HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the

PROPOSED GRID CONNECTION FOR THE BONSMARA SOLAR PHOTOVOLTAIC (PV) RENEWABLE ENERGY FACILITY NEAR KROONSTAD, FREE STATE PROVINCE

Prepared by CTS Heritage

CTS HERITAGE

For

SiVEST

February 2023

SAHRIS Case No: 15709

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EXECUTIVE SUMMARY

1. Site Name:

Bonsmara PV Facility Grid Connection

2. Location:

Remainder and Portion 1 of Farm Scheveningen 636

3. Locality Plan:

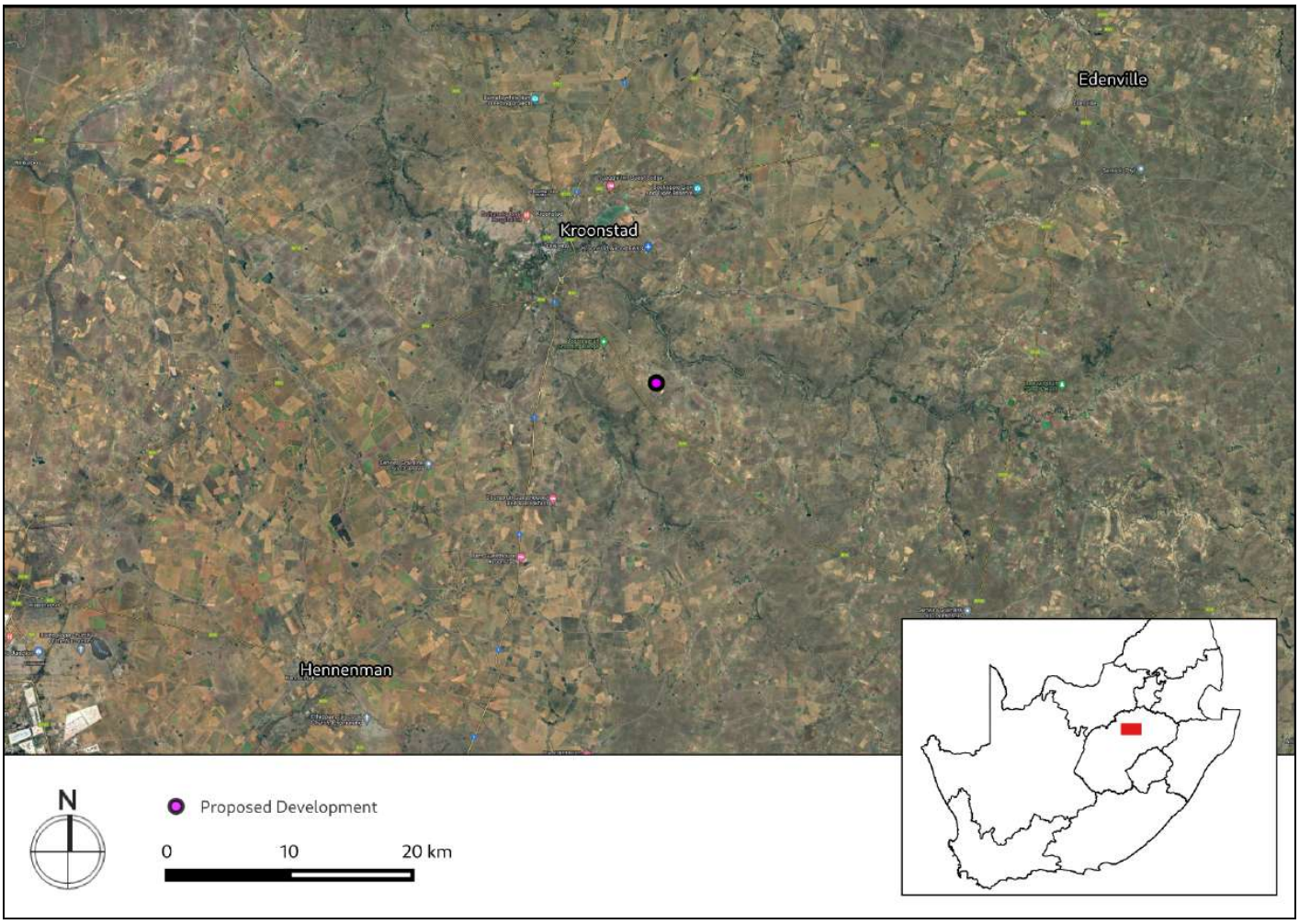

Figure 1: Location of the proposed development area

4. Description of Proposed Development:

Bonsmara Solar PV (RF) (Pty) Ltd is proposing the construction of the 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure on a site approximately 12km south-east from the town of Kroonstad, in the Free State Province. The facility will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The facility will compromise of several arrays

of PV panels and associated infrastructure that includes BESS and will have a contracted capacity of 100MW. The Solar PV facility will connect to the grid via a 2km 132kv powerline from the on-site substation to the Kroonstad Switching Station. This report assesses the likely impacts to heritage resources resulting from the proposed grid connection infrastructure for this PV facility.

5. Heritage Resources Identified:

Table A: Sites identified during the assessment

Site No.	Description	Density	Co-ordinates		Grading	Mitigation
KS1	Historical stone structures	NA	-27.76014296337	27.3097089584	IIIC	NA
KS2	Isolated Middle Stone Age core	~1-2/m2	-27.7530999854	27.31901396065	IIIC	NA
KS3	Middle Pleistocene scatter with MSA and ESA artefacts	~3-6/m2	-27.7530060242	27.3192510008	IIIC	50m Buffer
KS4	Middle Pleistocene scatter with MSA blade production and bifacial tools	~3-6/m2	-27.75347499176	27.3203409835	IIIC	50m Buffer
KS5	Isolated Middle Stone Age core	~3-6/m2	-27.76228697039	27.32221199199	IIIC	NA
KS6	Dense ESA scatter. Very extensive with clear sub-surface deposit	~4-8/m2	-27.76886701583	27.3229549638	IIIB	100m Buffer
KS7	ESA MSA site with partially submerged artefacts. Very extensive with clear sub-surface deposit	~3-6/m2	-27.76768399402	27.3294500168	IIIB	100m Buffer
KS8	ESA site with large flake blanks. Very extensive with clear sub-surface deposit.	~3-6/m2	-27.76499197818	27.3222829867	IIIB	100m Buffer

6. Anticipated Impacts on Heritage Resources:

The survey proceeded with two minor constraints and limitations, yet the project area was comprehensively surveyed for heritage resources, and only two archaeological heritage resources of significance were identified as being impacted in the layout provided - KS3 and KS4. These sites have been graded IIIC for their contextual scientific value and it is recommended that these sites are not impacted by the proposed development through the implementation of a 50m buffer around these sites.

Further, highly significant Early Stone Age open sites were identified within the property but are not impacted directly in the layout provided - KS6, KS7 and KS8. These sites are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposit. It is recommended that none of these sites be

impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area. The present layout assessed in this report does not impact on this archaeologically sensitive area. No mitigation recommendations are made for KS1 and KS5.

Should significant archaeological materials – such as well-preserved subsurface artefacts or fossils – be exposed during construction, the on-duty Environmental Control Officer should protect these (preferably in primary exposed context), and should immediately consult a professional archaeologist. In this circumstance, the South African Heritage Resources Authority should be immediately alerted so that appropriate mitigation measures by a professional archaeologist can be implemented, at the expense of the developer. In such a scenario, mitigation measures would normally involve the application for an excavation permit and the digital documentation of the occurrences with modern archaeological recording standards, as well as the collection of a reflective sample of material to be deposited in a local approved curation facility.

No impacts to palaeontological resources are anticipated, however it is recommended that, due to the high palaeontological sensitivity of the development area, the attached Chance Fossil Finds procedure is implemented for the duration of construction activities.

7. Recommendations:

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated grid connection infrastructure will negatively impact on significant heritage resources on condition that:

- A no development buffer of 50m is implemented around sites KS3 and KS4
- A no development buffer of 100m is implemented around sites KS6, KS7 and KS8
- The area identified as having higher levels of archaeological sensitivity in Figure 6 must not be impacted by any development activities.
- The attached Chance Fossil Finds procedure must be implemented for the duration of construction activities
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed

development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

8. Author/s and Date:

Jenna Lavin

February 2023

Details of Specialist who prepared the HIA

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management , heads up the heritage division of the organisation, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is a member of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 200 Heritage Impact Assessments throughout South Africa.

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APPENDICES

1 Archaeological Impact Assessment 2022

2 Palaeontological Impact Assessment 2022

3 Visual Impact Assessment and Visual Statement

4 Heritage Screening Assessment

1. INTRODUCTION

1.1 Background Information on Project

Bonsmara Solar PV (RF) (Pty) Ltd has appointed SiVEST Environmental (hereafter referred to as "SiVEST") to undertake the required EIA / BA Processes for the proposed construction of the Bonsmara Solar PV Energy Facility (SEF) and associated grid connection infrastructure near Kroonstad in the Free State Province. The distinct EA's that are required for the Projects are as follows:

- Bonsmara SEF (up to 100MW)
- Bonsmara Grid Connection Infrastructure (up to 132kV)

The overall objective of the development is to generate electricity by means of renewable energy technology capturing energy to feed into the National Grid.

Bonsmara Solar PV (RF) (Pty) Ltd is proposing the construction of the 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure on a site approximately 12km south-east from the town of Kroonstad, in the Free State Province. The facility will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The facility will consist of several arrays of PV panels and associated infrastructure that includes BESS and will have a contracted capacity of 100MW. The Solar PV facility will connect to the grid via a 2km 132kv powerline from the on-site substation to the Kroonstad Switching Station. This report assesses the likely impacts to heritage resources resulting from the proposed grid connection infrastructure for this PV facility.

1.2 Description of Property and Affected Environment

The footprint of the proposed development for the Bonsmara PV facility and associated grid infrastructure is located across three private agricultural camps, approximately 12 km southeast of the town of Kroonstad, in the Grassland Biome of the summer rainfall region of the Free State Province, South Africa.

Where retained and unaffected by agriculture, the natural vegetation comprises relatively dense grassland interspersed with shrubs that are typical of the Free State Grassland summer rainfall Biome. Both local and exotic wildlife are more abundant in the south eastern portion of the footprint which is used currently for hunting safaris, with evidence of both large and smaller antelope, suids, alcelaphines including various wildebeest species, indigenous and exotic fowl including francolin, spurfowl, guineafowl and ostrich, as well as some traces of burrowing rodents (hares and meerkats).

The north western portion of the footprint has camps that have been used historically for agricultural purposes. In some areas where cattle have aggregated for watering and feeding, the landscape is more heavily modified (trampled) which has impacted the archaeological potential of these areas substantially. As a result of such

disturbance, in these localities little of the original natural landscape - in terms of vegetation, geology and probably also archaeology - is visible today.

The potentially affected footprint has a relatively high frequency of active non-perennial drainages both within it and immediately to the north of the footprint. These drainages are associated with deposits of riverine quartzite cobbles (evident from the rock cortex), and other secondary deposits of sedimentary rocks that derive from the parent formations of the goldfields region. In addition to the primary outcrops on the koppies in the south east, these cobbles would also have been sources of raw-material for Stone Age occupants of the area. Other rock types evident within the footprint include quartz and indurated shales (Hornfels), which are artefact manufacturing quality in terms of homogeneity and lithic fracture properties.

The historical use of the north western portion of the footprint for agricultural purposes, and recently abandoned structures in one area (KS1), raise the potential for graves and isolated burials. Due to unusual recent Free State winter rainfall in September, grass coverage was a relevant constraint to documenting graves where the above surface material indicators may be partially or completely obstructed. Grass cover made potential grave locations challenging to exhaustively assess in areas where above surface material indicators may have been removed through crop related activities, through trampling related to stock farming or through natural processes such as seasonal flooding.

