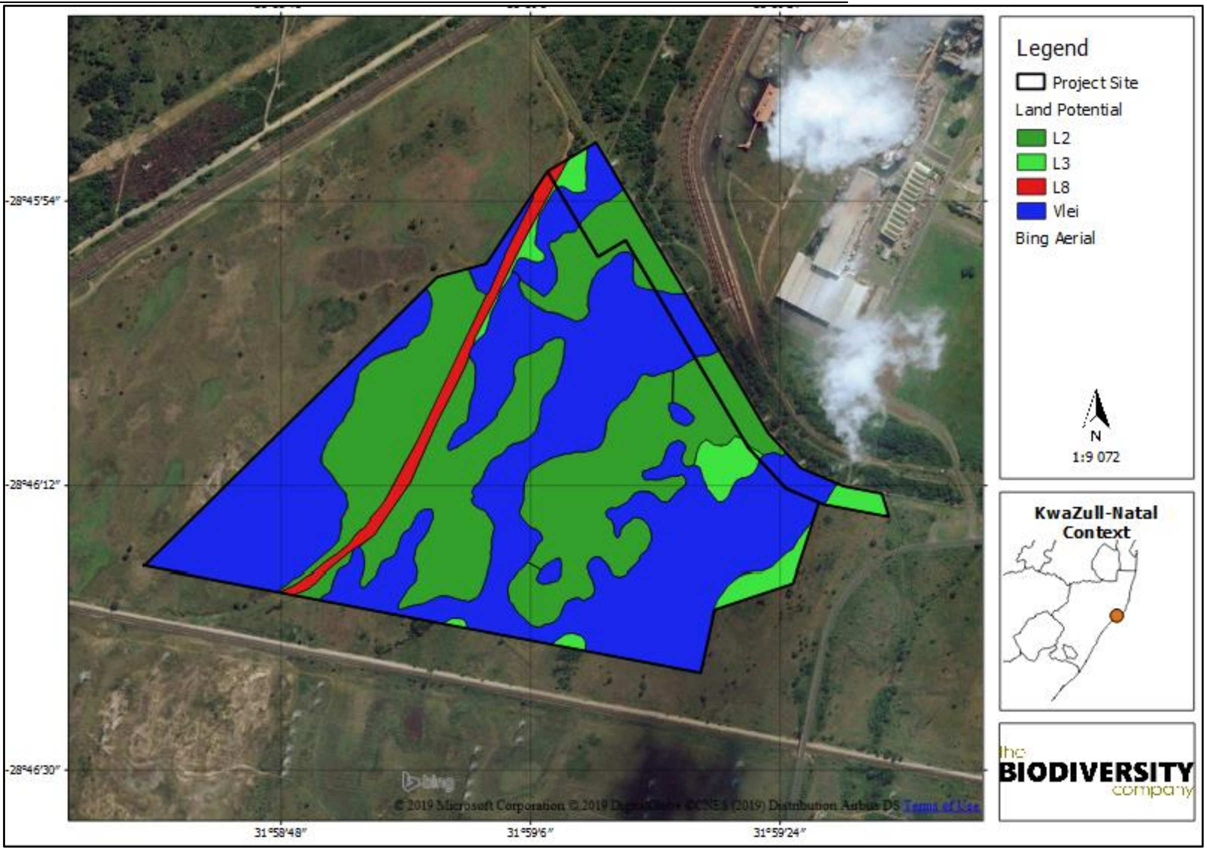

Figure 13: Land Potential Classes within the project area

6.3 Current Land Use

The project area is approximately 71 ha in size with grazing/veld activities dominating the area. The wetland areas are 28 ha of the project area, with a small portion being infrastructure and the remaining area being Veld (Grazing) Figure 14. Figure 15 shows the grazing activities taking place on the project area.

