ZIMPANDE
RESEARCH COLLABORATIVE

Soil, Landuse and Land Capability Assessment

SCOPING REPORT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED TOURNEE 2 SOLAR PARKS NEAR THUTHUKANI, MPUMALANGA PROVINCE.

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GLOSSARY OF TERMS

AGIS	Agricultural Geo-Referenced Information Systems
Alluvial soil:	A deposit of sand, mud, etc. formed by flowing water, or the sedimentary matter deposited thus within recent times, especially in the valleys of large rivers.
Chromic:	Having within ≤150 cm of the soil surface, a subsurface layer ≥30 cm thick, that has a Munsell colour hue redder than 7.5YR, moist.
Catena	A sequence of soils of similar age, derived from similar parent material, and occurring under similar macroclimatic condition, but having different characteristics due to variation in relief and drainage.
Catchment	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Chroma	The relative purity of the spectral colour which decreases with increasing greyness.
Evapotranspiration	The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants
IEM	Integrated Environmental Management
IUSS	International Union of Soil Sciences
Lithic	Having continuous rock or technic hard material starting ≤10 cm from the soil surface.
SACNASP	South African Council for Natural Scientific Professions
Salinity	High Sodium Adsorption Ratio (SAR) above 15% are indicative of saline soils. The dominance of Sodium (Na) cations in relation to other cations tends to cause soil dispersion (deflocculation), which increases susceptibility to erosion under intense rainfall events.
Sodicity	High exchangeable sodium Percentage (ESP) values above 15% are indicative of sodic soils. Similarly, the soil dispersion.
SOTER	Soil and Terrain
Watercourse	In terms of the definition contained within the National Water Act, a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks

ACRONYMS

°C	Degrees Celsius.
EAP	Environmental Assessment Practitioner
EMP	Environmental Management Programme
ET	Evapotranspiration
FAO	Food and Agriculture Organization
GIS	Geographic Information System
GPS	Global Positioning System
m	Meter
MAP	Mean Annual Precipitation
MPRDA	Minerals and Petroleum Resources Development Act, Act 28 of 2002
NEMA	National Environmental Management Act
NWA	National Water Act
SACNASP	South African Council for Natural Scientific Professions
WULA	Water Use Licence Application
ZRC	Zimpande Research Collaborative

1. INTRODUCTION

The Zimpande Research Collaborative (ZRC) was appointed to conduct a soil and land capability scoping assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the proposed Tournee 2 Solar Park as proposed by Tournee 2 Solar (Pty) Ltd. near Thuthukani, Mpumalanga Province.

1.1 Background and Project Description

The proposed Tournée 2 Solar PV Park will have a generating capacity of no more than 150 Megawatts (MW) and battery energy storage systems (BESS) of 600 megawatt-hours (MWh). Tier-1 bi-facial, single axis trackers are considered for the panels. The proposed Tournée 2 Solar PV Park will also include an on-site Independent Power Producer (IPP), which includes a substation. It is proposed that Lithium Battery Technologies such as Lithium-Ion Phosphate or Lithium Nickel Manganese Cobalt oxides will be considered as the preferred battery technology.

The purpose of the facility is to generate clean electricity from a renewable energy source (i.e., solar radiation) to contribute to the National Energy Grid.

The proponent provided preliminary development and exclusion areas for the Tournée 2 Solar PV Park (Figure 3), however, the layout will be finalised based on the results of all specialists and presented in the EIA report.

Table 1: Project details for the proposed Tournée 2 Solar PV Park.

Farm Potions Combined Extent	505.15 hectares (ha)
Buildable Area (subject to finalisation)	~297 ha
Contracted Capacity of PVSEF	Up to 150 MW/600MWh.
Associated Infrastructure	Internal Roads 4-5 m wide and up to 8km long.
	Independent Power Producer (IPP) site, (includes Back-to-back substation including IPP side and Eskom side)
	Battery Energy Storage System (BESS) (Including 132 kV feeder bays, transformers, control building and telecommunication infrastructure).
	Paved areas (m²) - 2 200.
	O&M building (m²) - 1 500.
	Construction phase: Construction camp area (m²) - 5,000 Laydown area (m²) - 20,000 Septic tanks, and portable toilets.
	PV Modules (229 Ha).
Technical Specifications	Tier 1 bi-facial, single axis trackers.

1.2 Terms of Reference and Scope of Work

For the desk-based phase of the assessment, the soil and land capability assessment entail the following aspects:

- Undertake a desktop study to determine the soil, land use and land capability of the Tournee 2 Solar PV Park;
- Assess spatial distribution of various soil types within the focus area at a high level;
- Compile various maps depicting the on-site conditions, soil types and land capability based on desktop review of existing data; and
- Compile a report presenting the opportunities and constraints and a description of the findings during the desktop exercise.

1.3 Assumptions and Limitations

For the purpose of this assessment, the following assumptions and limitations are applicable:

- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics associated with the investigation area at the scale required to inform an environmental process. However, this information is useful as background information to the study and, if desktop results are considered with the outcome of the soil and land capability assessment, sufficient decision making can take place;
- The soil survey conducted as part of the land capability assessment was confined within the study area outline. However, consideration of the immediately adjacent areas was given; and
- Since soils occur in a continuum with infinite variances, it is often problematic to classify any given soils as one form, or another. for this reason, the classifications presented in this report are based on the "best fit" to the soil classification system of South Africa.