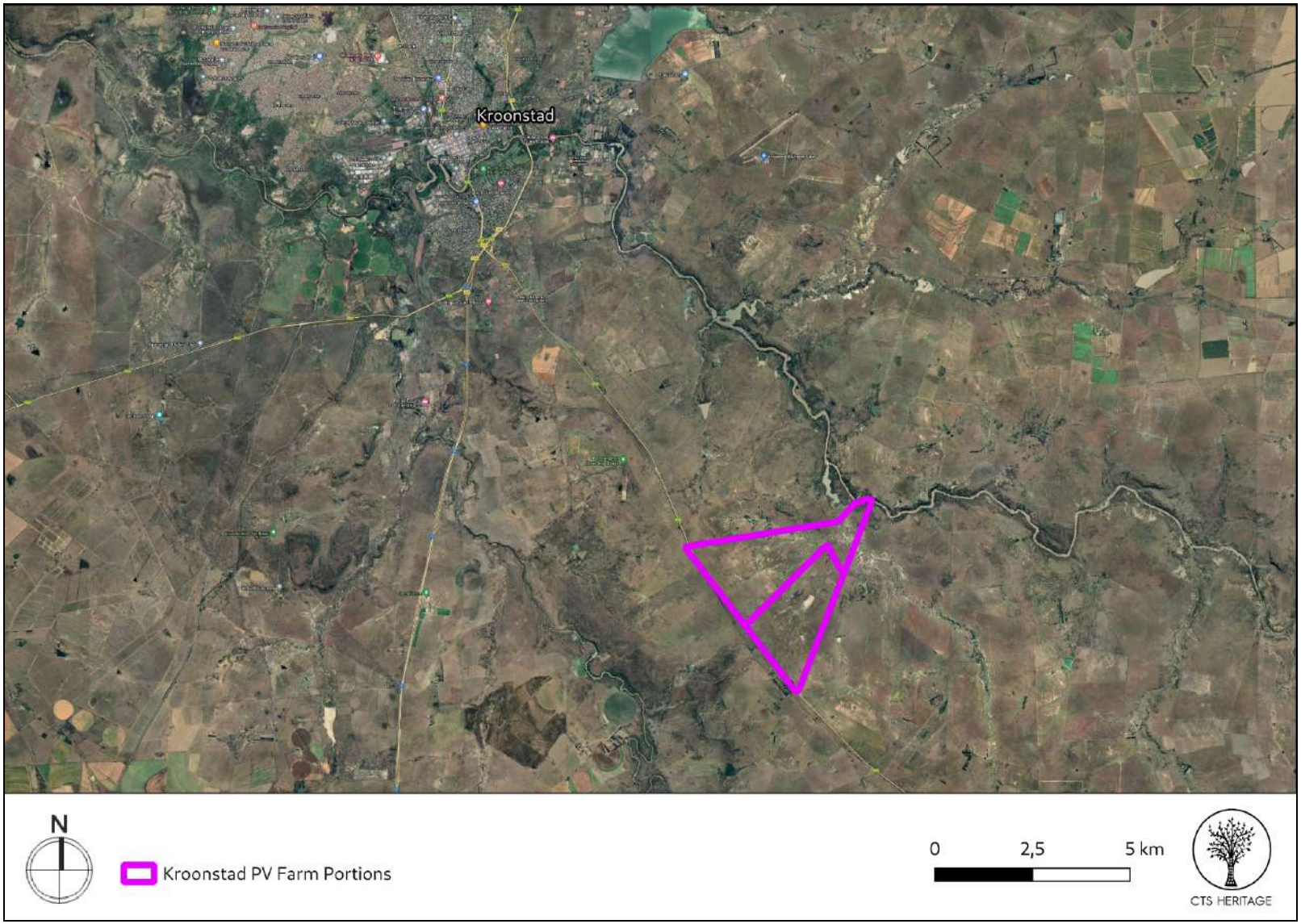


Figure 1.1: Satellite image indicating proposed location of development

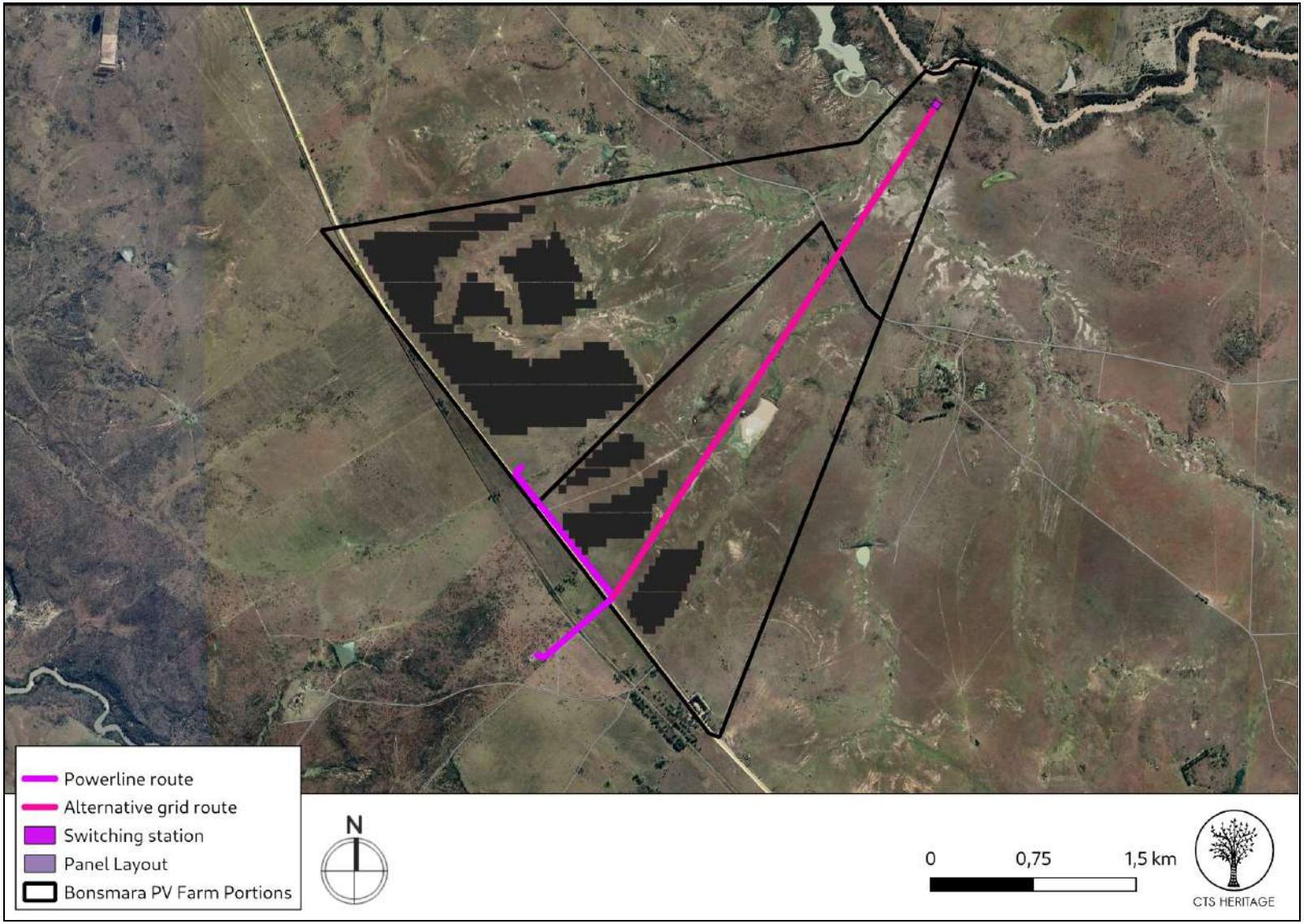


Figure 1.2: Proposed project area

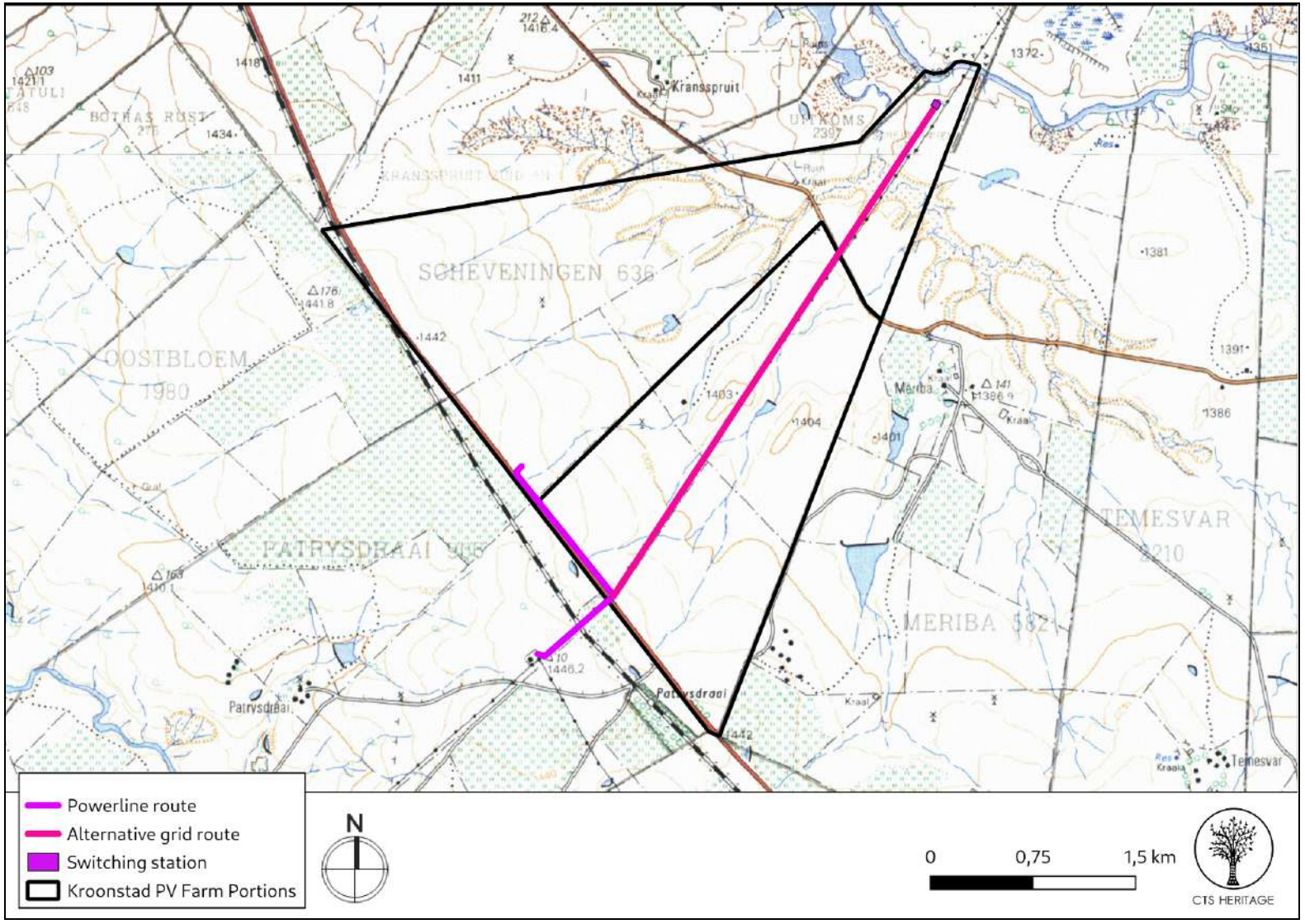


Figure 1.3: Proposed project boundary on the extract from the 1:50 000 Topo Map

2. METHODOLOGY

2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

2.2 Summary of steps followed

- A Desktop Study was conducted of relevant reports previously written (please see the reference list for the age and nature of the reports used)
- Two archaeologists conducted an assessment of archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit from 3 to 4 October 2022.
- A palaeontologist conducted an assessment of palaeontological resources likely to be disturbed by the proposed development. The palaeontologist conducted her site visit on 1 October 2022.
- A VIA specialist drafted a Visual Statement which was integrated into this HIA
- The identified resources were assessed to evaluate their heritage significance
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner

2.3 Assumptions and uncertainties

- The *significance* of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.
- It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants are notified for an investigation and evaluation of the find(s) to take place.
- The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.
- Comparable Assemblage Zones in other areas is also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and

geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment will thus improve the accuracy of the desktop assessment.

However, despite this, sufficient time and expertise was allocated to provide an accurate assessment of the heritage sensitivity of the area.

2.4 Constraints & Limitations

(1) Grasses and occasional shrubs that have flourished recently due to September (2022) rainfall, cover portions of the project area. This coverage inhibited the visibility of surface archaeology, although this is not regarded as a major problem in relation to the Stone Age archaeological remains, which in most cases look to have been reflectively documented.

(2) The northernmost portion of the footprint area was challenging to comprehensively assess at ground surface level (due to relatively denser modern vegetation cover). This should be regarded as a constraint to the documentation of potential graves.

(3) Large male ostriches were roaming freely in the northernmost portion of the footprint which made some localities challenging to access for safety reasons. Herds of *Alcelaphines* were present in the south east which also made foot access in some places challenging.

(4) The upper sediments are disturbed in portions of the potentially affected area that have been used as localities for feeding and watering stock, and potentially also as enclosures for animals, inhibiting visibility (pertains primarily to the western most property).

(5) In the south eastern portion of the affected area, access was not possible where people are actively living in dwelling structures today; however, any archaeology occurring in these areas apart from graves would probably be *ex situ* and of limited scientific importance.

(6) Access to the Power line was not allowed. But as the whole of the development is not deemed highly fossiliferous it is assumed that it is also the case in the power line footprint.

2.5 SiVEST Impact Assessment Methodology

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

2.5.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

2.5.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity.		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence)
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.

4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.

24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

Background:

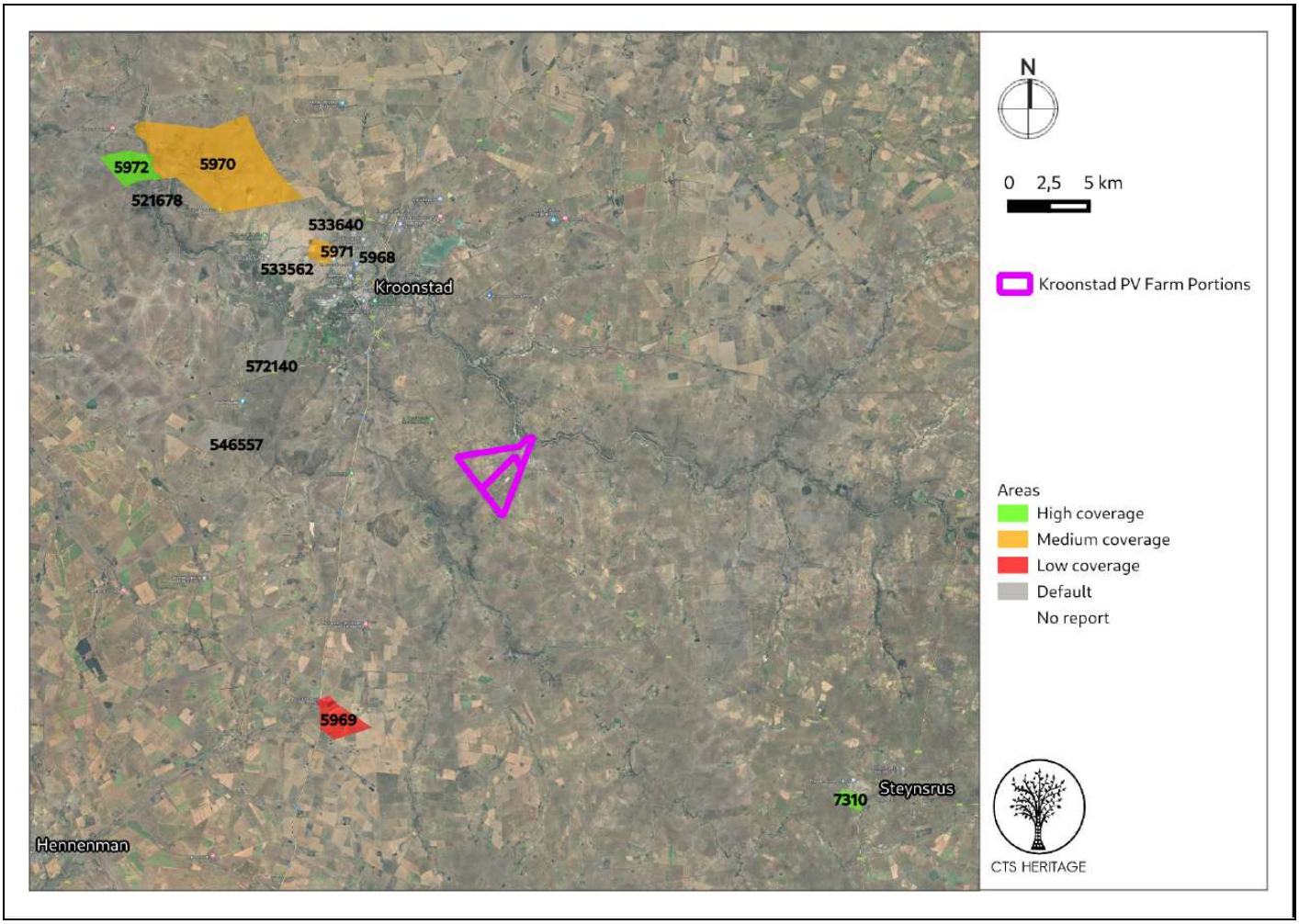
This application is for the proposed development of a PV facility and associated grid infrastructure located approximately southeast of Kroonstad along the R76 in the Free State Province. Kroonstad was established as a town in 1855. During the Second Boer War, from 13 March to 11 May 1900, the city became the capital of the Orange Free State, and subsequently the site of a British concentration camp to contain Boer women and children. Kroonstad still boasts much of the inherent rugged beauty which led the Voortrekkers to establish the town where they did and it is situated in an area characterised by open spaces and an abundant variety of vegetation that makes it particularly beautiful. According to Van Schalkwyk (2013), "Most farmsteads were burned down during the Anglo-Boer War, with the result that very little of the built environment dates to the 19th century." According to Matenga (2019), the Black and Coloured townships are significant as landscapes of segregation occupying the north-western fringe of the CBD, while the exclusive white suburbs were located northeast of the town and south of the Valsch River.

According to Van Schalkwyk (2013), "The cultural landscape qualities of the region essentially consist of a rural setup. In this the human occupation is made up of a pre-colonial element consisting of limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component. This was soon followed by the development of a number of urban centres or towns. Originally these mostly served the surrounding farming communities, but with the discovery of the Free State Gold Fields, they expanded rapidly in order to serve this industry as well." The proposed Solar Energy Facility and its associated grid connections are located some distance from the historic core of Kroonstad town. Furthermore, the areas proposed for development are located more than 10km away from the site of the Boer War concentration camps and associated burial grounds.