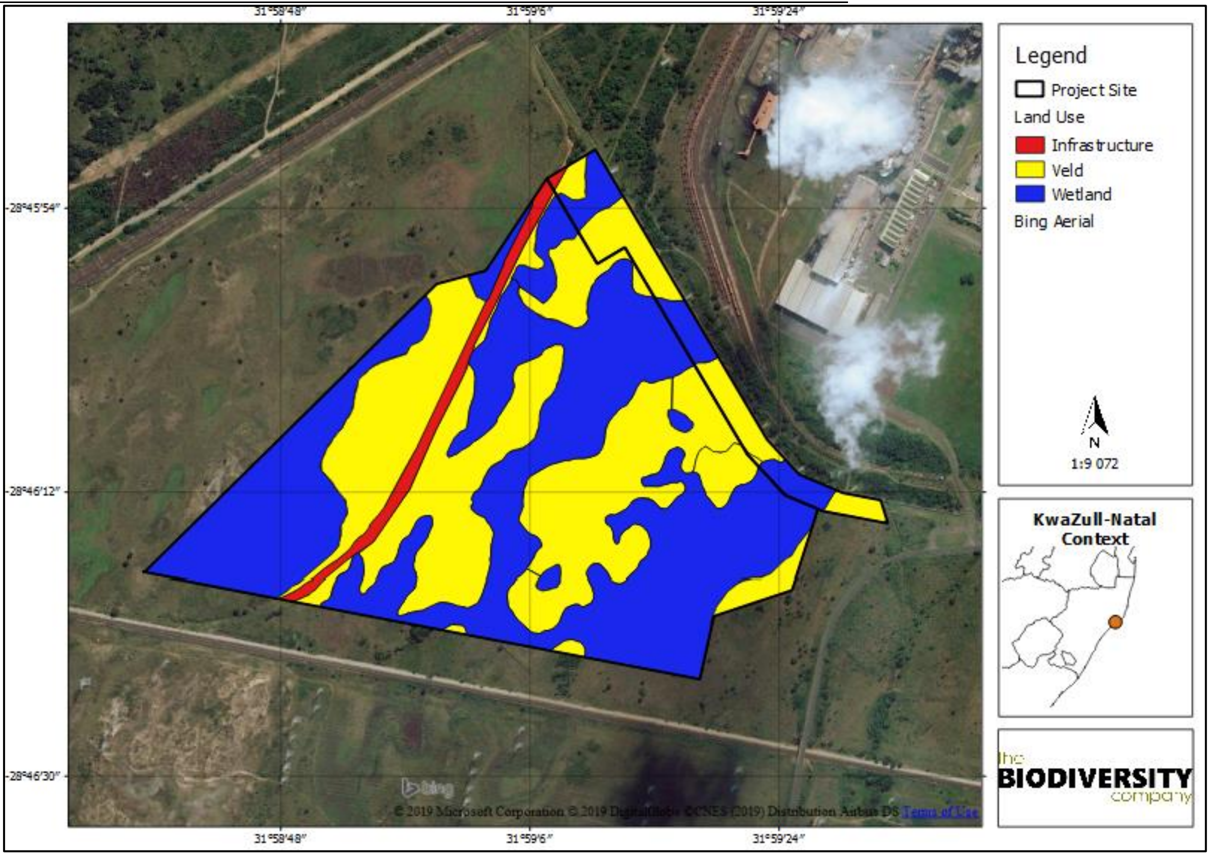

Figure 14: Land use within the project area

Figure 15: Cattle grazing within the project area.

7 Impact Assessment

7.1 Existing Impacts

The following existing impacts were observed in or adjacent to the project area:

- The removal of vegetation due to historical deforestation of the project area, and current livestock farming in the area. Livestock farming has resulted in vegetation being trampled and overgrazed.
- Historical disturbances and current land uses have resulted in the onset and establishment of alien vegetation across the project and offset areas.

7.2 Potential Impacts

Potential disturbances include compaction, physical removal and potential pollution; The exposed soil surfaces have the potential to erode easily if left uncovered which could lead to the loss of the soil resource.

- Soils that are excavated for the foundations will have their physical and chemical states altered negatively;
- Potential loss of stockpiled topsoil and other materials through erosion if not protected properly;
- Insufficient stormwater control measures may result in localised high levels of soil erosion, possibly creating dongas or gullies, which may lead to decreased water quality in surrounding watercourses;
- Increased erosion could result in increased sedimentation which could impact on ecological processes;
- The additional hardened surfaces created during construction could increase the amount of stormwater runoff, which has the potential to cause erosion;
- Physical disturbance of the soil and plant removal may result in soil erosion/loss; and
- Erosion and potential soil loss from cut and fill activities and areas where naturally dispersive soils occur.

7.3 Assessment of Significance

Figure 16 presents the proposed project aspects which have been considered for the study, with close consideration being afforded to the layout of the facility in relation to the delineated land potentials. The proposed project will result in the loss of high to good potential agricultural land. This loss is the key consideration for the impact assessment. No mitigation is possible for the loss of land capability/potential.

Table 9 shows the significance of potential impacts associated with the development on the agricultural potential before and after implementation of mitigation measures. The impact on the land capability both pre- and post-mitigation will be High, due to the permanence of the structures that are being proposed.