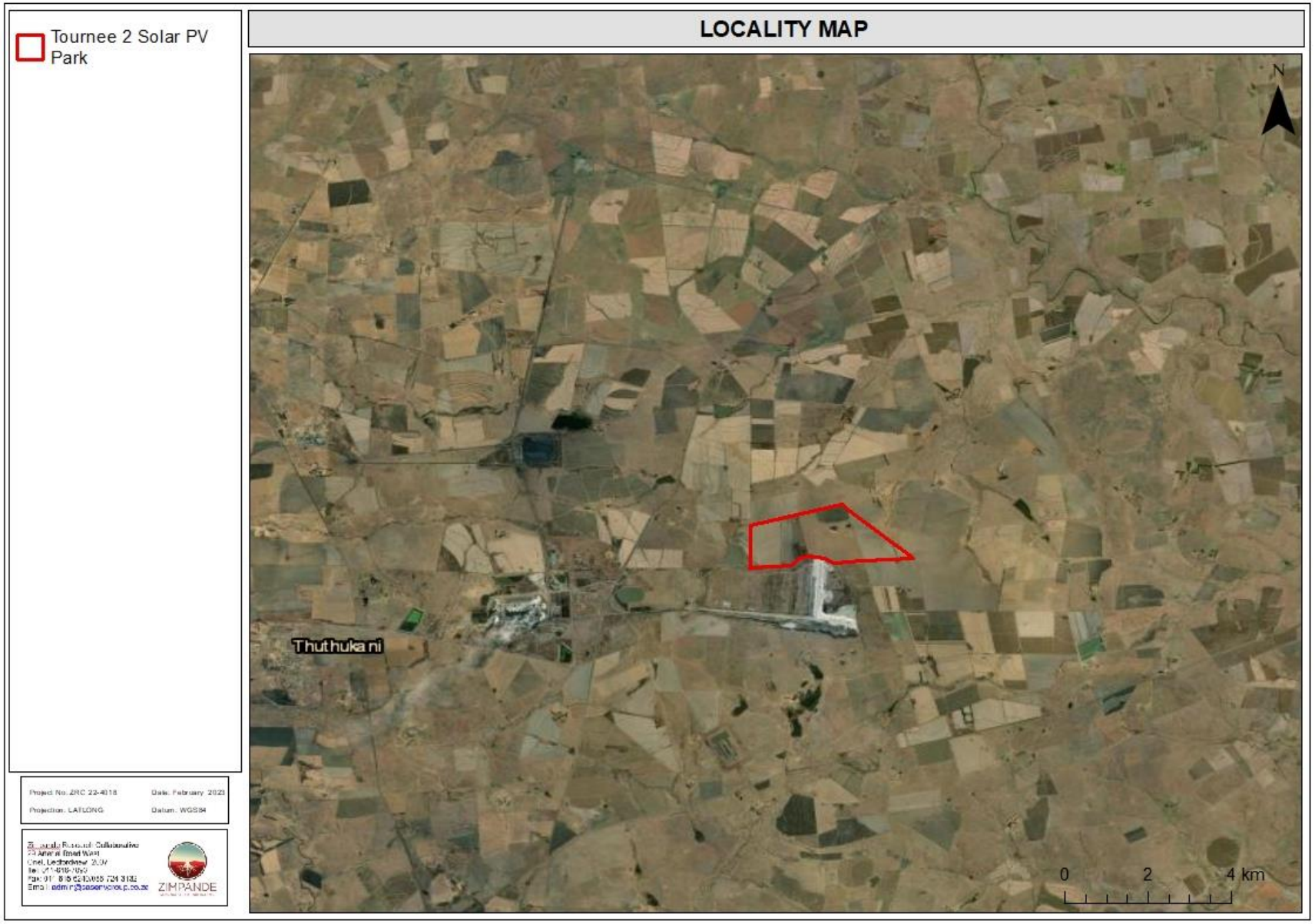

Figure 1: Digital satellite imagery depicting the locality of the Tournee 1Sola PV Park in relation to the surrounding areas.

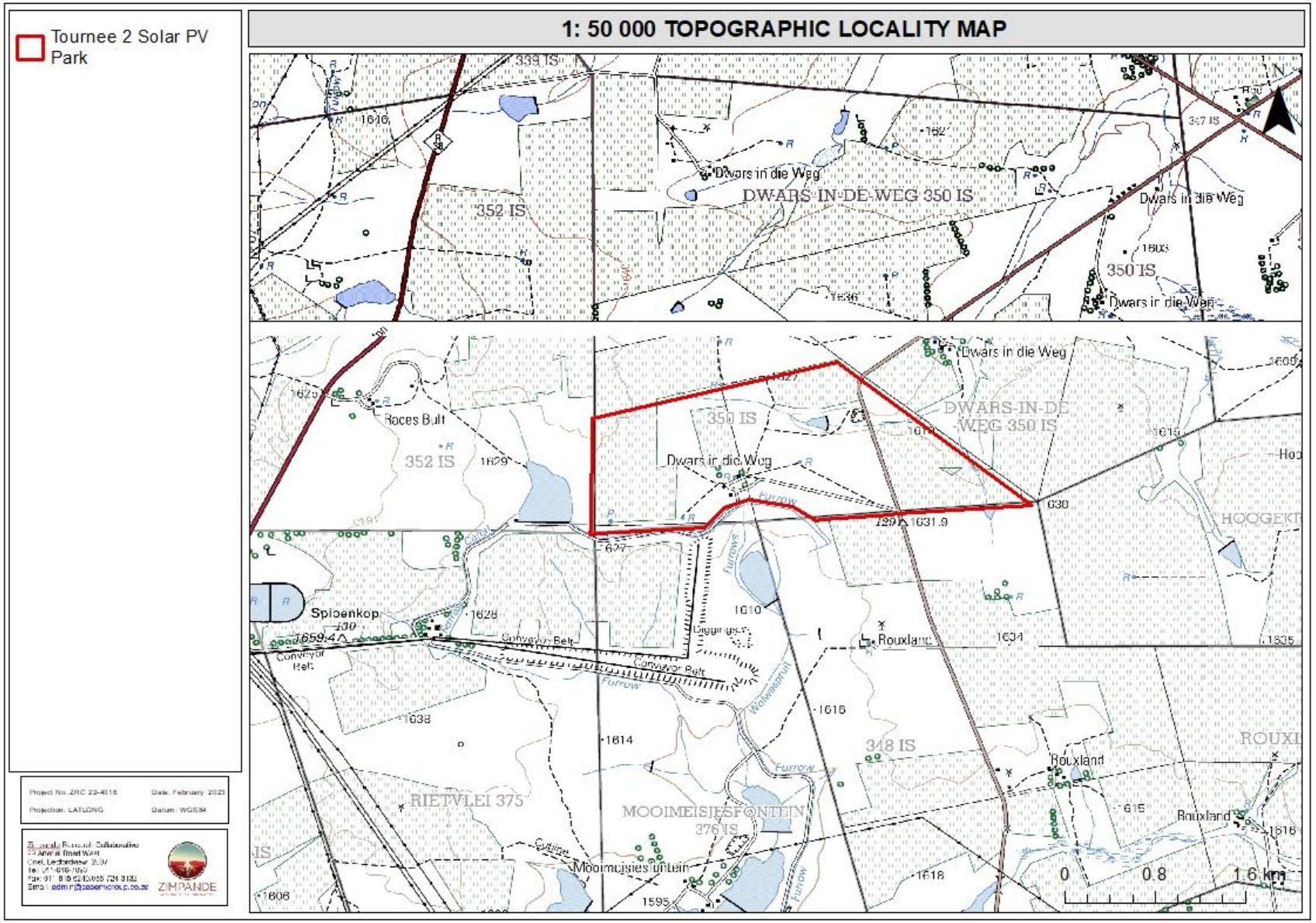

Figure 2: Location of the Tournee 2 Solar PV Park depicted on a 1:50 000 topographical map in relation to surrounding area.