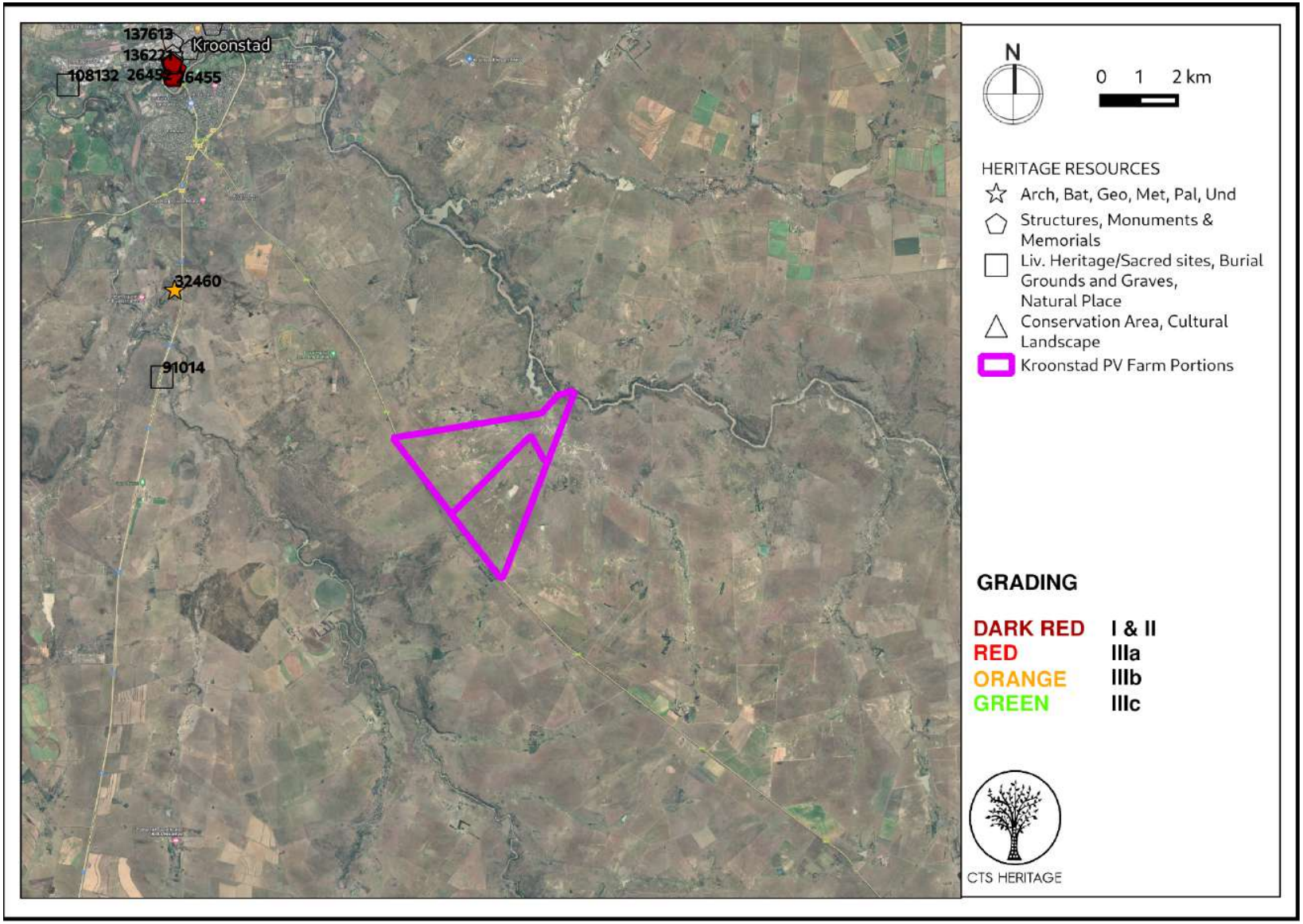
Archaeology

Prior to colonial settlement in 1855, the area proposed for development formed part of a landscape that was occupied by indigenous Khoe herders and San hunter-gatherers. These indigenous communities were displaced by Bantu-speaking people who began to occupy the area in the Iron Age. According to Van Schalkwyk (2013), "Sites dating to the Late Iron Age are known to occur in the region, especially… in the vicinity of the Sandrivier, whereas some are known to occur to the northwest of Ventersburg, These are typical stone walled sites that are linked with Sothospeakers and date to the period after 1600." As such, it is possible that Early, Middle or Later Stone Age artefacts may be located within the proposed development footprint. Furthermore, it is possible that evidence of Iron Age settlement may also be located within the proposed development areas. Recent archaeological field assessment conducted for the Vrede and Rondawel PV Facilities located approximately 10km from the proposed development area identified some cultural remains but with varied value and preservation.

The isolated and scattered lithic artefacts identified are typical of a deflated landscape and have very limited cultural value given that they have been accumulated and modified by various natural processes to their current *ex situ* state. The stone piles found in the south west of the property are more noteworthy (Grade IIIA) and require sensitive treatment. It is likely that similar heritage resources may be present within this development area. As such, it is recommended that an archaeological assessment of the areas proposed for development is completed and anticipated impacts to such resources assessed.



Map 2.1: Spatialisation of heritage assessments conducted in proximity to the proposed development



Map 2.2: Spatialisation of heritage resources known in proximity to the proposed development (see Appendices for insets)

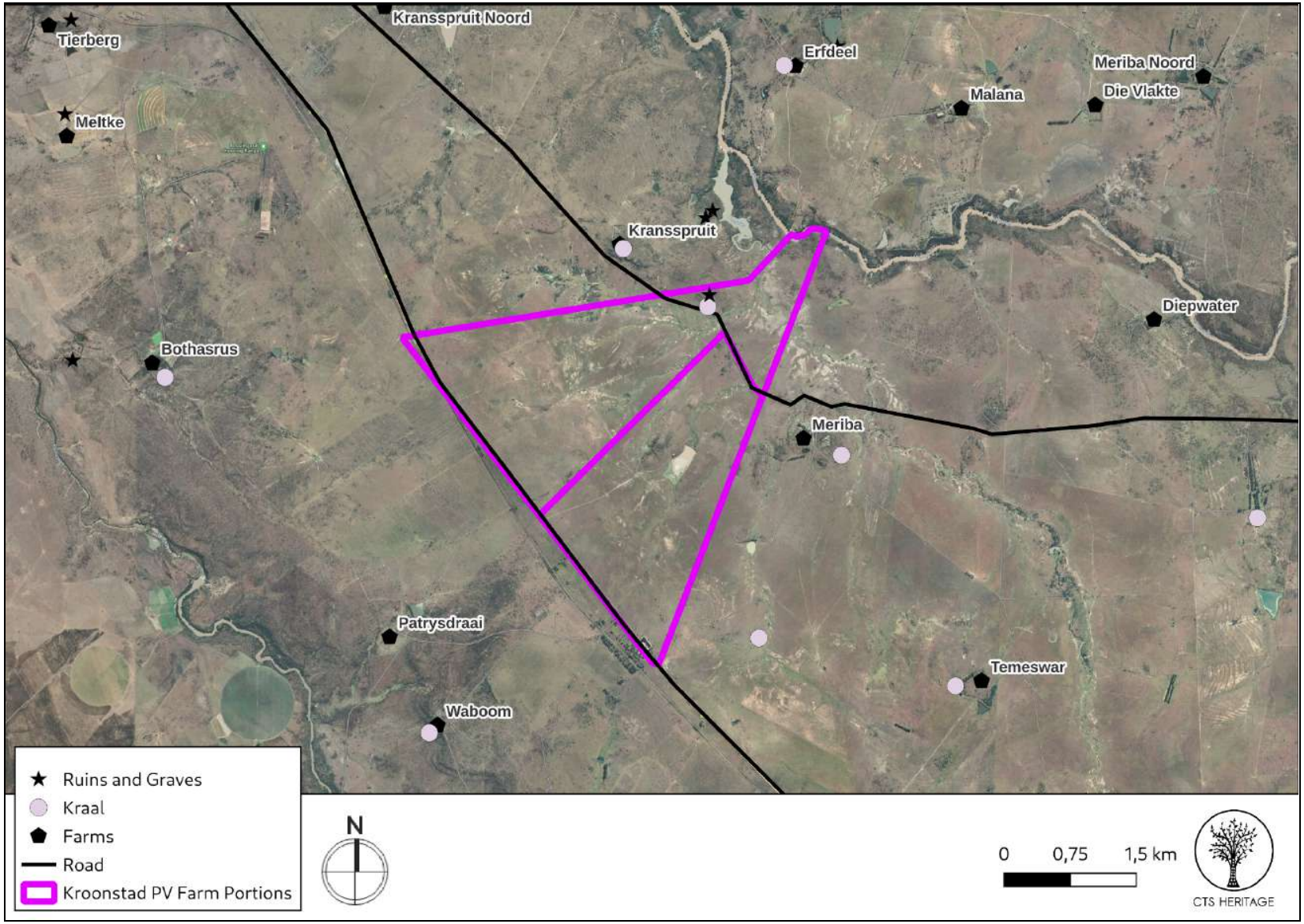


Figure 2.3. Heritage Resources Map. Potential heritage resources identified from the 1:50 000 Topo Map

Palaeontology

According to the SAHRIS Palaeosensitivity Map (Figure 3.1), the areas proposed for development are underlain by sediments of moderate to very high palaeontological sensitivity. According to the Council of GeoScience 2726 Kroonstad Map (Figure 3.2), the development area is underlain by sediments of the Karoo Supergroup including the Adelaide Subgroup (Pa) which have very high palaeontological sensitivity. This formation forms part of the Dicynodon and Lystrosaurus assemblage zones and is known to include fossils of fish, amphibians, reptiles, therapsids and vertebrate burrows. Diverse terrestrial and freshwater tetrapods of *Pristerognathus* to *Dicynodon* Assemblage Zones (amphibians, true reptiles, synapsids – especially therapsids) have been found in this formation, as well as, palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways), sparse to rich assemblages of vascular plants (*Glossopteris* Flora, including spectacular petrified logs) and insects. Based on the known palaeontological sensitivities of the Adelaide Subgroup, it is recommended that a palaeontological assessment of the areas proposed for development is completed and anticipated impacts to such resources assessed.

Geology (Appendix 2)

The district is known for the presence of fluvial deposits along the present river courses that are terrestrial sediments and includes diatomite (diatom deposits), calcareous tufa, pedocretes, peats, spring deposits, soils and gravel and other Tertiary calcrete deposits, that is very important for understanding the Early and Late Pliocene period in this region (De Ruiter et al, 2010). The late Cenozoic (Plio-Pleistocene) floodplain deposits (overbank sediments) found near the Sand, Doring-, Vals- and Vet River systems including pan sites, contain confined but abundant mammal vertebrate fossil sites. In 1955, Meiring, described an *in situ* proboscidian fossil (mammoth), comprising of a lower molar, large part of a tusk as well as a proximal portion of an ulna from the Sand River near Virginia. This specimen was found in pebbly channel-fill sediments about 40m above the current riverbed. Originally described as *Archidiskodon scotti* (Meiring 1955) this specimen was later assigned to the Pliocene species *Mammuthus subplanifrons* (Coppens et al. 1978). Later investigations uncovered diverse fauna that include amphibians, birds, fish, reptiles, as well as several proboscideans, perissodactyls and artiodactyls from the same site (De Ruiter 2010).

Terrace gravels above the Vet River, southwest of Welkom have uncovered Pliocene fossils while surveys along the Doring, Vals, Sand and Vet Rivers produced moderately fossiliferous overbank sediments and erosional gullies that comprise of a variety of Quaternary-aged mammals (Brink et al. 1999; De Ruiter et al. 2011) Ancient pan sites, for example near Whites, produced rich Quaternary-aged mammal fossil remains. Quaternary fossils are usually very rare but may also include mammalian teeth and bone, ostrich eggshells, tortoise remains, ostracods, diatoms, and reptilian skeletons, trace fossils include burrows, vertebrate tracks, rhizoliths as well as calcretised

termitaria (termite heaps). Plant remains include foliage, pear, wood, pollens. Microfossils and vertebrate remains are often found in Quaternary deposits near water courses and drainage lines.

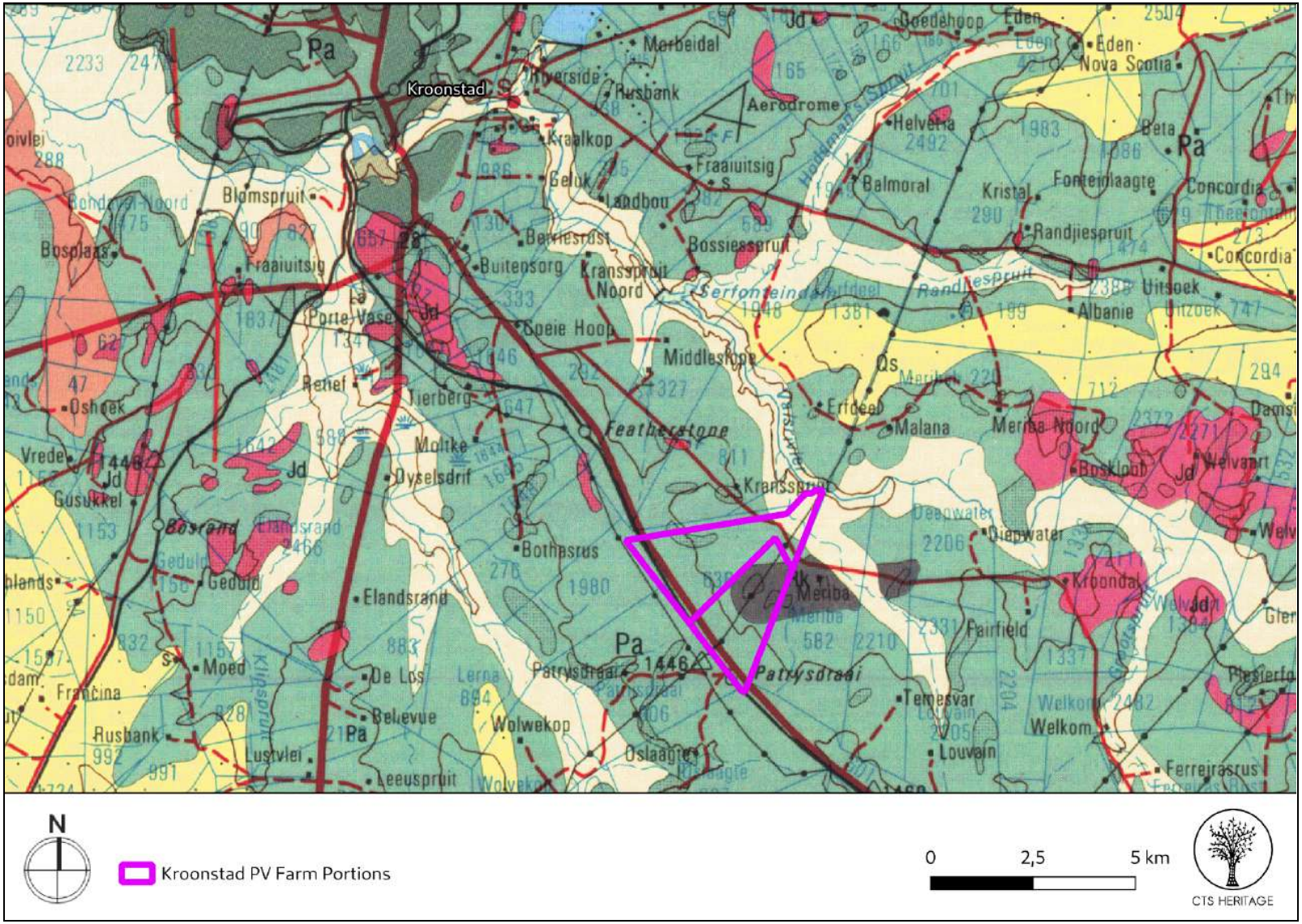
The superficial deposits (represented by yellow on the geological maps, Qs, /Qc, /Qd) are the youngest geological deposits formed during the most recent geological period (approximately 2.6 million years ago to present). Most of the superficial deposits are unconsolidated sediments and consist of clay, gravel, sand, silt, that form relatively thin, discontinuous patches of sediments or larger spreads onshore. These sediments comprise of channel, floodplain and stream deposits, talus gravels and glacial drift sediments. Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter et al., 2006). During the climate fluctuations in the Quaternary Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Quaternary but states that climatic changes during the Quaternary, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

The Ventersdorp Supergroup in the development footprint is represented by the Klipriviersberg Group. This Supergroup comprise of the biggest and most wide-spread system of volcanic rocks in the Kaapvaal Craton. This Supergroup unconformably overlies the Witwatersrand Supergroup and is also unconformably overlain by the Transvaal Supergroup. The elliptical basin is approximately 300 000km^2 in extent. The type-area is located between Klerksdorp (North West), and Welkom and Bothaville (Free State). This Supergroup mantles most of the distribution area of the Witwatersrand Supergroup as well as the Dominion Group.