Table 9: Assessment of significance of potential impacts on agricultural potential associated with the proposed development pre- and post- mitigation

Nature: Loss of agricultural potential		
The impacts to consider are those relating to the disturbance of the natural soil state. When soil is stripped the physical properties are changed and this impacts on the soil health. When the soil is stockpiled, the soils chemical properties will deteriorate unless properly managed. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil erosion could remove that same amount of soil if not more. Whilst the construction takes place, vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases run-off potential. The increased run-off potential then leads to increased erosion hazards. If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil seed bank and natural fertility balance is diluted. This will affect the re-growth of vegetation on the stockpiles as well as the re-growth when they have been replaced during the rehabilitation process, therefore soils should be handled with care from the construction phase through to the decommissioning phase.		
	Without mitigation	**With mitigation**
Extent	Moderately High (4)	Moderately High (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very High (10)	Very High (10)
Probability	Definite (5)	Definite (5)
Significance	**High**	**High**
Status (positive or negative)	Negative	Negative
Reversibility	None	Medium
Irreplaceable loss of resources?	Definite	Definite
Can impacts be mitigated?	No	No
Mitigation:		
• Bush clearing of all bushes and trees taller than one meter; Ensure proper storm water management designs are in place; • If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure; • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 1.5m; • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible;		

• The subsoil approximately 0.3 to the designated thickness in the stripping guidelines, will then be stripped and stockpiled separately; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly; • Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles; • The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil. • Place the above cleared vegetation were the topsoil stockpiles are to be placed.
Residual Risks:
Expected to be considerably high due to the permanent loss of agricultural potential.

Table 10 shows the significance of potential impacts associated with the development on the soil resources before and after implementation of mitigation measures. The impact on the soil as a valuable resource pre-mitigation is rated as High, due to the risk of erosion and incorrect stockpiling methods. Once the resource is lost it cannot be recovered. However, if mitigation is applied and the soil is handled correctly the impact is reduced to Medium. The same mitigation measures have been included into the agricultural potential impact assessment (Table 9) as a precautionary approach. These are incredibly important to protect the soil resource.