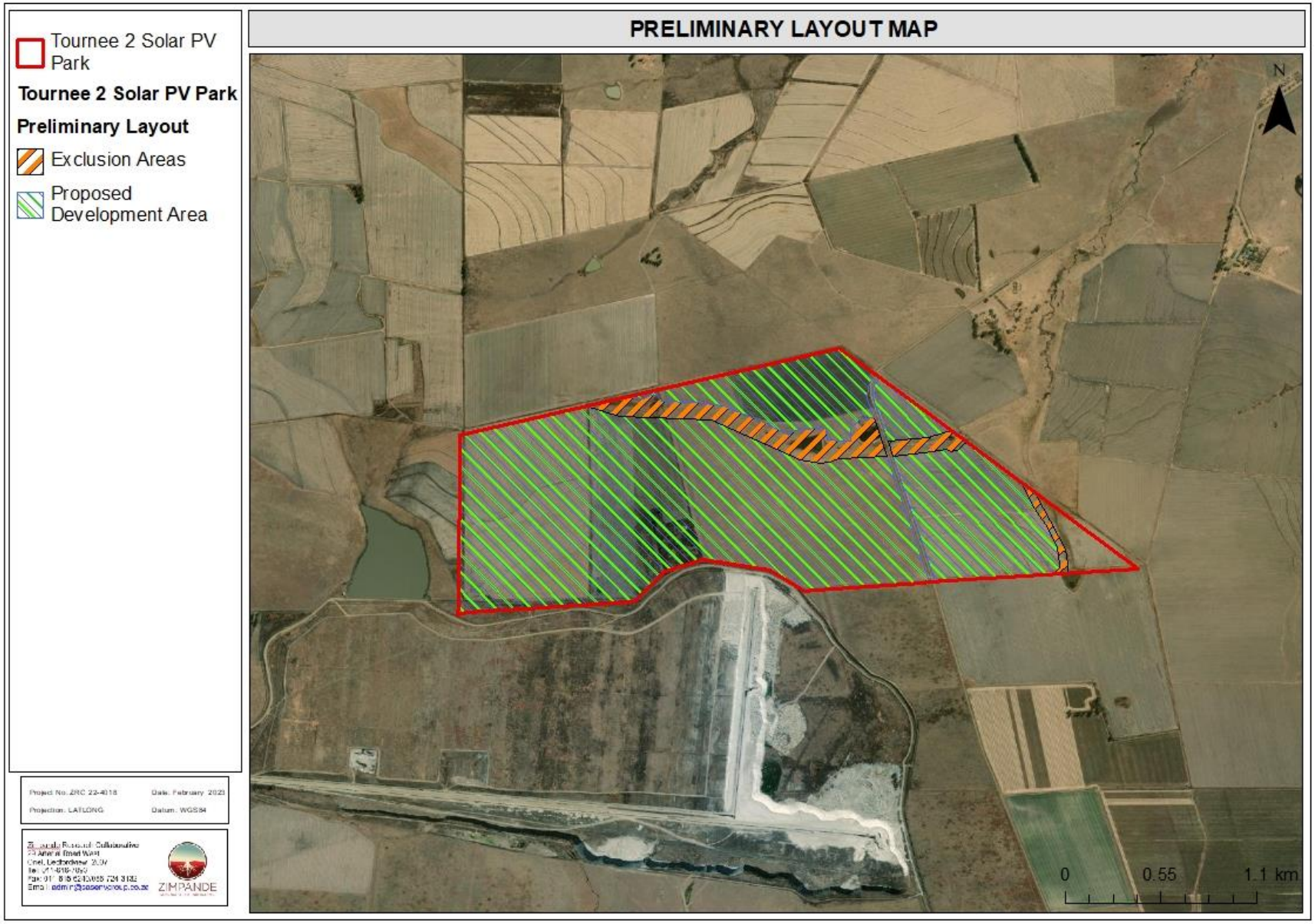

Figure 3: Location of the Tournee 2 Solar PV Park depicted on a 1:50 000 topographical map in relation to surrounding area.

1.4 Legislative Requirements

The bullets points below summarise the legislative requirements which will guide the scope of this study:

- The National Water Act (NWA) and in particular GN R 704, which acknowledges the principle of co-operative governance between the three key ministries (DME, DEAT, DWAF) that legislate key aspects of mining activity,
- The Mineral and Petroleum Resources Development (MPRDA) Act No. 28 of 2002
- The National Forests Act (NFA),
- The Conservation of Agricultural Resources Act (CARA), and
- The Disaster Management Act, 2002.

2. METHOD OF ASSESSMENT

2.1 Literature and Database Review

A desktop study was conducted to determine the soil, land use and land capability properties. Further to this, literature review and other database such as the Agricultural Geo-Referenced Information System (AGIS) and Agricultural Research Council Institute for Soil Climate and Water (ARC-ISCW), in order to collect the pre-development soil and land capability data.

2.2 Consideration of the Department Environmental Affairs (DEA) Screening Tool

The information provided in this section aims to understand the sensitivity of the agricultural resources and how the proposed solar facility may impact on the food production potential of the site. The results of the screening tool are contained in Figure 5.

2.3 Soil Classification and Sampling

A soil survey was conducted in February 2023 at which time the identified soils within the study area were classified into soil forms according to the Soil Classification System: A Natural and Anthropogenic System for South Africa Soil Classification System (2018). The soil survey was restricted to the study area. Subsurface soil observations were made using a manual hand auger in order to assess individual soil profiles, which will entail evaluation of physical soil properties and prevailing limitations to various land uses.

2.4 Land Capability Classification

Agricultural potential is directly related to Land Capability, as measured on a scale of I to VIII, as presented in Table 2 below; with Classes I to III classified as prime agricultural land that is well suited for annual cultivated crops, whereas Class IV soils may be cultivated under certain circumstances and specific or intensive management practices, and Land Classes V to VIII are not suitable to cultivation. Furthermore, the climate capability is also measured on a scale of C1 to C8, as illustrated in Table 3 below. The land capability rating is therefore adjusted accordingly, depending on the prevailing climatic conditions as indicated by the respective climate capability rating. The anticipated impacts of the proposed land use on soil and land capability were assessed to inform the necessary mitigation measures.

Table 2: Land Capability Classification (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups	Limitations
I	W	F	LG	MG	IG	LC	MC	IC	VIC	**Arable land**	No or few limitations
II	W	F	LG	MG	IG	LC	MC	IC			Slight limitations
III	W	F	LG	MG	IG	LC	MC	IC			Moderate limitations
IV	W	F	LG	MG	IG	LC					Severe limitations
V	W	F	LG	MG						**Grazing land**	Water course and land with wetness limitations
VI	W	F	LG	MG							Limitations preclude cultivation. Suitable for perennial vegetation
VII	W	F	LG								Very severe limitations. Suitable only for natural vegetation
VIII	W									**Wildlife**	Extremely severe limitations. Not suitable for grazing or afforestation.
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	

Table 3: Climate Capability Classification (Scotney et al., 1987)

Climate Capability Class	Limitation Rating	Description
C1	None to slight	Local climate is favorable for good yield for a wide range of adapted crops throughout the year.
C2	Slight	Local climate is favorable for good yield for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperatures increase risk and decrease yields relative to C1.
C3	Slight to moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.
C4	Moderate	Moderately restricted growing season due to low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.
C5	Moderate to severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops may be grown at risk of some yield loss.
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops for which frequently experience yield loss.
C7	Severe to very severe	Severely restricted choice of crops due to heat, cold and/or moisture stress.
C8	Very severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.

The land potential assessment entails the combination of climatic, slope and soil condition characteristics to determine the agricultural land potential of the investigated study area. The classification of agricultural land potential and knowledge of the geographical distribution of agricultural viable land within an area of interest. This is of importance for making an informed decision about land use. Table 4 below presents the land potential classes, whilst Table 5 presents a description thereof, according to Guy and Smith (1998).

Table 4: Table of Land Potential Classes (Adapted from Guy and Smith, 1998)

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	(L3) Wetland	(L3) Wetland	(L4) Wetland	(L4) Wetland	(L5) Wetland	(L5) Wetland	(L6) Wetland	(L6) Wetland
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 5: The Land Capability Classes Description (Guy and Smith, 1998)

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, temperature or rainfall. Appropriate permission is required before ploughing virgin land.
L5	**Restricted potential:** Regular and/or moderate to severe limitations due to soil, slope, temperature or rainfall.
L6	**Very restricted potential:** Regular and/or severe limitations due to soil, slope, temperature or rainfall. Non-arable.
L7	**Low potential:** Severe limitations due to soil, slope, temperature or rainfall. Non-arable.
L8	**Very low potential:** Very severe limitations due to soil, slope, temperature or rainfall. Non-arable.

3. DESKTOP ASSESSMENT RESULTS FROM VARIOUS DATABASES

The following data is applicable to the study area, according to various data sources including but not limited to the Agricultural Geo-referenced Information System (AGIS):

**It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics associated with the investigation area at the scale required to inform an environmental process. However, this information is useful as background information to the study and, if desktop results are considered with the outcome of the soil and land capability assessment, sufficient decision making can take place.*

Table 6 below presents the summary of the desktop exercise.

Table 6: Desktop based soil background information sourced from various databases.

Parameters	Description
Mean Annual precipitation (MAP)	The Mean Annual Precipitation (MAP) within the study area is estimated to range between 601 – 800 mm per annum. These conditions have a moderate yield potential for a moderate range of adapted crops and planting date options may be limited for supporting rain fed agriculture, in some instances supplementary irrigation may be required if available.
Mean Annual Evaporation (MAE)	The mean annual evaporation (MAE) of the majority of the Tournee 2 Solar PV Park is estimated to be between 1601 – 1800 mm. The high evaporation rates pose risks to plant yield due possible plant permanent wilting resulting desiccation and lack of adequate soil moisture.
Geology	The entire Tournee 2 Solar PV Park is underlain by the Suurberg, Drakensberg, Lebombo geological formation. This geological formation is known to yield soils with finer particles and high clayey content with high water holding capacity.
Landform type	The Plain Landform type dominates the entire Tournee 2 Solar PV Park, which means the terrain is suitable to allow agricultural activities.