The best exposures of the Ventersdorp Supergroup are in the North West Province as well as in the Northern Cape Province, Gauteng, and southern Botswana. This Supergroup is divided in the Klipriviersberg Group (oldest) which is overlain by the Platberg Group followed by the sedimentary Bothaville Formation and the volcanic Allanridge Formation (uppermost Ventersdorp unit, youngest Formation). Stromatolites may be present in the Klipriviersberg Group as in the rest of the Ventersdorp Supergroup.

The proposed development is underlain by Quaternary alluvium (yellow single bird figure), the Adelaide Subgroup (Pa, green) of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup.

Map 3.1: Palaeontological sensitivity of the proposed development area



Map 3.2 Geology Map. Extract from the CGS 2726 Kroonstad Geology Map indicating that the development area is underlain by sediments of the Adelaide Subgroup of the Beaufort Group (Pa), Klipriviersberg (Rk) and Quaternary Sands

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Cultural Landscape and VIA Summary

According to the VIA completed for this project, "the basis for the visual character is provided by the topography, vegetation and land use of the area, which is a predominantly rural environment characterised by the undulating, vegetated landscape, albeit with pockets of settlements and regional and national roads routed through the surrounding area. The rolling expanse of vegetated landscape surrounding the site evokes a rural, undeveloped environment. The project area can therefore be defined as a modified rural landscape as it is mostly rural but settlements, powerlines and roads and railway are visible in the landscape

The visual quality of the area can be experienced through rolling views of the gentle hills in the landscape, especially from and across the site. The study area is defined by the fabric of the agricultural grazing activity taking place in the area. The naturally undulating landscape is intermittently interrupted by powerlines and railway lines which detract from the visual quality of the surrounding area. The streams, rivers and dams in the area add to the somewhat unspectacular visual quality.

The region has scenic value in terms of its undulating natural landscape and the views over large portions of agricultural land. The natural landscape and rustic character contrast with the anthropogenic influence in the region, viz. urban development, albeit, some 12 km away. The sense of place of the surrounding area is strongly influenced by the surrounding land use, which can generally be described as a rural agricultural area."

Archaeology

The survey was conducted on foot and by vehicle, and sought to assess the presence and significance of archaeological occurrences within the project area. Field assessment documented a number of stone artefact scatters in both primary and secondary contexts, located at lithic raw-material sources, in eroded river terraces and dongas, and in deflated open landscape settings. These sites suggest the area may have been traversed by Stone Age groups potentially through Pleistocene periods in both the Middle Stone Age (MSA – ~300ka:~40ka) and the later Early Stone Age (later ESA: <1ma-250ka). Holocene archaeology was largely not documented. The presence of substantial unworked artefact-quality raw-materials in the project area as well as relatively abundant standing water (including sedimentary evidence for active drainages in the past) were the resources that likely attracted groups there, and resulted in them leaving behavioural traces in the form of stone artefacts.

In addition to the abundant lithic raw-materials available, there is also sedimentary evidence for past seasonal and permanent water within the footprint of the proposed Bonsmara PV facility. The broader Free state region is well-known archaeologically for its quaternary river terraces, springs and seasonal lake pans that are

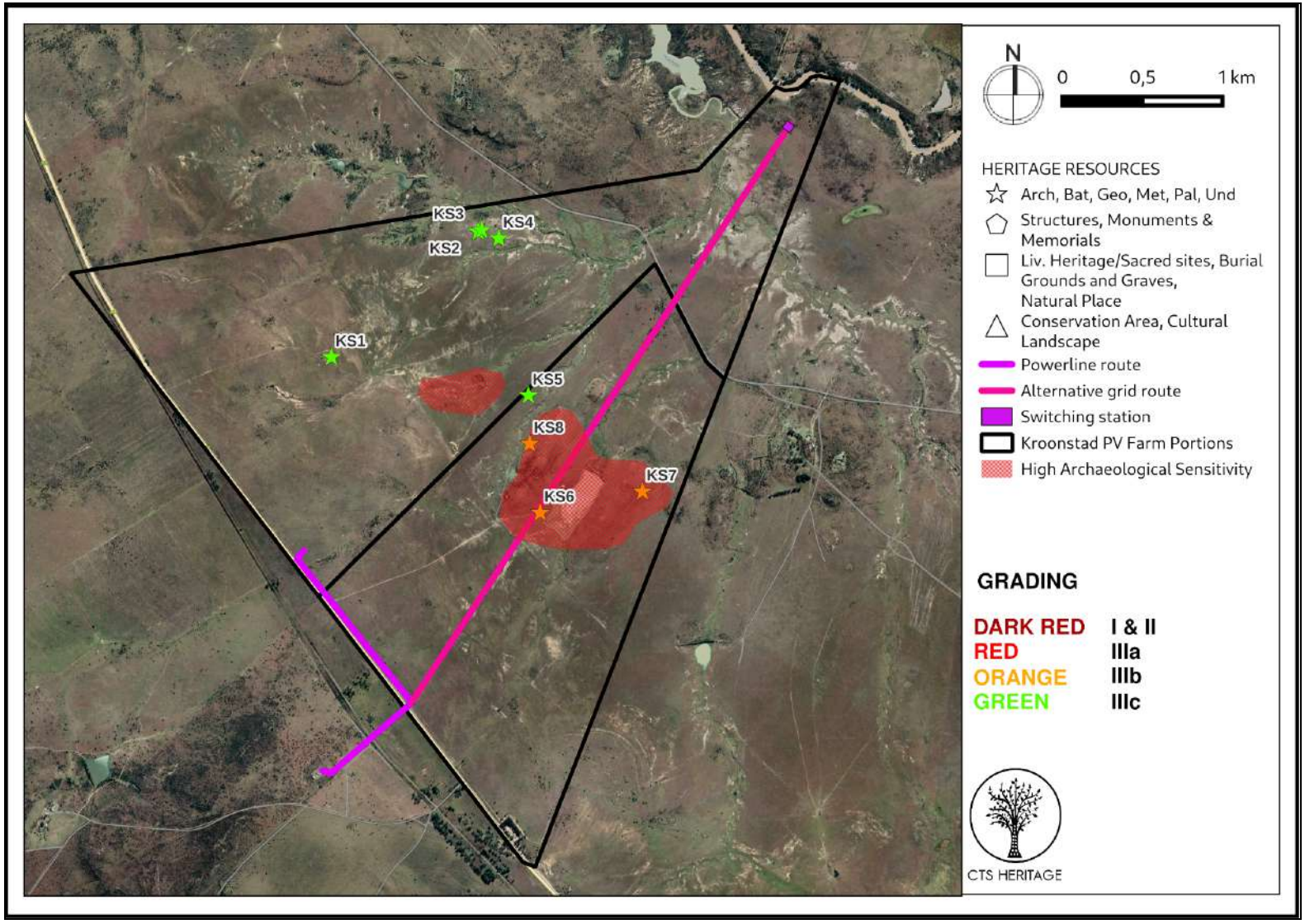
occasionally associated with Pleistocene archaeology. Fresh water was the main attractor for hominins and fauna to these areas and, when eroded through natural or anthropogenic processes, remains of ancient drainages occasionally yield material remains pertaining to human-environment interactions in the past. As mentioned above, the footprint in question is no exception, and has abundant evidence for water and past lithic raw-material exploitation.

Field assessment of the footprint for the proposed development for the Bonsmara PV facility and associated grid infrastructure documented several stone artefact scatters in secondary contexts and also potential for archaeological material in primary - or close to primary - context that needs to be avoided (KS6, KS7 and KS8). The koppies surrounding the modern pan in the south eastern portion of the area should, in general, be completely avoided (Fig. 4.6). This should not be an issue as the plans for development do not appear to encroach on the most sensitive (active) pan and koppies. The stone artefacts at KS2, KS3, KS4 and KS5 are *ex-situ* and occur in deflated contexts, whereas the denser ESA and MSA occupations of the koppies and associated pan margins (KS6, KS7 and KS8) need to be avoided.

Palaeontology

The proposed Bonsmara Solar PV Facility The proposed development is underlain by Quaternary alluvium, the Adelaide Subgroup of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of Quaternary sediments is Moderate, that of the Adelaide Subgroup is Very High while that of the Klipriviersberg Group is Low (blue) (Almond and Pether, 2009; Almond *et al.*, 2013). Updated Geology (Council of Geosciences) indicates that the proposed development is mainly underlain by alluvium, colluvium, eluvium, gravel; the Balfour Formation of the Adelaide Subgroup and the Klipriviersberg Group of the Ventersdorp Supergroup.

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 1 October 2022. No fossiliferous outcrop was detected in the proposed development area. However, loose, fragmented and weathered tree fossils and well-preserved trace fossils were detected. The latter was probably brought in from nearby areas and placed near the homestead (now in ruins). However, the apparent rarity of well-preserved fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.



Map 4.1: Map of heritage resources identified during the archaeological and palaeontological field assessments relative to the proposed development footprint (see appendices for detailed mapping)

4.2 Heritage Resources identified

Cultural Landscape and VIA

No elements of high cultural landscape value have been identified within close proximity to the area proposed for development. While dominated by agricultural activities, the naturally undulating landscape is intermittently interrupted by powerlines and railway lines which detract from the visual quality of the surrounding area.

Archaeology

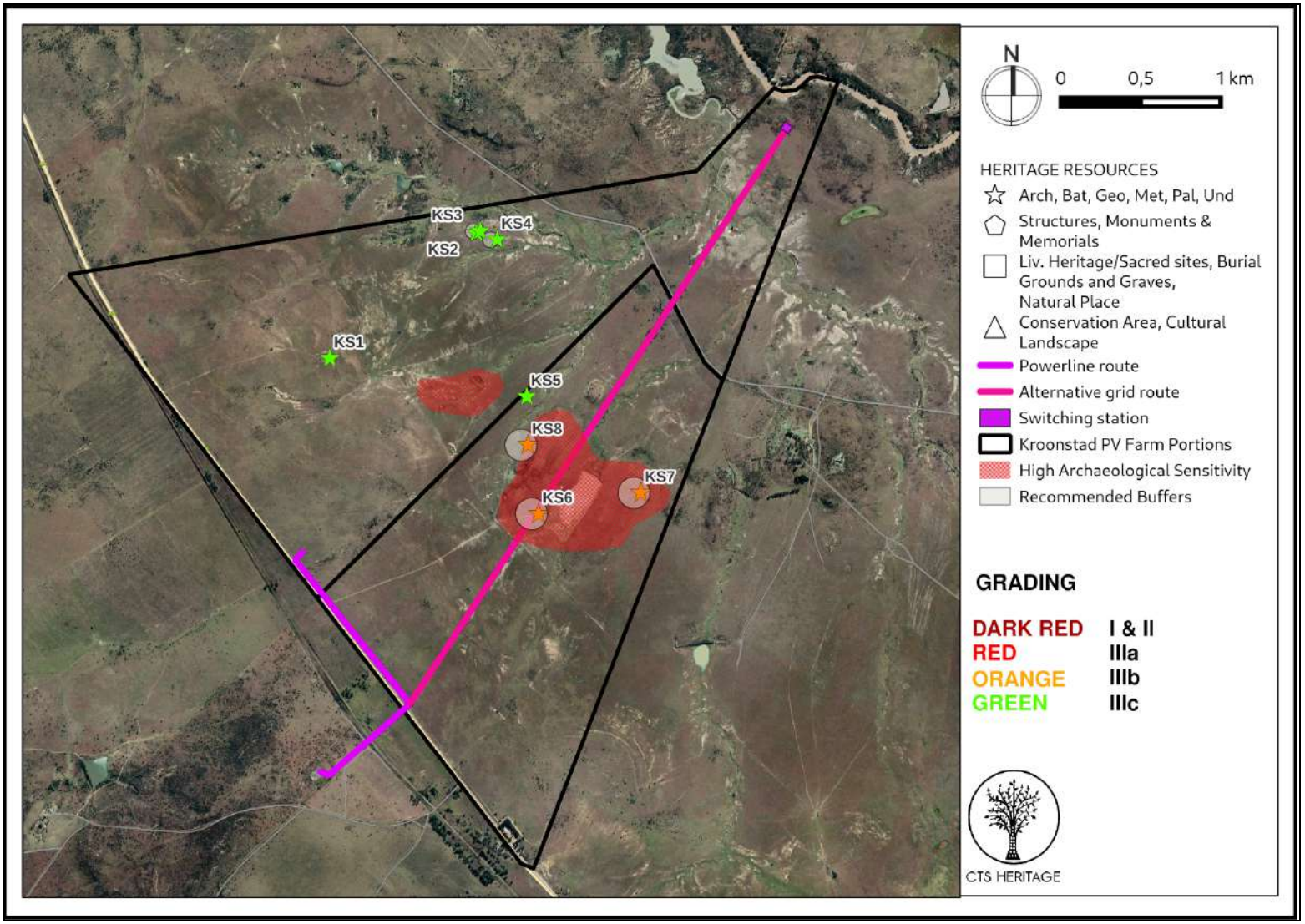
Table 2: Heritage resources known to be located within the development area

Site No.	Description	Density	Co-ordinates		Grading	Mitigation
KS1	Historical stone structures	NA	-27.76014296337	27.3097089584	IIIC	NA
KS2	Isolated Middle Stone Age core	~1-2/m2	-27.7530999854	27.31901396065	IIIC	NA
KS3	Middle Pleistocene scatter with MSA and ESA artefacts	~3-6/m2	-27.7530060242	27.3192510008	IIIC	50m Buffer
KS4	Middle Pleistocene scatter with MSA blade production and bifacial tools	~3-6/m2	-27.75347499176	27.3203409835	IIIC	50m Buffer
KS5	Isolated Middle Stone Age core	~3-6/m2	-27.76228697039	27.32221199199	IIIC	NA
KS6	Dense ESA scatter. Very extensive with clear sub-surface deposit	~4-8/m2	-27.76886701583	27.3229549638	IIIB	100m Buffer
KS7	ESA MSA site with partially submerged artefacts. Very extensive with clear sub-surface deposit	~3-6/m2	-27.76768399402	27.3294500168	IIIB	100m Buffer
KS8	ESA site with large flake blanks. Very extensive with clear sub-surface deposit.	~3-6/m2	-27.76499197818	27.3222829867	IIIB	100m Buffer

Palaeontology

No significant fossils were identified during the field analysis. This is mostly due to the soil cover and lack of outcrop in the area.