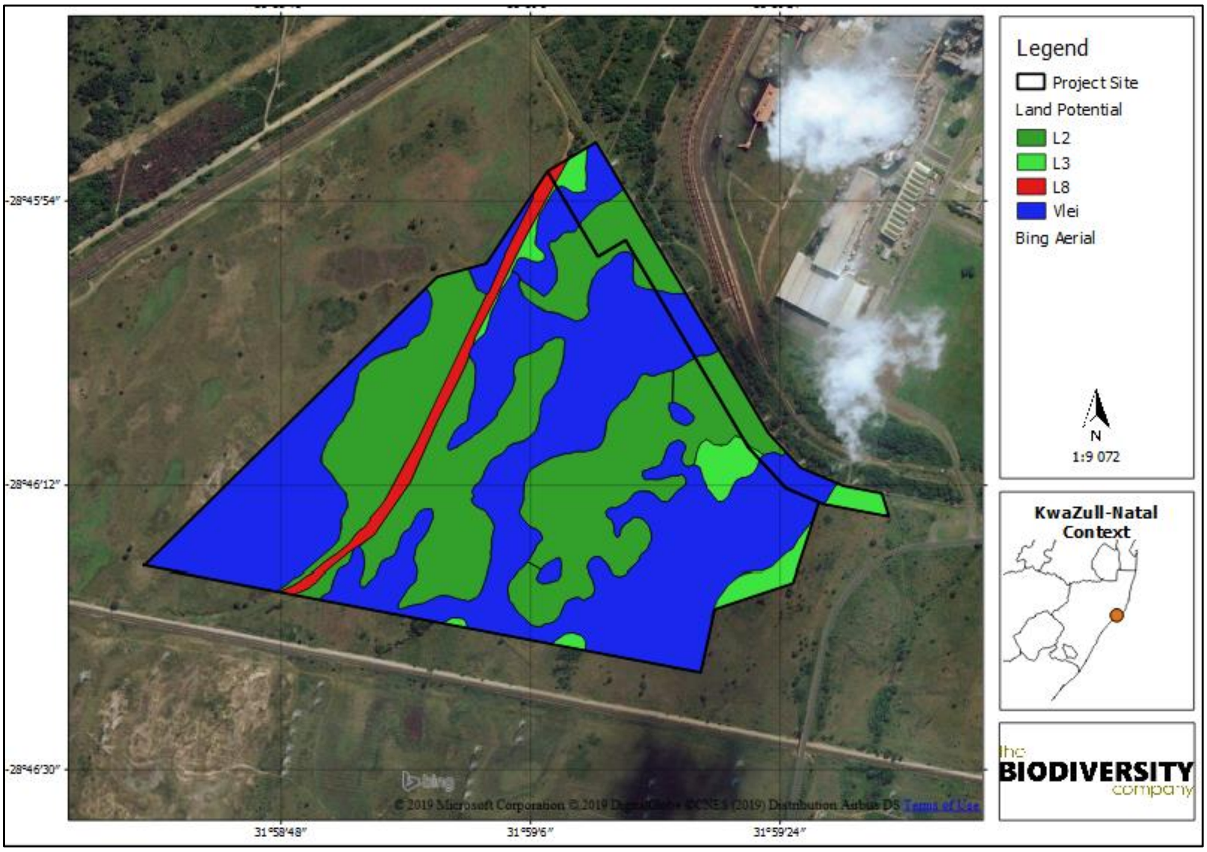

Figure 16: The proposed project aspects in relation to the Land Potential of the area

Table 10: Assessment of significance of potential impacts on soil resources associated with the proposed development pre- and post- mitigation

Nature: Loss of soil resources		
The impacts to consider are those relating to the disturbance of the natural soil state. When soil is stripped the physical properties are changed and this impacts on the soil health. When the soil is stockpiled, the soils chemical properties will deteriorate unless properly managed. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil erosion could remove that same amount of soil if not more. Whilst the construction takes place vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases run-off potential. The increased run-off potential then leads to increased erosion hazards. If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil seed bank and natural fertility balance is diluted. This will affect the re-growth of vegetation on the stockpiles as well as the re-growth when they have been replaced during the rehabilitation process, therefor soils should be handled with care from the construction phase through to the decommissioning phase.		
	Without mitigation	**With mitigation**
Extent	Moderately High (4)	Moderately Low (2)
Duration	Permanent (5)	Short Term (2)
Magnitude	Very High (10)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**High**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	Definite	Distinct Possibility
Can impacts be mitigated?	Yes	Yes
Mitigation:		
• Bush clearing of all bushes and trees taller than one meter; Ensure proper storm water management designs are in place; • If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure; • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 1.5m; • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; • The subsoil approximately 0.3 to the designated thickness in the stripping guidelines, will then be stripped and stockpiled separately; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly; • Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles; • The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.		

• Place the above cleared vegetation were the topsoil stockpiles are to be placed.
Residual Risks:
Expected to be moderate due to possible alien vegetation infestation and erosion

7.4 Cumulative Impact

The major impacts associated with industrial developments are the disturbance of natural occurring soil profiles consisting of layers or soil horizons. Soil formation is determined by a combination of five interacting main soil formation factors. These factors are time, climate, slope, organisms and parent material. Soil formation is an extremely slow process and soil can therefore be considered as a non-renewable resource.

The impact on soil is high because natural soil layers are stripped and stockpiled. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer. The topsoil layer is the layer where most plant roots are found and is generally 0.30 m thick.

Once soil resources or agricultural land has been lost it is increasingly difficult to replace. Therefor the impacts on a site specific and cumulative bases remain High.

Table 11: Assessment of significance of cumulative impacts on agricultural potential associated with the proposed development pre- and post- mitigation

Nature: Cumulative impact		
Agricultural land is threatened in South Africa from various sectors and the protection of these resources are of utmost importance to ensure food security.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (4)	Regional (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very High (10)	Very High (10)
Probability	Definite (5)	Definite (5)
Significance	**High**	**High**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Definite	Definite
Can impacts be mitigated?	No	No
Mitigation:		
No mitigation		
Residual Risks:		
Expected to be High if L2 and L3 land is developed in a cumulative way.		

7.5 Environmental Management Programme

An Environmental Management Program (EMPr) for the proposed development is required in terms of Sections 2 and Section 28 of the National Environmental Management Act (1998). The EMPr is a legally binding document on the applicant as a condition of approval of the Project by the Department of Environment Affairs and Development Planning (DEADP), in addition to other conditions that may be stipulated in the Record of Decision / Environmental Authorisation.

Table 12 present the recommended mitigation measures and the respective timeframes and responsibilities for the loss of, and impacts to the soils and agricultural potential.