Parameters	Description
Soil pH	According to the AGIS database, the pH of soil medium occurring within the Tournee 2 Solar PV Park is considered alkaline with pH ranging between .65 – 7.4. In slightly alkaline soil. Some micronutrients become less available. This is however not considered a limitation as the soil's pH condition can be ameliorated.
Landtype data	The entire Tournee 2 Solar PV Park is dominated by the Ea17 landtype. The Ea17 land type represent areas with clayey soils.
The Soil and Terrain (SOTER) soil classification	The Soil and Terrain (SOTER) database indicates that the entire Tournee 1 Solar PV Park is underlain by Eutric Vertisols. These soils are black coloured, strongly to very strongly structured (topsoil and subsoil) of varying depths.
Desktop land capability	The desktop land capability of the soils associated with Tournee 2 Solar PV Park is Arable capability (Class III).
Grazing Capacity	The livestock grazing capacity potential based on the AGIS database is estimated to be approximately 4 hectares per large animal. This is considered adequate for commercial livestock grazing.
Desktop based Land use	The majority of the Tournee 2 Solar PV Park is characterised by vacant or unspecified landuses, while the remaining portions are under cultivation. Refer to Figure 4.
Alkalinity and Sodicity of the soils	The soils within the Tournee 2 Solar PV Park are slightly saline which means that they are affected by salts.
Probability of soil loss	The predicted soil loss for the entire Tournee2 Solar PV Park is considered low, which means the soils are not susceptible to wind and water erosion attributed to the high clay content.
Soil Water Retaining Characteristics	Water retaining characteristics are scarce or absent within the entire Tournee 2 Solar PV Park. Water storage during the fallow period may not be possible in the absence of irrigated agriculture.
Clay Content	The clay content for the soils within the study area are characterised by clay contents greater than 35%.
Soil Depth	The soil depth for the entire Tournee 2 Solar PV Park ranges between 450 - 750 mm. This indicates a limited choice of crops for cultivation for majority of the area due to shallower depths.
Department of Environmental Affairs (DEA) screening tool	The entire Tournee 2 Solar PV Park is characterised by high sensitivity to agriculture (Figure 4).

Figure 4: Desk-based landuses associated with the Tournee 2 Solar PV Park and surroundings.

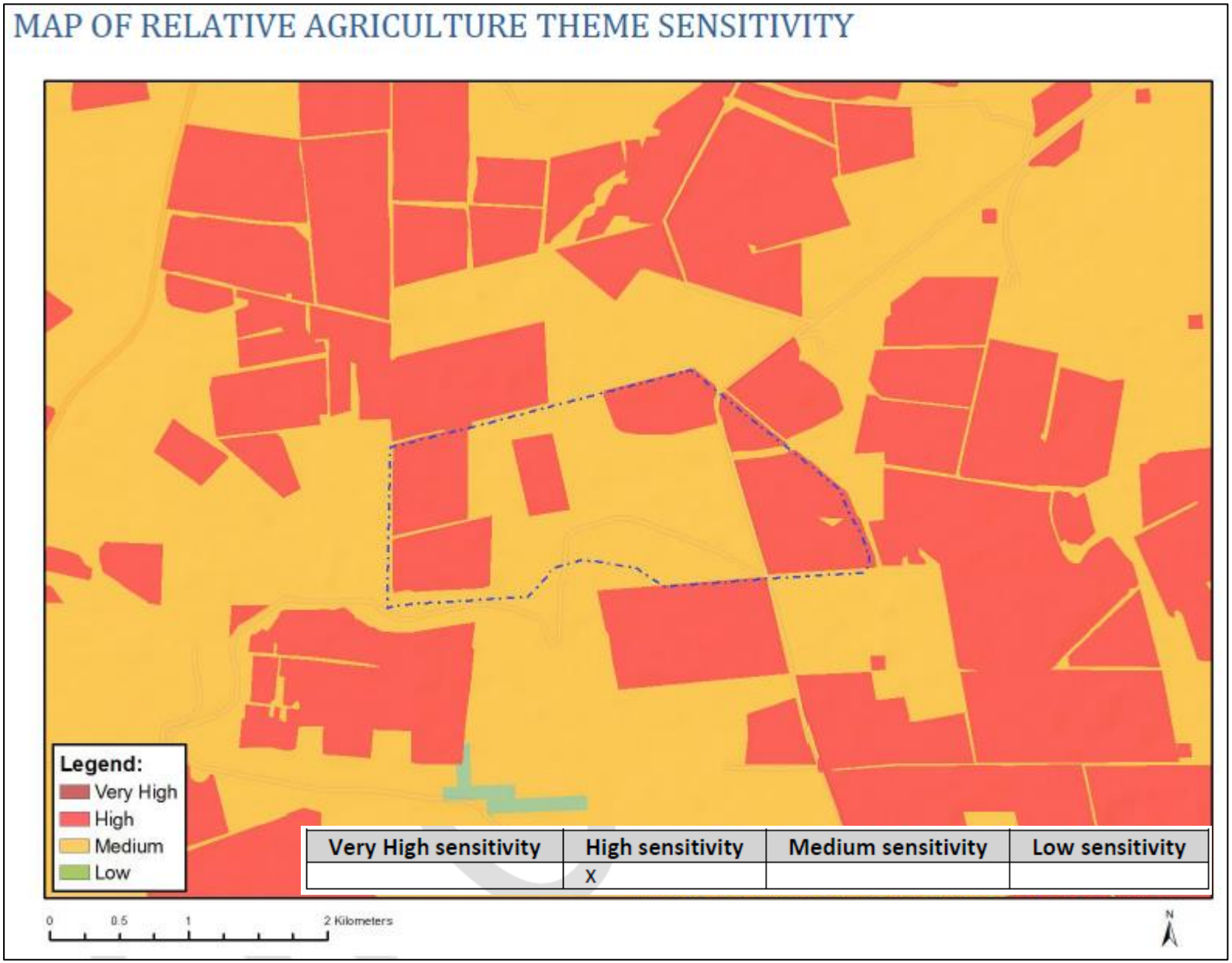

Figure 5: Screening tool agricultural them for the Tournee 2 Solar PV Park and surroundings.

4. FIELD ASSESSMENT FINDINGS

4.1 Current Land Use

This section aims to provide an overview of the current landuses associated the Tournee 2 Solar PV Park based on:

- Field verified data;
- Through the scrutiny of the satellite imagery; and
- The South African Land Cover (SANLC) data of 2020.

According to observations made during the site assessment the Tournee 2 Solar PV Park largely comprises grazing land as well as cultivated field with maize and soybeans as the crops of choice. The Tournee 2 Solar PV Park is traversed by watercourses which comprises instream dams as well other artificial impoundments in the immediate vicinity of these watercourses. The surroundings are characterised by cultivated lands as well as the Tutuka Power Station and ash dam located south of the Tournee 2 Solar PV Park. Figure 6 below depicts the associated land use within the study area.

DOMINANT LAND USES

Ash Dam

Soybeans cultivation

Figure 6: Land uses associated with the Tournee 2 Solar PV Park.

4.1 Dominant Soil Forms

The catena of the landscape in which the wetland is situated largely resembles a Vertic and Melanic topo sequence where the soils are characterised by black coloured, strongly to very strongly structured (topsoil and subsoil) of varying depths. These soils have high clay content, displaying a high water-holding capacity and mostly containing a high percentage of swelling clay minerals.