4.3 Mapping and spatialisation of heritage resources



Map 5: All known heritage resources located within the proposed development

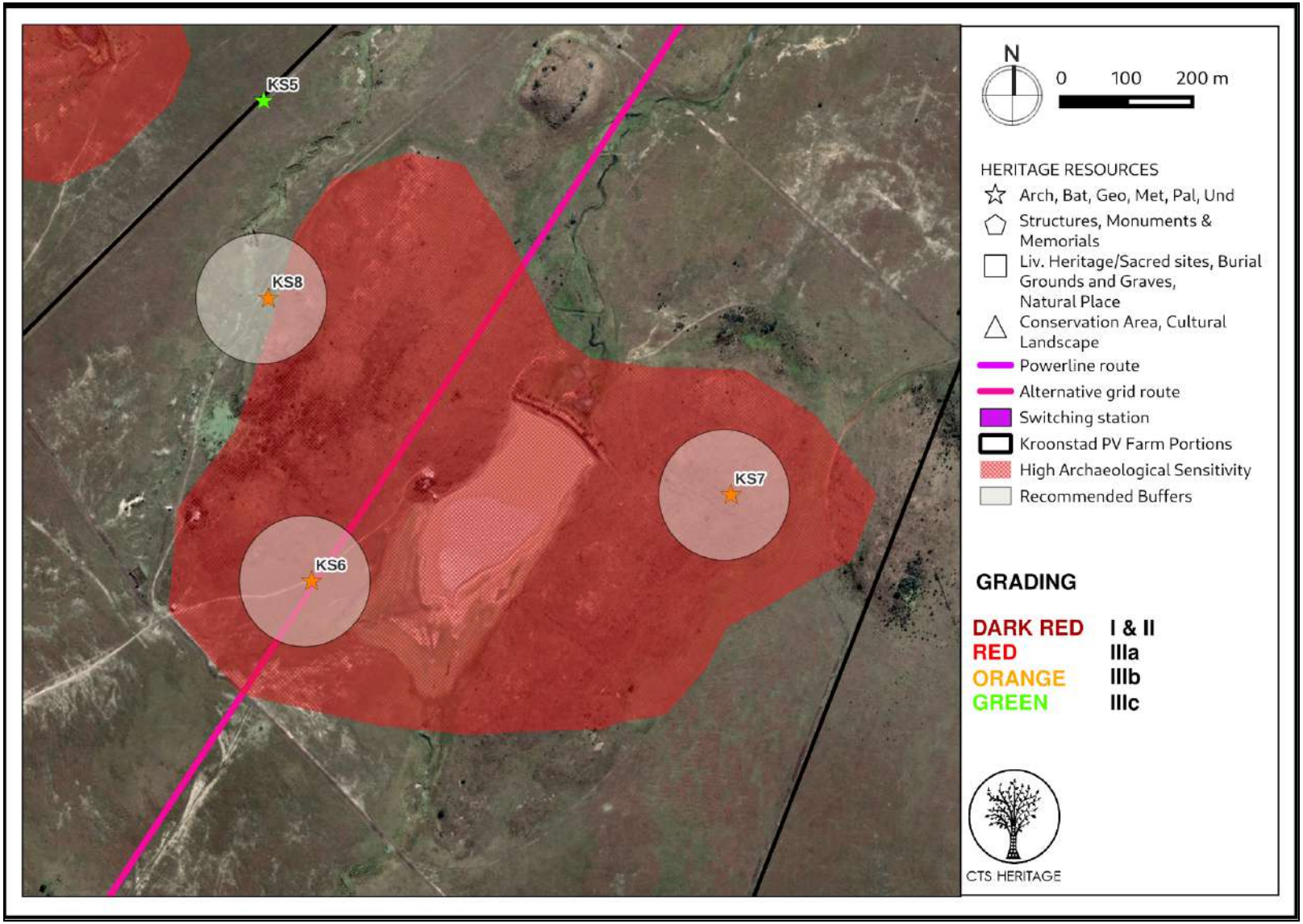


Figure 5.1: Heritage Observations made during field assessment with recommended mitigation measures

Table 5: Impacts Table

Bonsmara PV Facility Grid Connection																				
ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Impacts to archaeological heritage resources	Construction activities that take place near to archaeological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	A no development buffer of 50m is implemented around sites KS3 and KS4 A no development buffer of 100m is implemented around sites KS6, KS7 and KS8 The area identified as having higher levels of archaeological sensitivity in Figure 5 must not be impacted by any development activities. Should any previously unknown archaeological resources be impacted during construction, work must cese in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to palaeontological resources	Construction activities that take place near to palaeontological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the Chance Fossil Finds Procedure	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to the cultural ladscape	Construction activities that take place near to cultural landscape elements may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the recommendations included in the VIA	1	1	4	1	4	1	11	(-)	Negative Low
Operational Phase																				
Impacts to archaeological heritage resources	Operational activities that take place near to archaeological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	A no development buffer of 50m is implemented around sites KS3 and KS4 A no development buffer of 100m is implemented around sites KS6, KS7 and KS8 The area identified as having higher levels of archaeological sensitivity in Figure 5 must not be impacted by any development activities. Should any previously unknown archaeological resources be impacted during construction, work must cese in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to palaeontological resources	Operational activities that take place near to palaeontological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the Chance Fossil Finds Procedure	1	1	4	1	4	1	11	(-)	Negative Low

Impacts to the cultural landscape	Operational activities that take place near to cultural landscape elements may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the recommendations included in the VIA	1	1	4	1	4	1	11	(-)	Negative Low
Decommissioning Phase																				
Impacts to archaeological heritage resources	Decommissioning activities that take place near to archaeological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	A no development buffer of 50m is implemented around sites KS3 and KS4 A no development buffer of 100m is implemented around sites KS6, KS7 and KS8 The area identified as having higher levels of archaeological sensitivity in Figure 5 must not be impacted by any development activities. Should any previously unknown archaeological resources be impacted during construction, work must cese in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to palaeontological resources	Decommissioning activities that take place near to palaeontological resources may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the Chance Fossil Finds Procedure	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to the cultural landscape	Decommissioning activities that take place near to cultural landscape elements may result in their destruction	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the recommendations included in the VIA	1	1	4	1	4	1	11	(-)	Negative Low
Cumulative																				
Impacts to archaeological heritage resources	Cumulative destruction of significant archaeological heritage	1	2	4	3	4	3	42	(-)	Negative Medium	A no development buffer of 50m is implemented around sites KS3 and KS4 A no development buffer of 100m is implemented around sites KS6, KS7 and KS8 The area identified as having higher levels of archaeological sensitivity in Figure 5 must not be impacted by any development activities. Should any previously unknown archaeological resources be impacted during construction, work must cese in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to palaeontological resources	Cumulative destruction of significant palaeontological heritage	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the Chance Fossil Finds Procedure	1	1	4	1	4	1	11	(-)	Negative Low
Impacts to the cultural landscape	Cumulative impact to the cultural landscape	1	2	4	3	4	3	42	(-)	Negative Medium	Implementation of the recommendations included in the VIA	1	1	4	1	4	1	11	(-)	Negative Low

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources (See Table 5)

Planning Phase

No impacts to heritage resources are anticipated during this phase.

Construction Phase

Impacts to archaeological, palaeontological and other heritage resources are anticipated during this phase.

No impacts to heritage resources are anticipated if the preferred powerline alignment is implemented. However, the alternative alignment runs through an area that has been identified as having high levels of heritage sensitivity. Sites KS6, KS7 and KS8 are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposits. It is recommended that none of these sites be impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area, including the proposed grid alignment.

No impacts to palaeontological resources are anticipated, however it is recommended that, due to the high palaeontological sensitivity of the development area, the attached Chance Fossil Finds procedure is implemented for the duration of construction activities.

Operational Phase

No impacts to heritage resources are anticipated during this phase.

Decommissioning Phase

No impacts to heritage resources are anticipated during this phase.

5.2 Sustainable Social and Economic Benefit

This grid infrastructure is proposed to support the Bonsmara SEF and connect the SEF to the national grid. The findings of the social impact scoping assessment show that the development of the Bonsmara SEF will create skilled and unskilled jobs during the construction and operational phases. While skilled employment will be open to experts across the country, unskilled labour may be mostly reserved for the locals. There will also be business opportunities associated with the project that local businesses may benefit from. Skills transfer may also be one of the positive impacts of the project on local people.

On condition that the recommendations indicated below are implemented, the anticipated socio-economic benefits will outweigh the negative impacts identified to heritage resources.

5.3 Proposed development alternatives

Two alternative grid alignments are proposed for assessment.

Alternative 1: The powerline takes the shortest route to the grid connection point and a portion of it follows an existing 132kV powerline.

Alternative 2: Alternative 2 consists of a 5.5km 132kv powerline from the on-site step-station and follows the original route before turning north-east and following the existing powerline. It is a LILO connection. A 300m corridor (150m on each side) of this line is assessed as an alternative to the original grid route. Other infrastructure associated with this alternative is a switching station (0.5ha in size) that is located at the end of the line.

Alternative 2 is NOT preferred from a heritage perspective as it traverses an area that has been identified as having high levels of archaeological sensitivity, and it runs directly through Site KS6 (Grade IIIB).

5.4 Site Verification Statement

According to the DFFE Screening Tool analysis, the development area has Very High levels of sensitivity for impacts to palaeontological heritage and Low levels of sensitivity for impacts to archaeological and cultural heritage resources. The results of this assessment in terms of site sensitivity are summarised below:

- The cultural value of the broader area has some significance in terms of its sense of place and scenic qualities (Moderate)
- Some significant archaeological resources were identified within the broader area (Very High)
- No highly significant palaeontological resources were identified within the development area and the sediments underlying the development area have zero palaeontological sensitivity (Low)

As per the findings of this assessment, and its supporting documentation, the outcome of the sensitivity verification disputes the results of the DFFE Screening Tool for Cultural Heritage, Archaeology and Palaeontology.

5.5 Cumulative Impacts

At this stage, there is the potential for the cumulative impact of the proposed PV facility and associated infrastructure to negatively impact the cultural landscape due to a change in the landscape character from rural to semi-industrial. Based on the available information, very few renewable energy facilities and their associated

grid infrastructure (power lines and substations) have been approved in the immediate vicinity of the proposed development. As such, cumulative impacts are not anticipated. It is noted that it is preferable to have renewable energy facility development and associated infrastructure focused in an area such as a REDZ or Strategic Transmission Corridor.

6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the EAP during the Environmental Impact Assessment process. Any comments received on heritage concerns will be responded to directly and included in this section in the Final Report.

7. LEGISLATIVE AND PERMIT REQUIREMENTS

This proposed development triggers sections 38(1) and 38(8) of the National Heritage Resources Act (Act 25 of 1999) as this proposed development constitutes a change of character to a site exceeding 50000m^2 and this proposed development requires an evaluation of impacts to heritage resources in terms of other legislation (NEMA). This section states that the consenting authority must ensure that the assessment completed for impacts to heritage satisfies the requirements of the relevant heritage authority in terms of section 38(3) of the NHRA (SAHRA in the Free State), and that the recommendations of the relevant heritage authority must be taken into consideration prior to the granting of consent.

Section 38(3) of the NHRA details the information that MUST be included in a Heritage Impact Assessment drafted in terms of section 38 of the NHRA. Furthermore, SAHRA has published Minimum Standards for Archaeological and Palaeontological Impact Assessments. All such guidelines and minimum standards have been complied with in the drafting of this HIA.

In terms of section 38(10) of the NHRA, if the applicant complies with the recommendations and requirements of the relevant heritage authority issued in terms of section 38(8) of the NHRA, then the applicant MUST be exempted from compliance with all other (general) protections included in the NHRA. As such, as long as the requirements of the heritage authority are satisfied, no permit application is required for the destruction of or impact to any heritage resource that has been identified in the HIA.

Should any heritage resources be newly uncovered during excavation activities i.e. heritage resources that were not identified in the HIA, then as per the recommendations of the HIA, work must cease in that area and the relevant heritage authority must be contacted regarding a way forward. This HIA recommends that the attached Chance Fossils Finds procedure be implemented in order to direct such actions.

8. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS (See Table 7)

The following recommendations must be included in the EMPr for this project:

- A no development buffer of 50m is implemented around sites KS3 and KS4
- A no development buffer of 100m is implemented around sites KS6, KS7 and KS8
- The area identified as having higher levels of archaeological sensitivity in Figure 6 must not be impacted by any development activities.
- The attached Chance Fossil Finds Procedure must be implemented for the duration of construction activities.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

9. FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

9.1 Statement and Reasoned Opinion

The survey proceeded with two minor constraints and limitations, yet the project area was comprehensively surveyed for heritage resources. Highly significant Early Stone Age open sites were identified within the property - KS6, KS7 and KS8. These sites are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposit. It is recommended that none of these sites be impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area. The preferred grid alignment does not impact on this sensitive area however the alternative grid alignment runs directly through this area. A such, the powerline alternative route 1 is preferred from a heritage perspective.

Should significant archaeological materials – such as well-preserved subsurface artefacts or fossils – be exposed during construction, the on-duty Environmental Control Officer should protect these (preferably in primary exposed context), and should immediately consult a professional archaeologist. In this circumstance, the South African Heritage Resources Authority should be immediately alerted so that appropriate mitigation measures by a professional archaeologist can be implemented, at the expense of the developer. In such a scenario, mitigation measures would normally involve the application for an excavation permit and the digital documentation of the occurrences with modern archaeological recording standards, as well as the collection of a reflective sample of material to be deposited in a local approved curation facility.

No impacts to palaeontological resources are anticipated, however it is recommended that, due to the high palaeontological sensitivity of the development area, the attached Chance Fossil Finds procedure is implemented for the duration of construction activities.

9.2 EA Condition Recommendations

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated grid connection infrastructure will negatively impact on significant heritage resources on condition that:

- A no development buffer of 50m is implemented around sites KS3 and KS4
- A no development buffer of 100m is implemented around sites KS6, KS7 and KS8
- The area identified as having higher levels of archaeological sensitivity in Figure 6 must not be impacted by any development activities.
- The attached Chance Fossil Finds procedure must be implemented for the duration of construction activities

- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

Table 3: Measures for inclusion in the EMP

Objective: Mitigating negative impact to significant Archaeological, Palaeontological and Cultural Landscape heritage resources		
Project Components	Construction phase of the development, ground disturbance and excavation	
Potential Impact	Disturbance and destruction of scientifically valuable archaeological and palaeontological resources located either at the ground surface or below ground	
Activity/Risk Source	Extensive bedrock excavations and surface disturbance (*e.g.* laydown areas, new access roads, transmission line pylon footings, on-site substation, foundations for the office / workshop, underground cables).	
Mitigation: Target/Objective	Recording, judicious sampling and curation of any important archaeological or fossil heritage exposed during construction within the OHL development area. Safeguarding of scientifically-important archaeological and fossil sites that cannot be effectively mitigated	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Monitoring of all bedrock excavations for archaeological resources or fossil remains during the construction phase.	ESO	Construction Phase
Fossil finds to be safeguarded as per the Chance Finds Procedure and reported to SAHRA for possible mitigation.	ESO	Construction Phase
Recording and judicious sampling of exceptional new fossil material or archaeological resources from the development footprint.	Archaeologist/Palaeontologist depending on the nature of the finds	Construction Phase
Curation of fossil specimens or archaeological resources at an approved repository (*e.g.* museum).	Archaeologist/Palaeontologist depending on the nature of the finds	Following mitigation
Final technical report on palaeontological or archaeological heritage mitigated within study area submitted to SAHRA.	Archaeologist/Palaeontologist depending on the nature of the finds	Following mitigation
Performance Indicator	Identification of any new archaeological or palaeontological hotspots within the broader development footprint by ESO. Submission of interim and final technical reports to HWC by palaeontologist or archaeologist involved with mitigation work. Palaeontology: Cumulative acquisition of geographically and stratigraphically well-localised fossil records, samples and relevant geological data from successive subsections of the development area.	

	Archaeology: Controlled sampling and collection or recording of any significant archaeological resources identified.
Monitoring	Monitoring on on-going basis during construction phase of fresh bedrock exposures within development footprint by ESO and, if necessary, by professional palaeontologist/archaeologist.

10. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
5968	Cobus Dreyer	20/06/2005	AIA Phase 1	Archaeological and Historical Investigation of the Proposed New Filling Station at Kroonstad, Free State
5969	Cobus Dreyer	25/08/2005	AIA Phase 1	Historical Investigation of the Existing Outbuildings at the Farm Smaldeel 202, Kroonstad, Free State
5970	Cobus Dreyer	29/05/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Middenspruit 151, Kroonstad, Free State
5971	Cobus Dreyer	12/07/2006	AIA Phase 1	Archaeological and Historical Investigation of the Proposed Township Developments at Maokeng, Kroonstad, Free State
5972	Cobus Dreyer	26/10/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Boschpunt 2218 Kroonstad, Free State

Additional References:

Lavin and Wiltshire. November 2020. ARCHAEOLOGICAL SPECIALIST STUDY In terms of Section 38(8) of the NHRA for a Proposed development of the Vrede and Rondavel Solar Energy Facilities near Kroonstad, Free State Province. Unpublished. Section 38(8) Heritage Impact assessment process.