Table 12: Mitigation measures including requirements for timeframes and responsibilities for the loss of agricultural potential

Objective: Minimise impact to soil resources and agricultural potential		
Project components	Infrastructure Development	
Potential impacts	Loss of soil resources and land capability	
Activity / risk source	Vegetation / soil clearing. Excavations, stockpiling.	
Target / objective	Minimise erosion (soil loss), compaction and further loss of soils and land capability.	
Mitigation Measures	**Timeframe**	**Responsibility**
The impacts to consider are those relating to the disturbance of the natural soil state. When soil is stripped the physical properties are changed and this impacts on the soil health. When the soil is stockpiled, the soils chemical properties will deteriorate unless properly managed. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil erosion could remove that same amount of soil if not more. *Whilst the construction takes place vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases runoff potential. The increased runoff potential then leads to increased erosion hazards.* *If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil seed bank and natural fertility balance is diluted. This will affect the re-growth of vegetation on the stockpiles as well as the re-growth when they have been replaced during the rehabilitation process, therefor soils should be handled with care from the construction phase through to the decommissioning phase.*	Construction and operation	Applicant / EAP / ECO

7.6 Recommendations

These recommendations may supplement the prescribed mitigation measures, but these recommendations must be investigated prior to the issuing of environmental authorisation. These recommendations must be investigated for the feasibility to realistically achieve what is intended for this project. The following recommendations are applicable for this project:

1. The areas rated as L2 and L3 are High to Good potential soils, however, these soils are either frequently inundated with water or are in the form of sand dunes. These are not as suitable as anticipated but are still arable if managed correctly.

8 Conclusion

Afzelia Environmental Consultants (Pty) Ltd (Afzelia) were appointed by Savannah Environmental Consultants (Pty) Ltd (Savannah) to provide supporting specialist studies for the proposed development of a Combined Cycle Power Plant (CCPP) and associated infrastructure on a site near Richards Bay, KwaZulu-Natal Province. The intent of these specialist studies was to provide supporting information for the Environmental Impact Assessment (EIA).

The Biodiversity Company was commissioned by Afzelia to conduct specialist studies to supplement the abovementioned applications. This agricultural potential assessment was conducted from 25th January 2018.

The project area is characterised by a relatively flat and uniform relief. The soils delineation is shown in Figure 11. The soil distribution is shown in Table 4. The soils in the project area are dominated by sandy alluvial soils. the areas with accumulated windblown sands were classified as Namib soils, which accounted for 27.6 ha (38.8 %) of the project area. The areas with moisture at depths greater than 30cm were classified as the Longlands soil form, which accounted for 3.3 ha (4.6 %) of the project area. The soil forms with moisture at or near the surface were classified as Katspruit / Westleigh soil forms, which accounted for 37.5 ha (52.8 %) of the area.

The climate capability for this region falls within the **C2 classification**. C2 (Slight limitation rating): Local climate is favourable for a wide range of adapted and a year-round growing season. Moisture stress and lower temperatures increase risks and decrease yields relative to C1.

The Land Capability for the project area is shown in Figure 12. The Namib soils were rated as having a Class III (Moderate Cultivation) land capability based on the flat topography and soils depth greater than 50 cm. The Class III land capability portions accounted for 19.2 ha of the project area. The Longlands soil forms were rated to have a Class IV (Light Cultivation/ Intensive Grazing) land capability based on the soil wetness being between 20cm and 50cm from the surface. The Class IV land capability accounted for 3.3 ha of the project area. The Katspruit and Westleigh soil forms were rated to be Class V (Wetland) land capability based on soil moisture being within 20cm from the surface. The Class V land capability accounted for 37.5 ha of the project area.

The Land Potential of the project area is shown in Figure 13 and the land potential groups are described previously in Table 2.

The land capability classes were rated to have the following land potentials;

Class III = L2 (High Potential);

Class IV = L3 (Good Potential);

Class V = Vlei (Wetland); and

Class VIII = L8 (Very Low Potential).

An impact assessment showed that the impact on the agricultural potential will be High pre- and post-mitigation due to the permanence of the structures to be developed. The impact on the soil resource as a valuable resource pre-mitigation is rated as High, due to the risk of erosion and incorrect stockpiling methods. Once the resource is lost it cannot be recovered. However, if mitigation is applied and the soil is handled correctly the impact is reduced to Medium. The same mitigation measures have been included into the agricultural potential impact assessment (Table 9) as a precautionary approach. These are incredibly important to protect the soil resource.

<u>It is the opinion of the Agricultural Specialist that there is no reason why the proposed development should not proceed, this is based on the following reasons:</u>

1. The areas rated as L2 and L3 are High to Good potential soils, however, these soils are either frequently inundated with water or are in the form of sand dunes. These are not as suitable as anticipated but are still arable if managed correctly.

9 References

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