Vertic and Melanic soils associated with the study area can be classified as Arcadia, Rustenburg and Rensburg soil forms, where the Vertic/Melanic A horizon grades directly into a Hard Rock material (Milkwood/Mayo) or a Gleyed horizon which indicates signs of prolonged saturation. These soils can also be moderately deep where the Vertic/Melanic grades into a pedocutanic horizon, underlain by gleyed material. Figure 13 below depicts the locality of the identified soil forms within the study area. Thus, these soils are generally restricted to intensive grazing and wildlife.

The portions to the east are characterised by Darnall/Bonheim soil forms which are also of melanic (dark clayey) character underlined by pedocutanic horizons as well as lithic/hard rock material. Although these soils resemble the Milkwood/Mayo soils these soils have adequate root depth for most crops and can be cultivated and produce good yield if intensive management practices are implemented.

The remaining portion to the south is comprised of Glencoe soil forms which are characterised by Orthic A horizon, underlain by yellow brown apedal B horizon over hard plinthic material.

These are considered arable soils with wetness limitation due to the occurrence of semi-impermeable plinthic material which impedes vertical movement and promotes lateral flows.

The spatial distribution of all identified soil forms within the study area is presented in soil map in Figure 5 below. Table 6 below presents the dominant soil forms and their respective diagnostic horizon sequence.

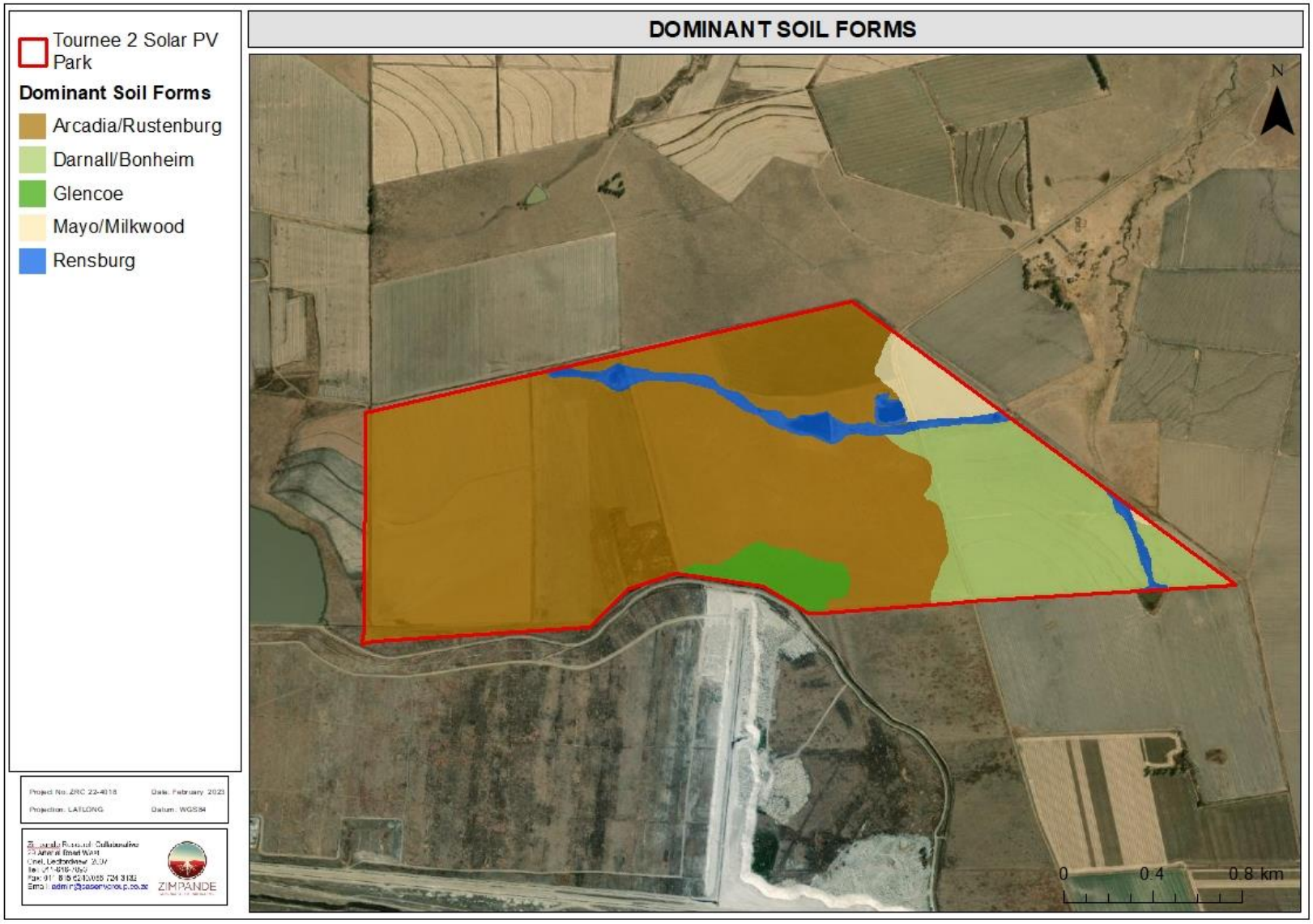

Figure 7: Dominant soil forms associated with the Tournee 2 Solar PV Park.

4.2 Land Capability Classification

For this assessment, land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential classification. The study area falls into Climate Capability Class 4 due a moderately restricted growing season due to low temperatures and severe frost. Good yield potential for a moderate range of adapted crops.

The identified soils were classified into land capability and land potential classes using the Camp *et. al*, and Guy and Smith Classification system (Camp *et al.,* 1987; Guy and Smith, 1998), as presented on Figure **8;** while Figure **9** illustrates the Land Potential associated with the study area when incorporating other factors such as climate, slope and soil conditions together. **Table 7** below presents the dominant soil forms and their respective land capability, agricultural potential as well as areal extent expressed as hectares as well as percentages.

Table 7: Land capability and land potential associated with the soils occurring within the study area.

Soil Form	Land Capability	Land Potential	Area (ha)	Percentage (%)
Darnall/Bonheim	Arable (Class IV)	Moderate Potential (L4)	70.4	21.3
Glencoe				
Rensburg	Watercourse (Class V)	Watercourse (L4)	13.5	4.1
Arcadia	Grazing (Class VI)	Restricted Potential (L5)	246.3	74.6
Mayo/Milkwood				
Total Enclosed			**330.2**	**100**