CTS HERITAGE

APPENDICES

APPENDIX 1: Archaeological Assessment

ARCHAEOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA for a

PROPOSED BONSMARA SOLAR PHOTOVOLTAIC (PV) RENEWABLE ENERGY FACILITY NEAR KROONSTAD, FREE STATE PROVINCE

Prepared by

CTS HERITAGE

Jenna Lavin
and Dr. Darya Presnyakova

In Association with

SiVEST

October 2022

CTS HERITAGE

EXECUTIVE SUMMARY

Bonsmara Solar PV (RF) (Pty) Ltd has appointed SiVEST Environmental (hereafter referred to as "SiVEST") to undertake the required EIA / BA Processes for the proposed construction of the Bonsmara Solar PV Energy Facility (SEF) and associated grid connection infrastructure near Kroonstad in the Free State Province. The distinct EA's that are required for the Projects are as follows:

- Bonsmara SEF (up to 100MW)
- Bonsmara Grid Connection Infrastructure (up to 132kV)

The overall objective of the development is to generate electricity by means of renewable energy technology capturing energy to feed into the National Grid.

Bonsmara Solar PV (RF) (Pty) Ltd is proposing the construction of the 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure on a site approximately 12km south-east from the town of Kroonstad, in the Free State Province. The facility will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The facility will compromise of several arrays of PV panels and associated infrastructure that includes BESS and will have a contracted capacity of 100MW. The Solar PV facility will connect to the grid via a 2km 132kv powerline from the on-site substation to the Kroonstad Switching Station. This heritage screening assessment forms part of the Scoping Phase of the EIA for the Bonsmara PV Project.

The survey proceeded with two minor constraints and limitations, yet the project area was comprehensively surveyed for heritage resources, and only two archaeological heritage resources of significance were identified as being impacted in the layout provided - KS3 and KS4. These sites have been graded IIIC for their contextual scientific value and it is recommended that these sites are not impacted by the proposed development through the implementation of a 50m buffer around these sites.

Further, highly significant Early Stone Age open sites were identified within the property but are not impacted directly in the layout provided - KS6, KS7 and KS8. These sites are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposit. It is recommended that none of these sites be impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area. The present layout assessed in this report does not impact on this archaeologically sensitive area. No mitigation recommendations are made for KS1 and KS5.

Should significant archaeological materials – such as well-preserved subsurface artefacts or fossils – be exposed during construction, the on-duty Environmental Control Officer should protect these (preferably in primary exposed context), and should immediately consult a professional archaeologist. In this circumstance, the South African Heritage Resources Authority should be immediately alerted so that appropriate mitigation measures by a professional archaeologist can be implemented, at the expense of the developer. In such a scenario, mitigation measures would

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normally involve the application for an excavation permit and the digital documentation of the occurrences with modern archaeological recording standards, as well as the collection of a reflective sample of material to be deposited in a local approved curation facility.

Recommendations

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated grid connection infrastructure will negatively impact on significant archaeological heritage on condition that:

- A no development buffer of 50m is implemented around sites KS3 and KS4
- A no development buffer of 100m is implemented around sites KS6, KS7 and KS8
- The area identified as having higher levels of archaeological sensitivity in Figure 6 must not be impacted by any development activities.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

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CTS HERITAGE

CONTENTS

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1. INTRODUCTION

1.1 Background Information on Project

Bonsmara Solar PV (RF) (Pty) Ltd has appointed SiVEST Environmental (hereafter referred to as "SiVEST") to undertake the required EIA / BA Processes for the proposed construction of the Bonsmara Solar PV Energy Facility (SEF) and associated grid connection infrastructure near Kroonstad in the Free State Province. The distinct EA's that are required for the Projects are as follows:

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1.2 Description of Property and Affected Environment

The footprint of the proposed development for the Bonsmara PV facility and associated grid infrastructure is located across three private agricultural camps, approximately 12 km southeast of the town of Kroonstad, in the Grassland Biome of the summer rainfall region of the Free State Province, South Africa.

Where retained and unaffected by agriculture, the natural vegetation comprises relatively dense grassland interspersed with shrubs that are typical of the Free State Grassland summer rainfall Biome. Both local and exotic wildlife are more abundant in the south eastern portion of the footprint which is used currently for hunting safaris, with evidence of both large and smaller antelope, suids, alcelaphines including various wildebeest species, indigenous and exotic fowl including francolin, spurfowl, guineafowl and ostrich, as well as some traces of burrowing rodents (hares and meerkats).

The north western portion of the footprint has camps that have been used historically for agricultural purposes. In some areas where cattle have aggregated for watering and feeding, the landscape is more heavily modified (trampled) which has impacted the archaeological potential of these areas substantially. As a result of such disturbance, in these localities little of the original natural landscape - in terms of vegetation, geology and probably also archaeology - is visible today.

The potentially affected footprint has a relatively high frequency of active non-perennial drainages both within it and immediately to the north of the footprint. These drainages are associated with deposits of riverine quartzite cobbles

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(evident from the rock cortex), and other secondary deposits of sedimentary rocks that derive from the parent formations of the goldfields region. In addition to the primary outcrops on the koppies in the south east, these cobbles would also have been sources of raw-material for Stone Age occupants of the area. Other rock types evident within the footprint include quartz and indurated shales (Hornfels), which are artefact manufacturing quality in terms of homogeneity and lithic fracture properties.

The historical use of the north western portion of the footprint for agricultural purposes, and recently abandoned structures in one area (KS1), raise the potential for graves and isolated burials. Due to unusual recent Free State winter rainfall in September, grass coverage was a relevant constraint to documenting graves where the above surface material indicators may be partially or completely obstructed. Grass cover made potential grave locations challenging to exhaustively assess in areas where above surface material indicators may have been removed through crop related activities, through trampling related to stock farming or through natural processes such as seasonal flooding.

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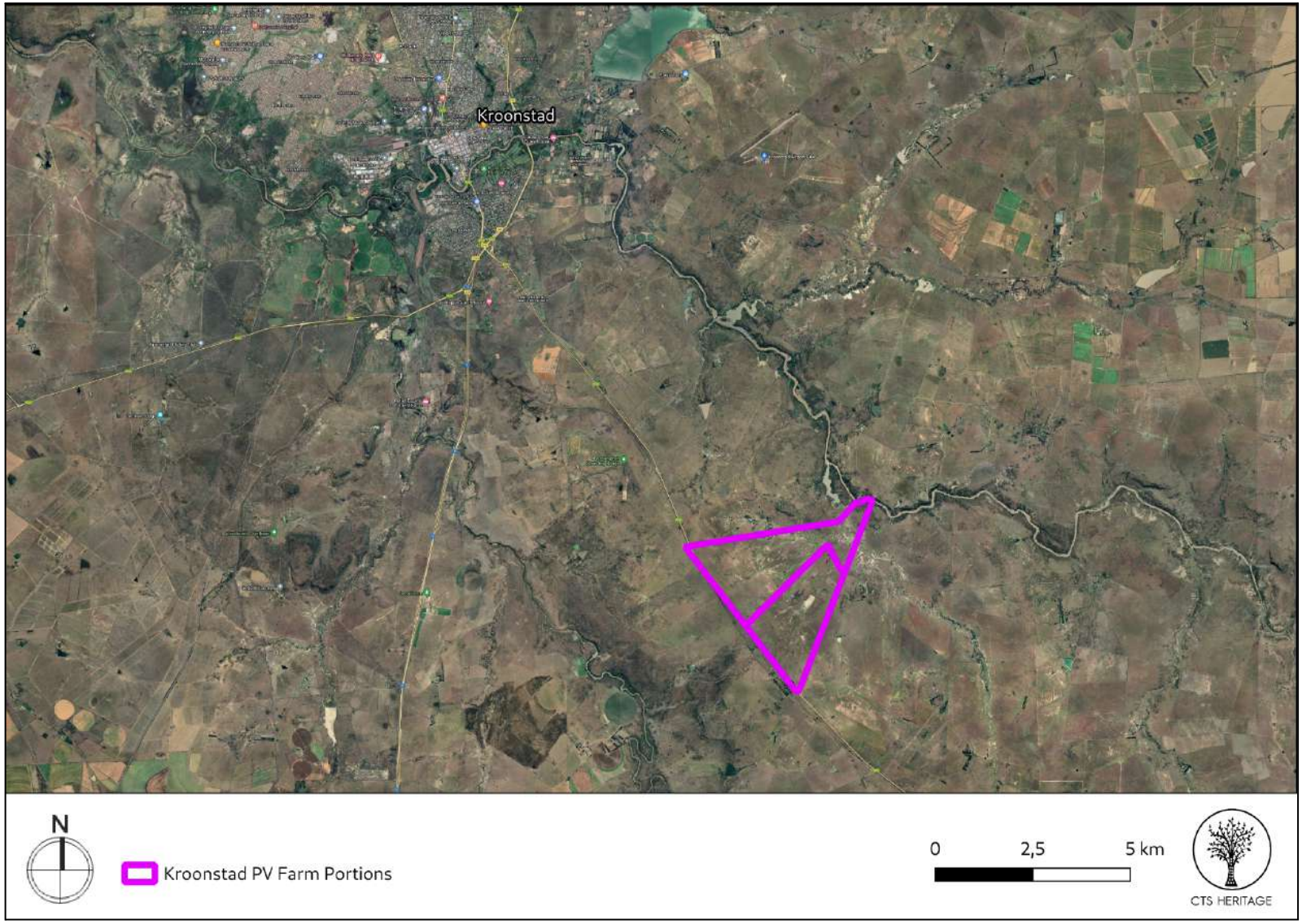

Figure 1.1: Satellite image indicating proposed location of development

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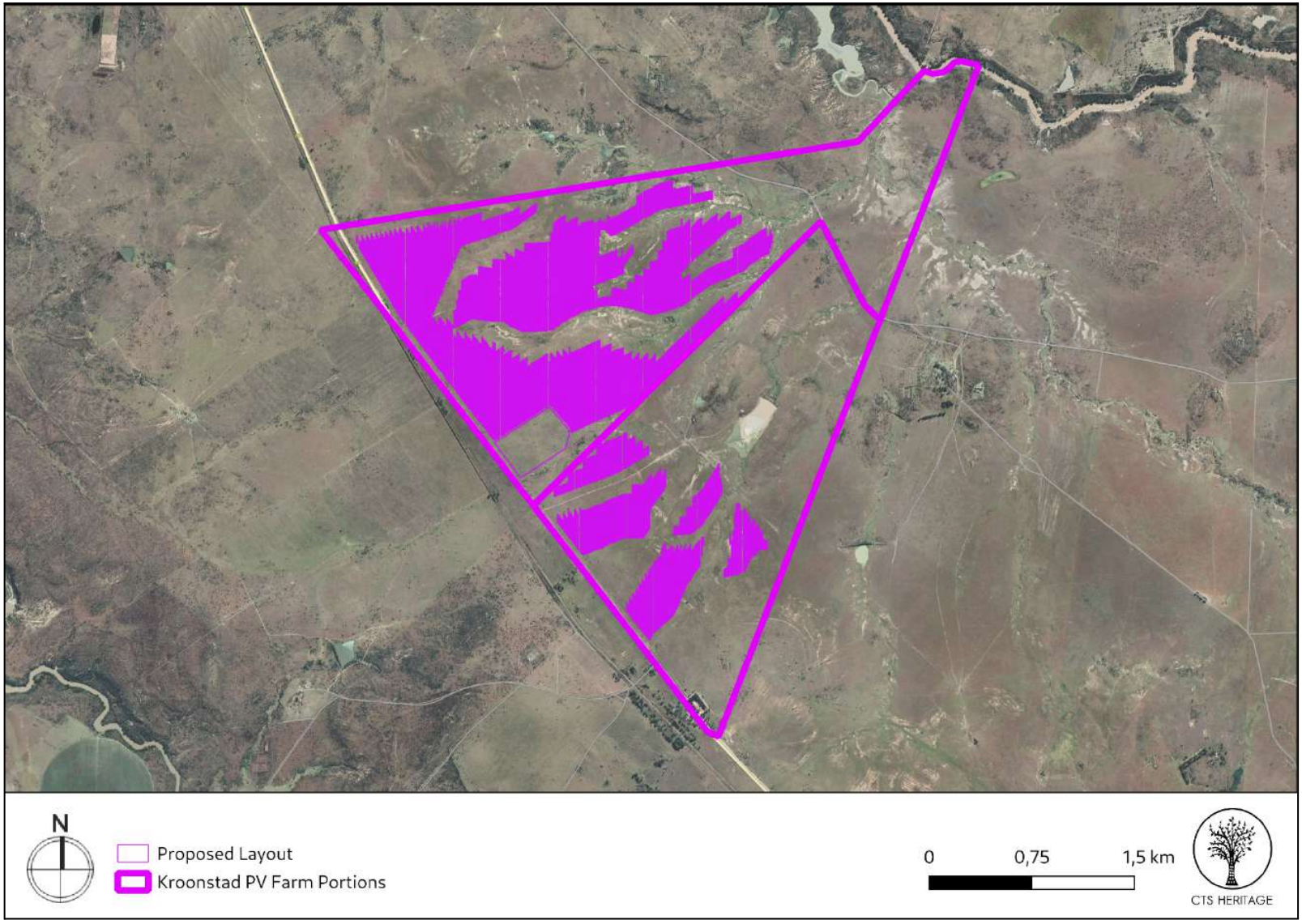

Figure 1.2: Proposed project boundary

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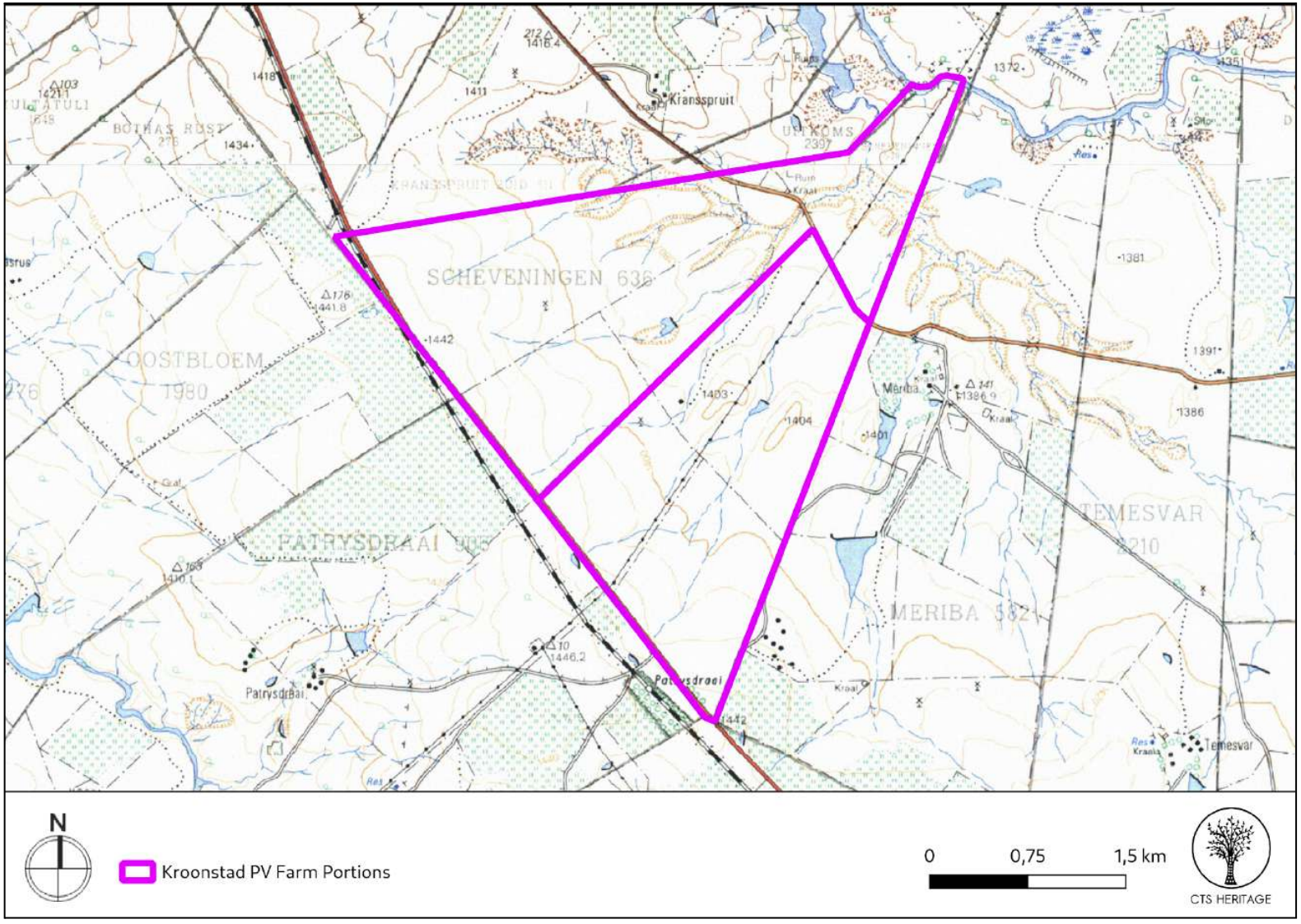

Figure 1.3: Proposed project boundary on the extract from the 1:50 000 Topo Map

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2. METHODOLOGY

2.1 Purpose of Archaeological Study

The purpose of this archaeological study is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to archaeological resources.

2.2 Summary of steps followed

- An archaeologist conducted a survey of the site and its environs on from 3 to 4 October 2022 to determine what archaeological resources are likely to be impacted by the proposed development.
- The area proposed for development was assessed on foot, photographs of the context and finds were taken, and tracks were recorded using a GPS.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

2.3 Constraints & Limitations

(1) Grasses and occasional shrubs that have flourished recently due to September (2022) rainfall, cover portions of the project area. This coverage inhibited the visibility of surface archaeology, although this is not regarded as a major problem in relation to the Stone Age archaeological remains, which in most cases look to have been reflectively documented.

(2) The northernmost portion of the footprint area was challenging to comprehensively assess at ground surface level (due to relatively denser modern vegetation cover). This should be regarded as a constraint to the documentation of potential graves.

(3) Large male ostriches were roaming freely in the northernmost portion of the footprint which made some localities challenging to access for safety reasons. Herds of *Alcelaphines* were present in the south east which also made foot access in some places challenging.

(4) The upper sediments are disturbed in portions of the potentially affected area that have been used as localities for feeding and watering stock, and potentially also as enclosures for animals, inhibiting visibility (pertains primarily to the western most property).

(5) In the south eastern portion of the affected area, access was not possible where people are actively living in dwelling structures today; however, any archaeology occurring in these areas apart from graves would probably be *ex situ* and of limited scientific importance.

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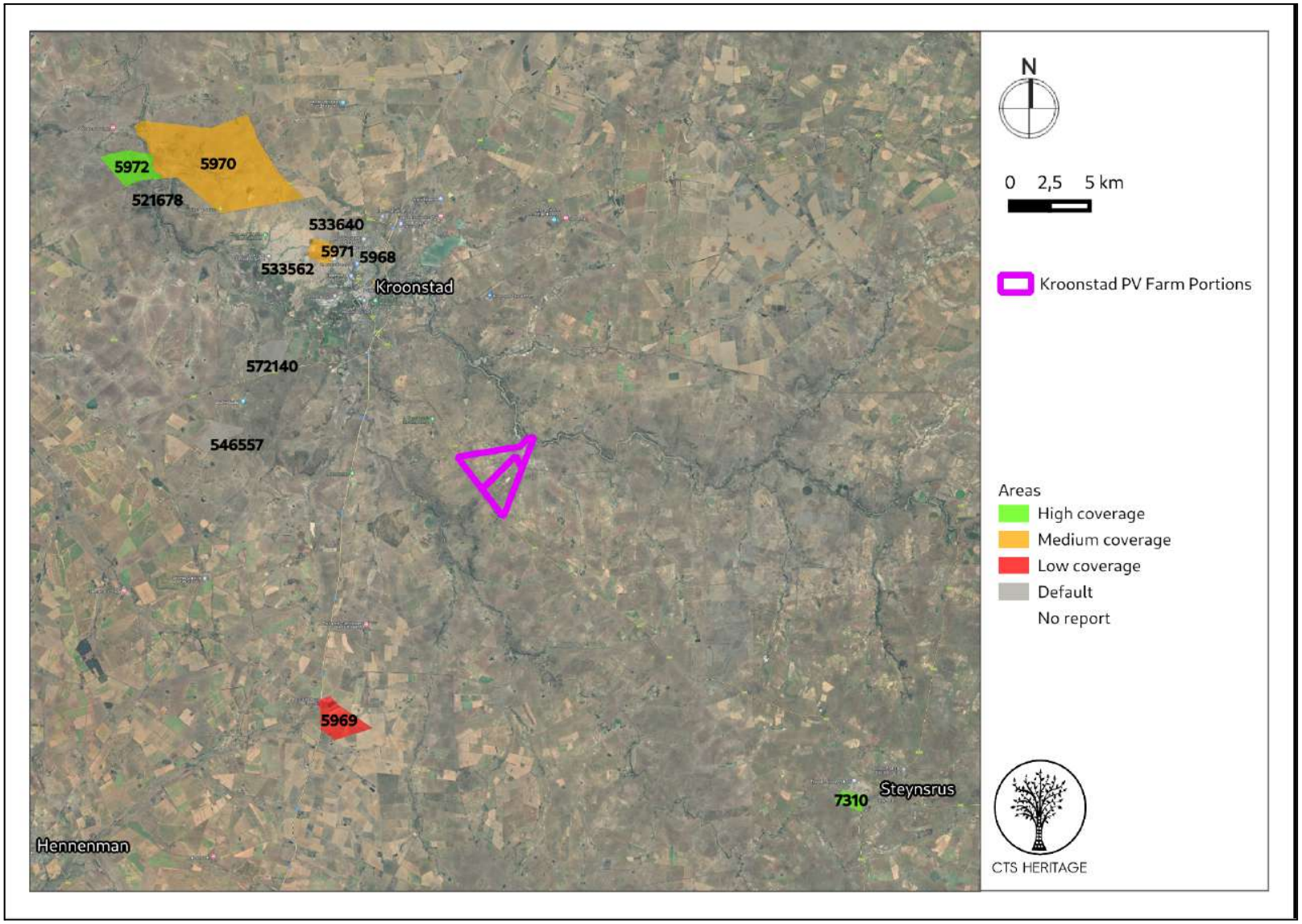

Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted

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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

Background:

This application is for the proposed development of a PV facility and associated grid infrastructure located approximately southeast of Kroonstad along the R76 in the Free State Province. Kroonstad was established as a town in 1855. During the Second Boer War, from 13 March to 11 May 1900, the city became the capital of the Orange Free State, and subsequently the site of a British concentration camp to contain Boer women and children. Kroonstad still boasts much of the inherent rugged beauty which led the Voortrekkers to establish the town where they did and it is situated in an area characterised by open spaces and an abundant variety of vegetation that makes it particularly beautiful. According to Van Schalkwyk (2013), "Most farmsteads were burned down during the Anglo-Boer War, with the result that very little of the built environment dates to the 19th century." According to Matenga (2019), the Black and Coloured townships are significant as landscapes of segregation occupying the north-western fringe of the CBD, while the exclusive white suburbs were located northeast of the town and south of the Valsch River.

According to Van Schalkwyk (2013), "The cultural landscape qualities of the region essentially consist of a rural setup. In this the human occupation is made up of a pre-colonial element consisting of limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component. This was soon followed by the development of a number of urban centres or towns. Originally these mostly served the surrounding farming communities, but with the discovery of the Free State Gold Fields, they expanded rapidly in order to serve this industry as well." The proposed Solar Energy Facility and its associated grid connections are located some distance from the historic core of Kroonstad town. Furthermore, the areas proposed for development are located more than 10km away from the site of the Boer War concentration camps and associated burial grounds.

Archaeology

Prior to colonial settlement in 1855, the area proposed for development formed part of a landscape that was occupied by indigenous Khoe herders and San hunter-gatherers. These indigenous communities were displaced by Bantu-speaking people who began to occupy the area in the Iron Age. According to Van Schalkwyk (2013), "Sites dating to the Late Iron Age are known to occur in the region, especially… in the vicinity of the Sandrivier, whereas some are known to occur to the northwest of Ventersburg, These are typical stone walled sites that are linked with Sothospeakers and date to the period after 1600." As such, it is possible that Early, Middle or Later Stone Age artefacts may be located within the proposed development footprint. Furthermore, it is possible that evidence of Iron Age settlement may also be located within the proposed development areas. Recent archaeological field assessment conducted for the Vrede and Rondawel PV Facilities located approximately 10km from the proposed development area identified some cultural remains but with varied value and preservation. The isolated and scattered lithic artefacts identified are typical of a deflated landscape and have very limited cultural value given that they have been accumulated and modified by various natural processes to their current *ex situ* state. The stone piles found in the south west of the property are more noteworthy (Grade IIIA) and require sensitive treatment. It is likely that similar heritage resources may be present within this development area. As such, it is recommended that an archaeological assessment of the areas proposed for development is completed and anticipated impacts to such resources assessed.

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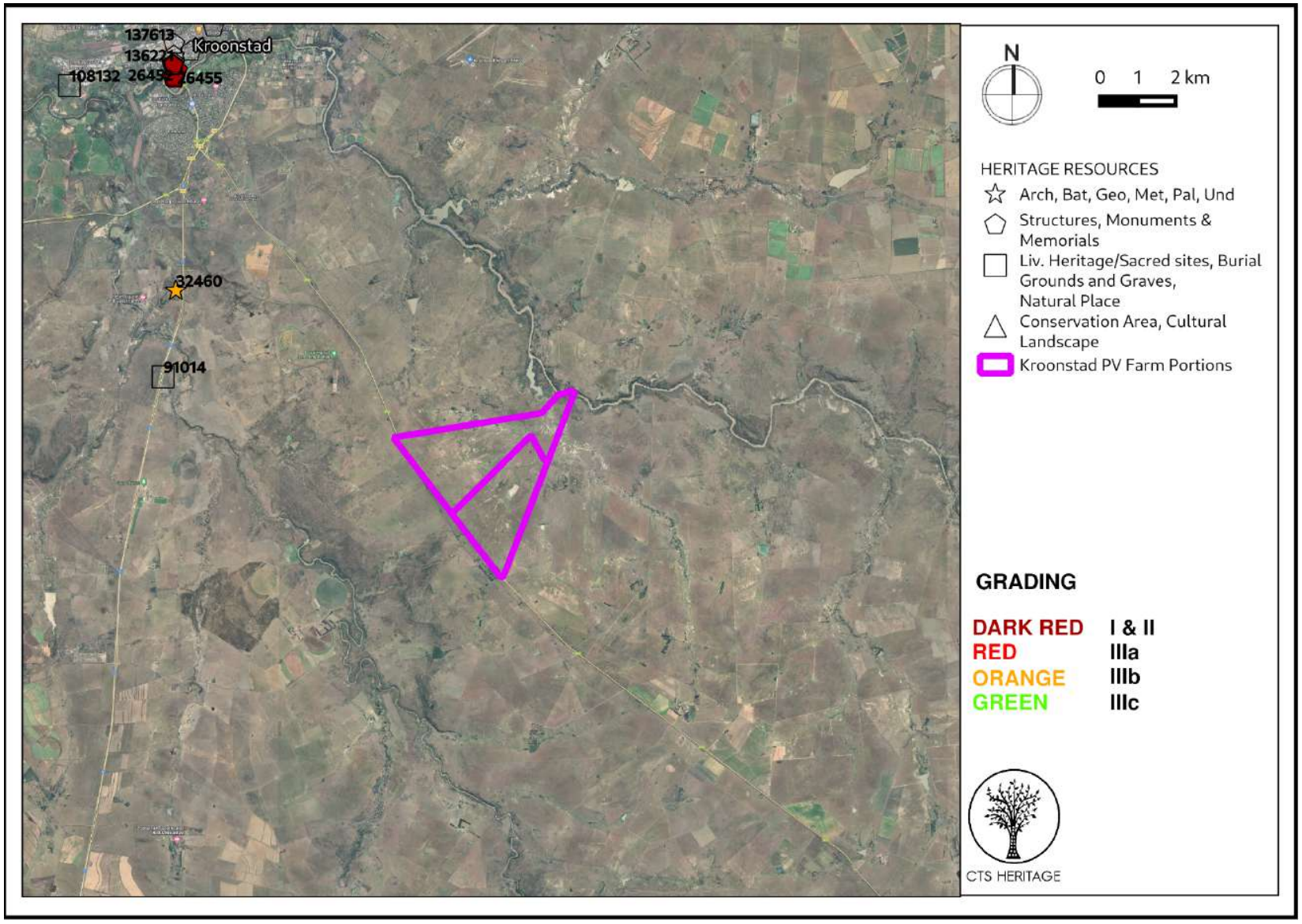

Figure 3.1. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated

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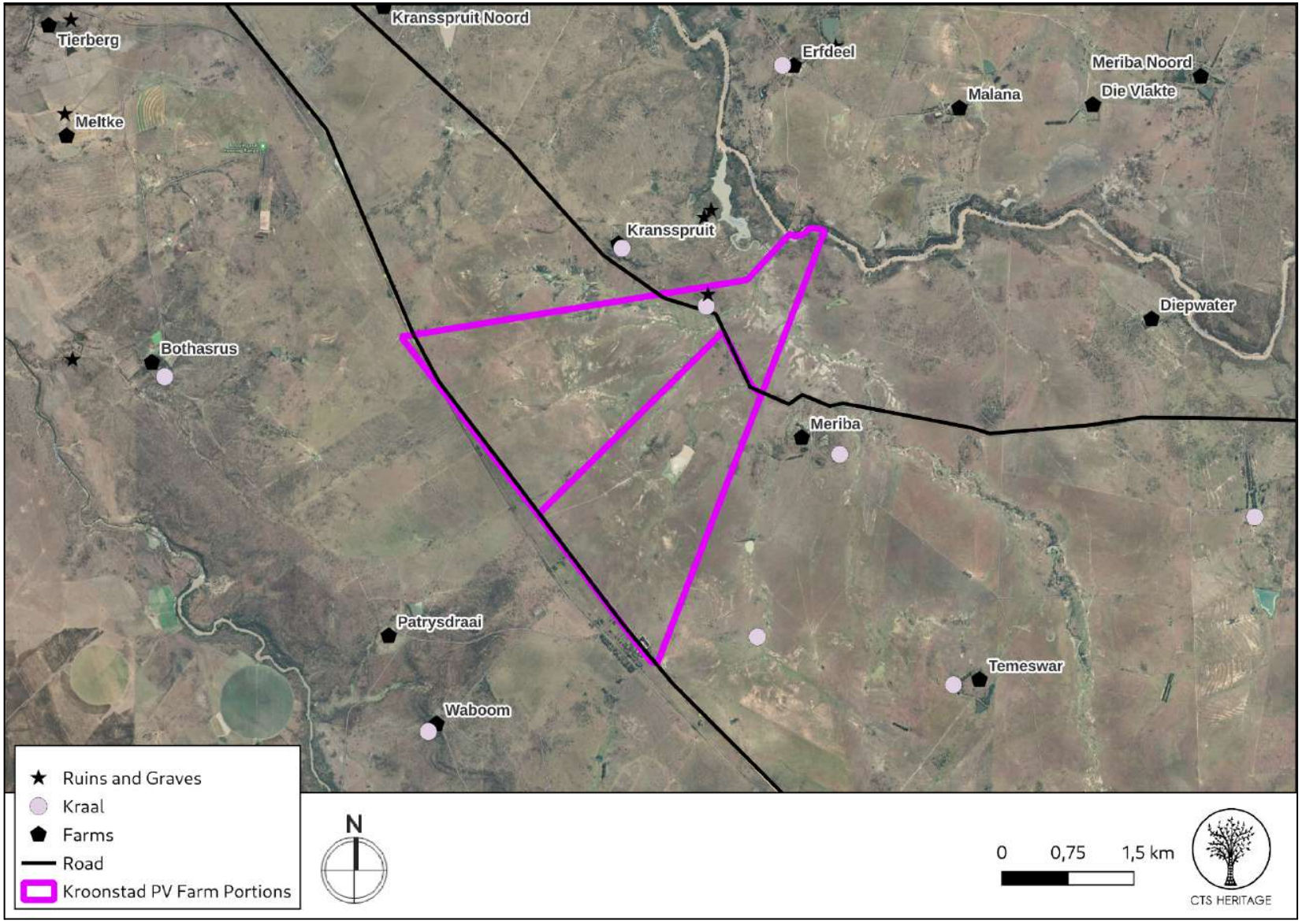