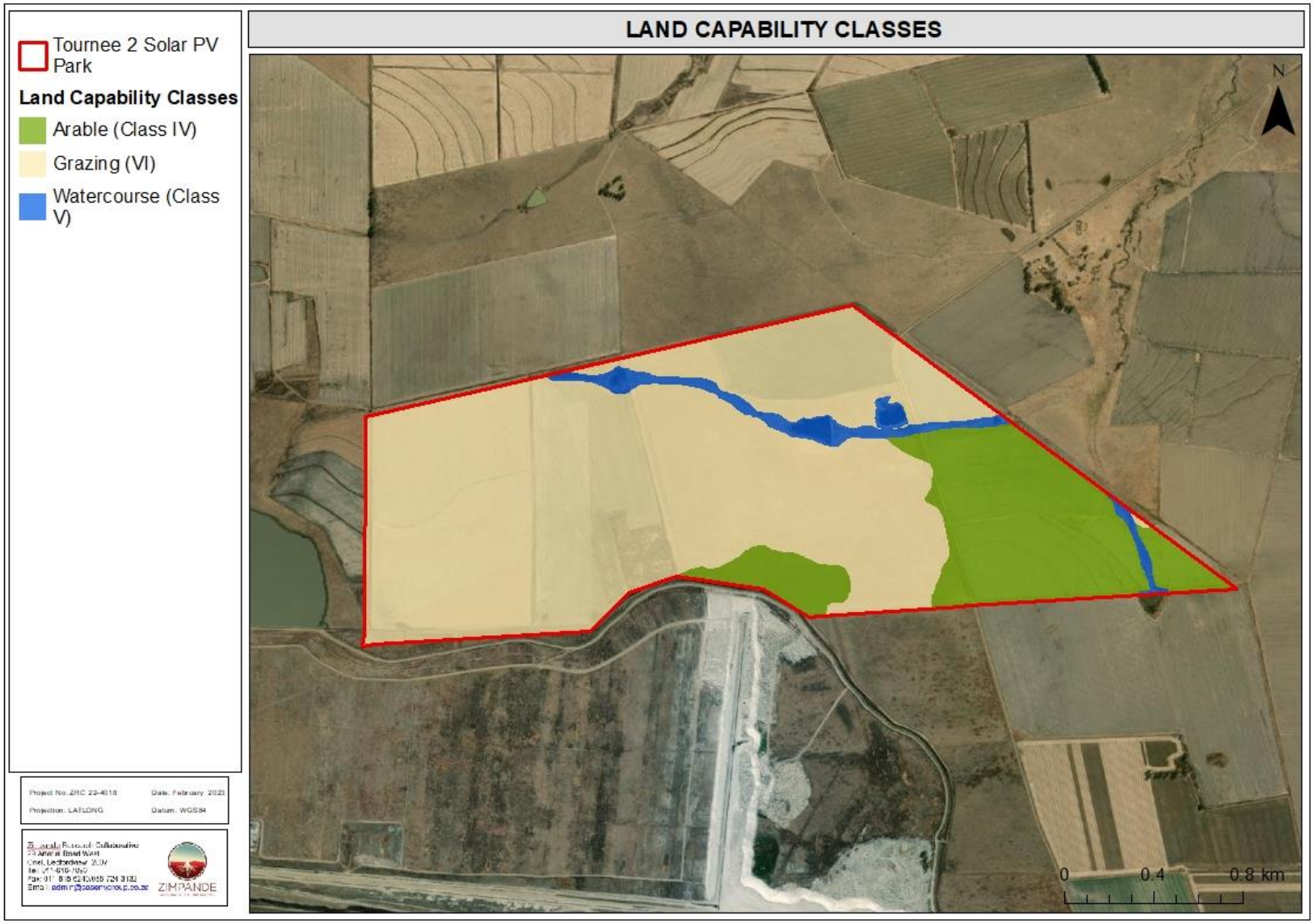

Figure 8: Land Capability of the soil forms associated with the Tournee 2 Solar PV Park.

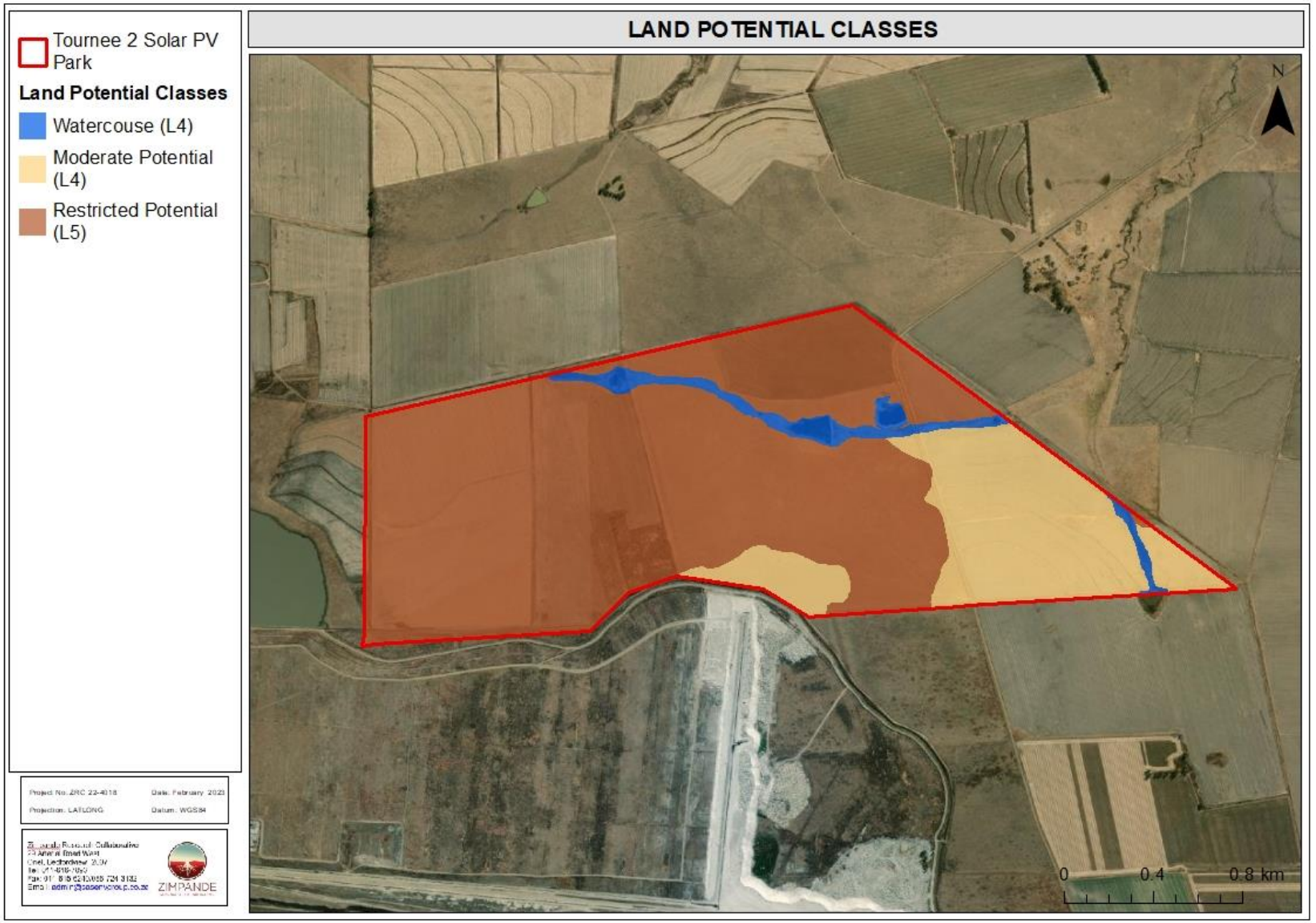

Figure 9: Land potential associated with the Tournee 2 Solar PV Park.

5. POTENTIAL IMPACTS ASSOCIATED WITH THE DEVELOPMENT

In addition to the loss of growth medium (stripped soils), the soils are anticipated to be exposed to erosion, dust emission, and potential soil contamination impacts during the construction phase of the proposed development; and these impacts may persist for the duration of the operational phase if not mitigated adequately. Table 8 below presents a summary of the potential impacts, impact significance as well as mitigation measures for the scoping phase.

Table 8: Preliminary Impact Assessment considering the perceived impacts and mitigation within the Tournée 1 Solar PV Park.

Impacts:

- Site clearing, removal of vegetation and associated disturbances to soils, leading to increased runoff, erosion, and consequent loss of land capability in cleared areas;
- Potential frequent movement of earth moving machinery within lose and exposed soils, leading to excessive erosion and soil compaction;
- Spillage of petroleum hydrocarbons during construction of associated infrastructure;
- Potential disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil; and
- Construction within actively cultivated and grazing soils leading to loss of land capability.

	Probability	Consequence	Significance
Soil and land capability	4	3	**High**
Soil Contamination	3	2	**Medium**
Soil Compaction	3	2	**Medium**
Soil Erosion	2	2	**Low**

Mitigation:

Loss of soil and Land Capability:

- Direct disturbance of the actively cultivated soils must be avoided where possible to minimise loss of arable soils;
- Areas adjacent to the footprint should be ripped to alleviate compaction;
- Define cut-off horizons in simple terms that the stripping operator can understand and demarcate boundaries of different soil types.
- Close supervision and monitoring of the stripping process is required to ensure that soils are stripped correctly.
- Strip a suitable distance ahead of mining at all times, to avoid loss and contamination.
- The dumping of waste materials next to or on the stockpiles should be prohibited.

Erosion:

- The footprint of the proposed development and construction activities should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible;
- Bare soils within the access roads can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast;
- All disturbed areas adjacent to the proposed development areas should be re-vegetated with an indigenous grass mix to re-establish a protective cover, to minimise soil erosion;

- Although the soils have a high clay content, temporary erosion control measures in sloping areas should be used to protect the disturbed soils during the construction phase until adequate vegetation has established.

Contamination:

- Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be always implemented and made available and accessible to the contractors and construction crew conducting the works on site for reference;
- A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works;
- An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent contamination; and
- Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.

Compaction:

- Soil Compaction is usually greatest when soils are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, shovel and truck should be used as bowlscrapers create excessive compaction when moving wet soils;
- Compaction should be minimised by use of appropriate equipment;
- Heavy equipment movement over replaced soils should be minimised;
- Minimise compaction during smoothing of replaced soils by using dozers rather than graders; and
- Following placement, compacted soils should be ripped to full rooting depth (30cm as the bare minimum seedbed) to allow penetration of plant root.

6. OPPORTUNITIES AND CONSTRAINTS ANALYSIS

The development footprint presents areas of active cultivation where maize and soybeans are currently cultivated. The yield potential for maize is approximately 8 tons per hectare while the soybeans is 3 tons per hectare. The cultivated areas are therefore regarded important from an agricultural point of view and as such this is deemed to be a constraint for this project.

According to the desk-based assessment the grazing capacity for this area is 4 Hectares per animal which is considered adequate for commercial farming. It was also evident during the site verification that the grazing land was utilised for fodder which means that these areas are actively used for commercial purposes. As such, this also presents a constraint for this project.

7. AGRICULTURAL SENSITIVITY

The agricultural sensitivity was based on the site verified results which considered the occurring soils as well as the current landuses particularly landuses contribution to the agricultural production spectrum. It is acknowledged that the DFFE screening sensitivity indicates the study areas as having a high agricultural sensitivity. Upon verification the site

sensitivity ranged between low and high. Areas under active cultivation were targeted as these are the areas where the impact will mostly be felt. The sensitivity classes were as follows:

- Cultivated land with Maize and Soybeans – High
- Grazing land – Intermediate
- Watercourses – Low

Figure 10 below depicts the agricultural sensitivity.

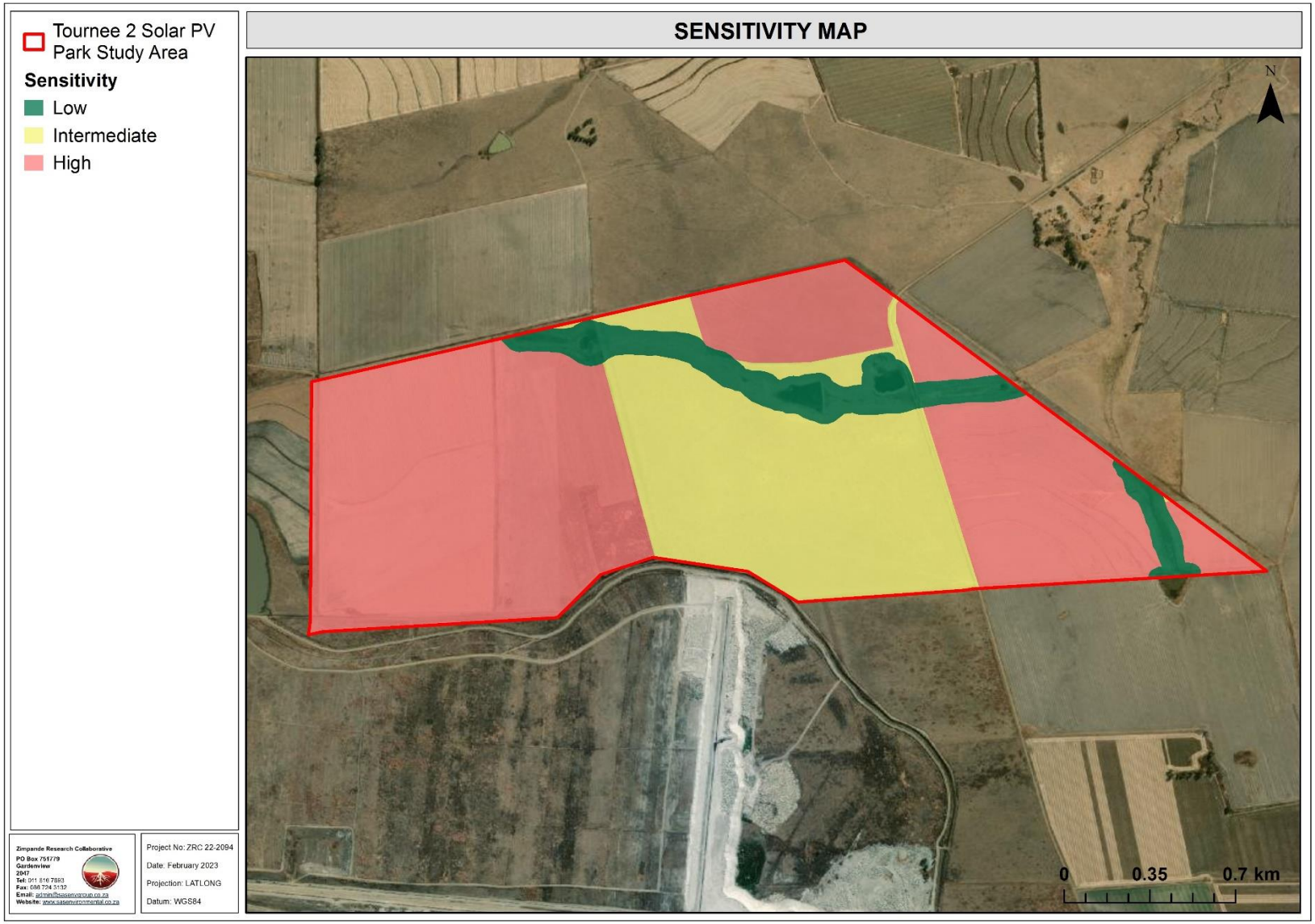

Figure 10: Agricultural sensitivity associated with the Tournee 1 Solar PV Park.

8. HYDROPEDOLOGICAL OPINION

The catena of the landscape in which the wetlands are situated largely resembles a Vertic and Melanic topo sequence where the soils are characterised by black coloured, strongly to very strongly structured (topsoil and subsoil) of varying depths. These soils have high clay content, displaying a high water-holding capacity and mostly containing a high percentage of swelling clay minerals. The recharge mechanism of the occurring soils is classified as responsive shallow. The high clay content of these soils lead to surface sealing once the soils become saturated, resulting in the generation of overland flow after rain events. Shallow responsive soils lead to a rapid runoff response time during intense rainfall events attributed to their clayey nature which inhibits infiltration.

A small portion comprising Glencoe soil form which depicts interflow processes is present within the southern portion of the footprint area, however these soils are not hydrologically linked with the wetland since a portion between these and the wetland downgradient. As such the overall impact on the hydropedological recharge mechanisms is anticipated to be limited.

Based on the above, the proposed development will not lead to any significant loss of hydropedological process, however a change in hydrological patterns is anticipated. The project will likely lead to **a No-Net Loss** of interflow recharge if mitigation measures are carefully implemented. The surface runoff would still be delivered into the wetlands through stormwater management systems, although the pattern, timing and duration of the hydrograph would change to some degree. A change in the Present Ecological State (PES) category is however not deemed likely, provided that all mitigation measure are implemented.

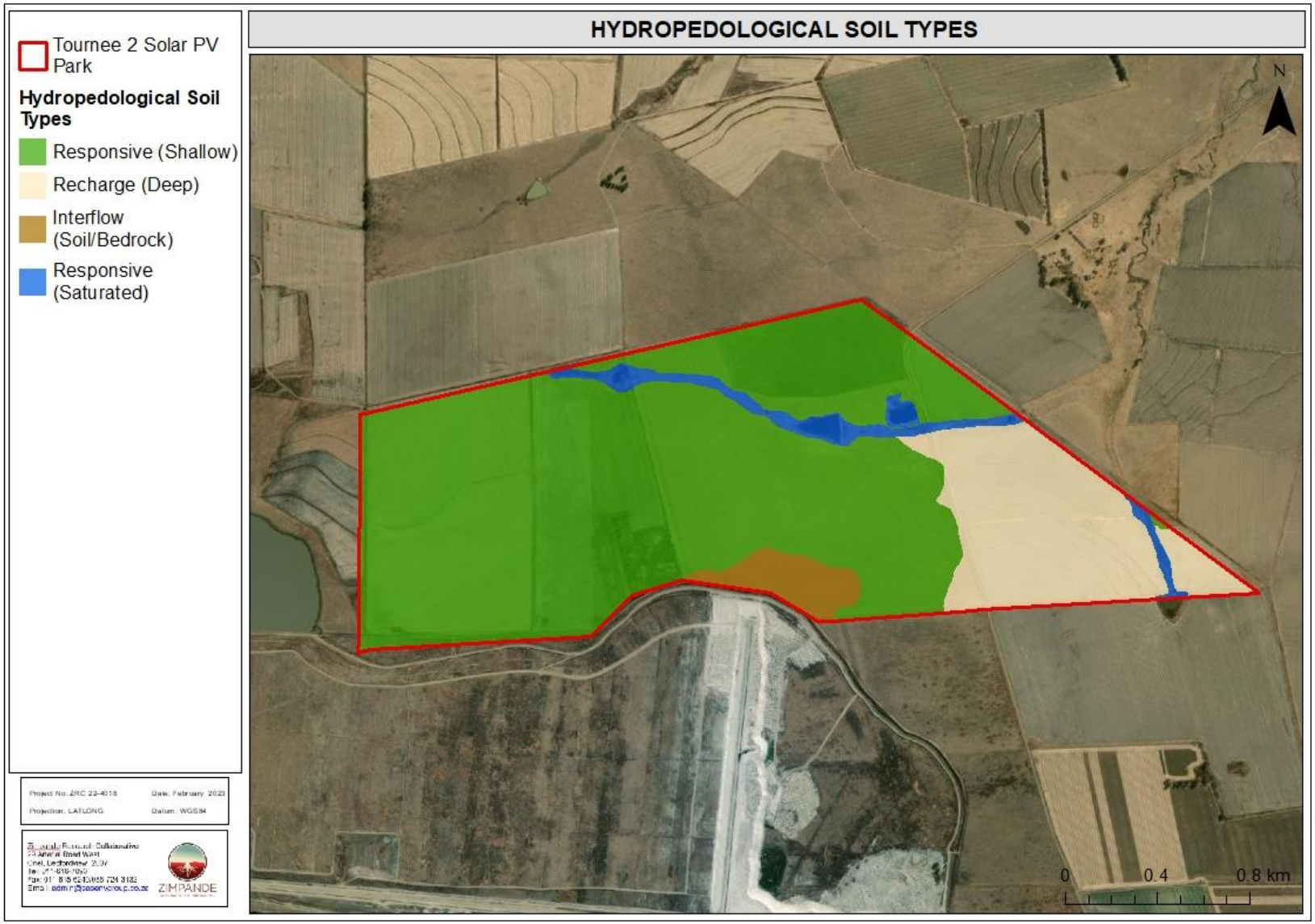

Figure 11: Map depicting hydrological soil types associated with the study area.

9. SOIL, LAND USE AND LAND CAPABILITY AND HYDROPEDOLOGY ACTION PLAN FOR EIA PHASE

For the soil and land capability component, the scope of work and specific outcomes in terms of the EIA Phase report will be undertaken as follows:

- Present land capability and land potential summary tables presented in dashboard format;
- Undertake a detailed impact assessment;
- Recommendation and mitigation measures will be provided for implementation to comply with applicable articles of legislation.

For the hydropedology component, the scope of work and specific outcomes in terms of the EIA Phase report will be undertaken as follows:

- Conceptual hydropedological response models will be presented;
- A scientific buffer will be determined and presented in like with the DWS requirements as part of the Water use Licence Authorisation process;
- A detailed impact statement will be presented;
- A hydropedological opinion report presented in a memorandum format will be compiled; and
- Recommendation and mitigation measures will be provided for implementation to comply with applicable articles of legislation.

10. REFERENCES

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Cboil, F.C., 2003. Environmental Management Framework Report (Consolidated). Volume 1 Chapter 1 to 9. Illovo, South Africa.

Morgenthal, T.L., Newby, T., Smith, H.J.C., and Pretorius, D.J. (2004). Developing and refinement of a grazing capacity map for South Africa using NOAA (AVHRR) satellite derived data. Report GW/A/2004/66. ARC Institute for Soil, Climate and Water, Pretoria.

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APPENDIX A: DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

1. (a) (i) Details of the specialist who prepared the report

Stephen van Staden MSc (Environmental Management) (University of Johannesburg)

Tshiamo Setsipane MSc (Agric.) (Soil Science) (University of Free State)

Braveman Mzila BSc (Hons) Environmental Hydrology (University of KwaZulu-Natal)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Zimpande Research Collaborative		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

1.(b) A declaration that the specialist is independent in a form as may be specified by the competent authority

I, Braveman Mzila, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource discipline lead, Managing member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland assessment short course Rhodes University	2016
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2013

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Soil Monitoring
- Soil Mapping

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

SAS ENVIRONMENTAL GROUP OF COMPANIES (SEGC) –
SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF TSHIAMO SETSIPANE

PERSONAL DETAILS

Position in Company	Soil Scientist/ Hydropedologist
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

South African Council for Natural Scientist Professions (SACNASP)

EDUCATION

Qualifications

M.Sc. (Agric) Soil Science (*Cum Laude*)	(University of the Free State)	2019
BSc. (Agric) Honours Soil Science	(University of the Free State)	2014
BSc. (Agric) Soil Science & Agrometeorology	(University of the Free State)	2013

COUNTRIES OF WORK EXPERIENCE

South Africa – Kwa-Zulu Natal, Mpumalanga and Free State

KEY SPECIALIST DISCIPLINES

Hydropedological Assessments:

- Soil Survey
- Soil Delineation
- Hydrological hillslope classification
- Hydropedological loss Quantification
- Hydropedological impact assessment
- Scientific buffer determination

Soil, Land use, Land Capability and Agricultural Potential Studies

- Soil Desktop assessment
- Soil classification
- Agricultural potential
- Agricultural Impact Assessments

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF BRAVEMAN MZILA

PERSONAL DETAILS

Position in Company	Wetland Ecologist and Soil Scientist
Joined SAS Environmental Group of Companies	2017

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Soil Science Society (SASSO)

Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

BSc (Hons) Environmental Hydrology (University of Kwazulu-Natal)	2013
BSc Hydrology and Soil Science (University of Kwazulu-Natal)	2012

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape, KwaZulu-Natal

KEY SPECIALIST DISCIPLINES

Hydropedological Assessments:

- Soil Survey
- Soil Delineation
- Hydrological hillslope classification
- Hydropedological loss Quantification
- Hydropedological impact assessment
- Scientific buffer determination

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- Soil Desktop assessment
- Soil classification
- Agricultural potential
- Agricultural Impact Assessments