Figure 3.2. Heritage Resources Map. Potential heritage resources identified from the 1:50 000 Topo Map

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

The survey was conducted on foot and by vehicle, and sought to assess the presence and significance of archaeological occurrences within the project area. Field assessment documented a number of stone artefact scatters in both primary and secondary contexts, located at lithic raw-material sources, in eroded river terraces and dongas, and in deflated open landscape settings. These sites suggest the area may have been traversed by Stone Age groups potentially through Pleistocene periods in both the Middle Stone Age (MSA – ~300ka:~40ka) and the later Early Stone Age (later ESA: <1ma-250ka). The presence of substantial unworked artefact-quality raw-materials in the project area as well as relatively abundant standing water (including sedimentary evidence for active drainages in the past) were the resources that likely attracted groups there, and resulted in them leaving behavioural traces in the form of stone artefacts.

In addition to the abundant lithic raw-materials available, there is also sedimentary evidence for past seasonal and permanent water within the footprint of the proposed Bonsmara PV facility. The broader Free state region is well-known archaeologically for its quaternary river terraces, springs and seasonal lake pans that are occasionally associated with Pleistocene archaeology. Fresh water was the main attractor for hominins and fauna to these areas and, when eroded through natural or anthropogenic processes, remains of ancient drainages occasionally yield material remains pertaining to human-environment interactions in the past. As mentioned above, the footprint in question is no exception, and has abundant evidence for water and past lithic raw-material exploitation.

Field assessment of the footprint for the proposed development for the Bonsmara PV facility and associated grid infrastructure documented several stone artefact scatters in secondary contexts and also potential for archaeological material in primary - or close to primary - context that needs to be avoided (KS6, KS7 and KS8). The koppies surrounding the modern pan in the south eastern portion of the area should, in general, be completely avoided (Fig. 4.6). This should not be an issue as the plans for development do not appear to encroach on the most sensitive (active) pan and koppies. The stone artefacts at KS2, KS3, KS4 and KS5 are *ex-situ* and occur in deflated contexts, whereas the denser ESA and MSA occupations of the koppies and associated pan margins (KS6, KS7 and KS8) need to be avoided.

The proposed development is unlikely to affect the scientific potential of the deflated stone artefacts as they do not occur in geological contexts that can be easily dated or excavated, whereas the *in situ* remains, particularly at KS7, are sensitive and scientifically valuable. Cumulatively these finds suggest the area was occupied or traversed intermittently by Stone Age groups through periods in the Middle and Early Stone Age (KS2-8), as well as historical periods associated with more recent occupations of the region (KS1).

The sites of KS2-KS5 comprise predominantly MSA artefacts occurring in *ex-situ* contexts, and the weathering of the artefact edges, in addition to the cortex of the rocks exploited, suggests that these finds have been exposed for substantial periods of time, and have limited scientific value. KS2-5 are deflated finds that have eroded out of quaternary sediments through fluvial activity, and implicate occupation of a paleo-drainage terrace, which may have been more extensive (wider with standing water) in wetter (inter-glacial) periods in the past. The artefacts at KS2-KS5 document the prehistoric occupation of drainage margins by MSA hominins in the past. Several bifacial tool fragments

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were present in addition to Levallois point cores (Nubian like), and flakes with facetted platforms, all of which are characteristic MSA technologies. Given the deflated context of these finds, the recommendation is that they have relatively limited relevance to modern scientific analysis and as such, have been graded IIIC for their contextual value.

The sites at KS6-KS8 document an interesting and unusual context for Early Stone Age archaeology in that they are associated with higher elevation koppies (koppie ridges) surrounding a modern pan (which may have been active in a different spatial configuration in the past). Abundant large flake production is documented at these sites, likely in association with Large Bifacial Cutting Tool (LCT) production. The sites at KS6-8 are dense and extensive and some indicators of partially submerged artefacts were documented, potentially in dateable contexts (Fig. 7.1). The artefact edges in several instances were fresh and sharp, potentially indicative of recent exposure. These sites may be useful for modern scientific analyses, and may be important to future generations of researchers, and should therefore be completely avoided. The modern pan terrace deposits may be Pleistocene in origin and are possibly dateable with luminescence techniques, although the direct association of the archaeology with the pan sediments would require further geoarchaeological investigation. Due to their scientific value, these sites have been graded IIIB. These areas of higher archaeological sensitivity associated with the koppies and the pan have been mapped in Figure 6.

The historical structures located at KS1 were documented, but are largely demolished and may be relatively recent, having limited scientific value. This site has been graded IIIC for its contextual value.

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Figure 4.1: Grass coverage and limited visibility during survey, documented at CKS1.

Figure 4.2: Extensive grass coverage and limited visibility during survey, documented at CKS2.

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Figure 4.3: Pleistocene sediments exposed through donga formation at CKS3 (see scale in top right corner).

Figure 4.4: Collapsed rock shelter on spring margin at CKS5.

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Figure 4.5: Extensive grass coverage and limited visibility during survey, documented at CKS12.

Figure 4.6: Context of pan margin and koppies with abundant artefact scatters at CKS11.

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Figure 4.7: Extensive grass and shrub coverage that limited visibility during survey, documented at CKS12.

Figure 4.8: Visibility and ecological context at CKS 21.

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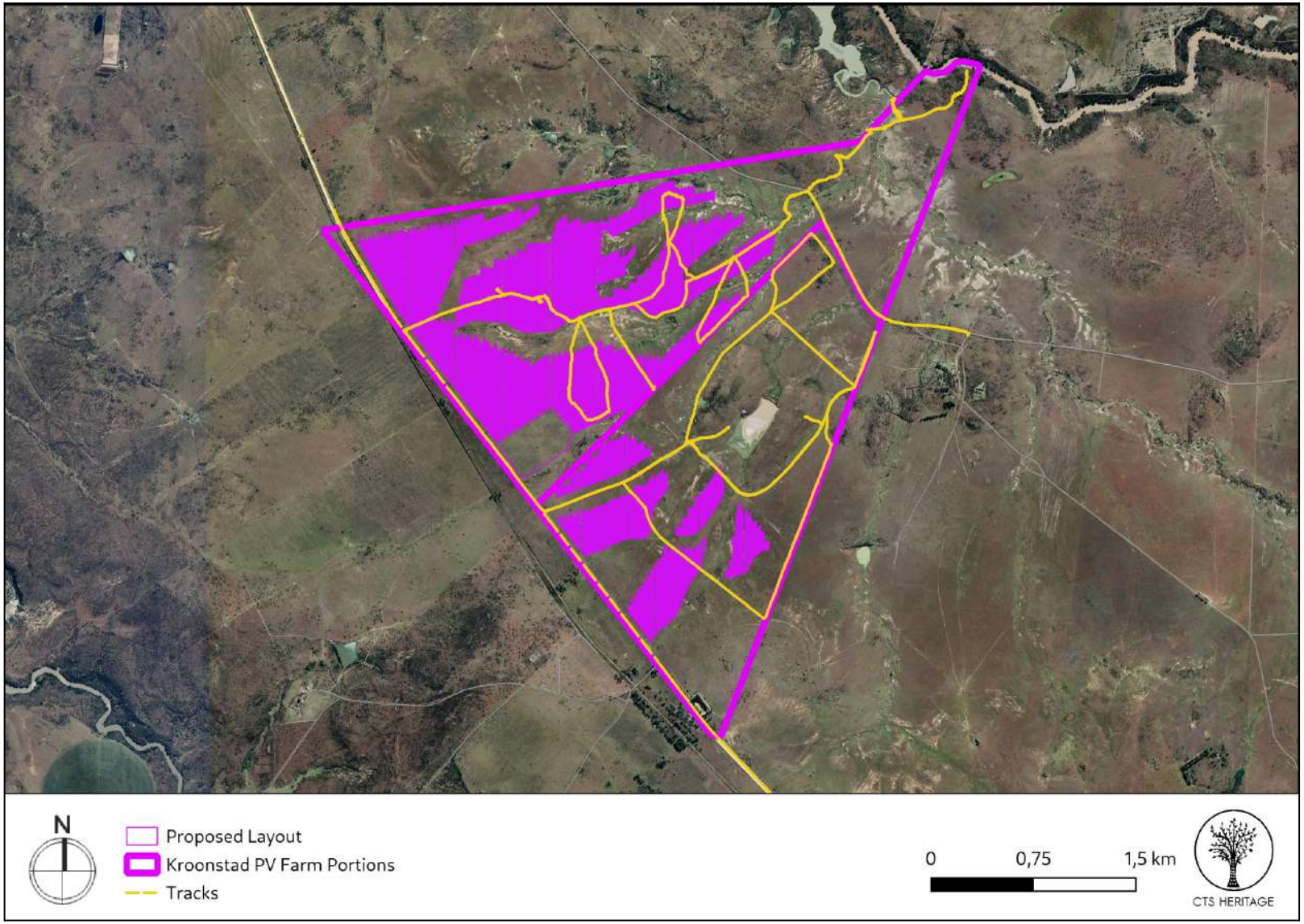

Figure 5.1: Overall track paths of foot survey for development

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4.2 Archaeological Resources identified

Site No.	Description	Density	Co-ordinates		Grading	Mitigation
KS1	Historical stone structures	NA	-27.76014296337	27.3097089584	IIIC	NA
KS2	Isolated Middle Stone Age core	~1-2/m2	-27.7530999854	27.31901396065	IIIC	NA
KS3	Middle Pleistocene scatter with MSA and ESA artefacts	~3-6/m2	-27.7530060242	27.3192510008	IIIC	50m Buffer
KS4	Middle Pleistocene scatter with MSA blade production and bifacial tools	~3-6/m2	-27.75347499176	27.3203409835	IIIC	50m Buffer
KS5	Isolated Middle Stone Age core	~3-6/m2	-27.76228697039	27.32221199199	IIIC	NA
KS6	Dense ESA scatter. Very extensive with clear sub-surface deposit	~4-8/m2	-27.76886701583	27.3229549638	IIIB	100m Buffer
KS7	ESA MSA site with partially submerged artefacts. Very extensive with clear sub-surface deposit	~3-6/m2	-27.76768399402	27.3294500168	IIIB	100m Buffer
KS8	ESA site with large flake blanks. Very extensive with clear sub-surface deposit.	~3-6/m2	-27.76499197818	27.3222829867	IIIB	100m Buffer

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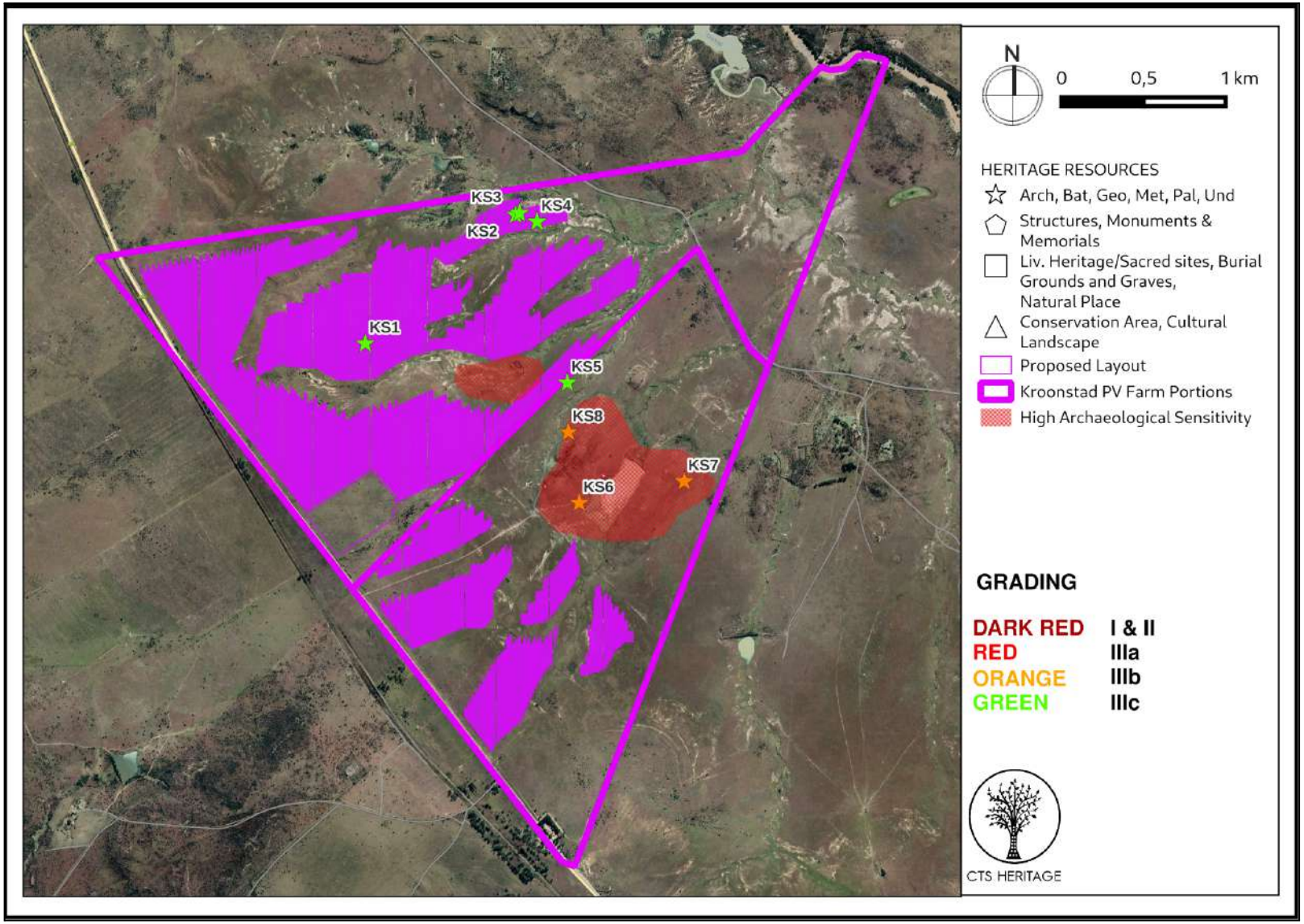

Figure 6: Heritage Observations made during field assessment

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4.3 Selected Photographic Record

A full photographic record is available on request

Figure 7.1: Stone structures documented at KS1

Figure 7.2: Isolated Middle Stone Age core at KS2

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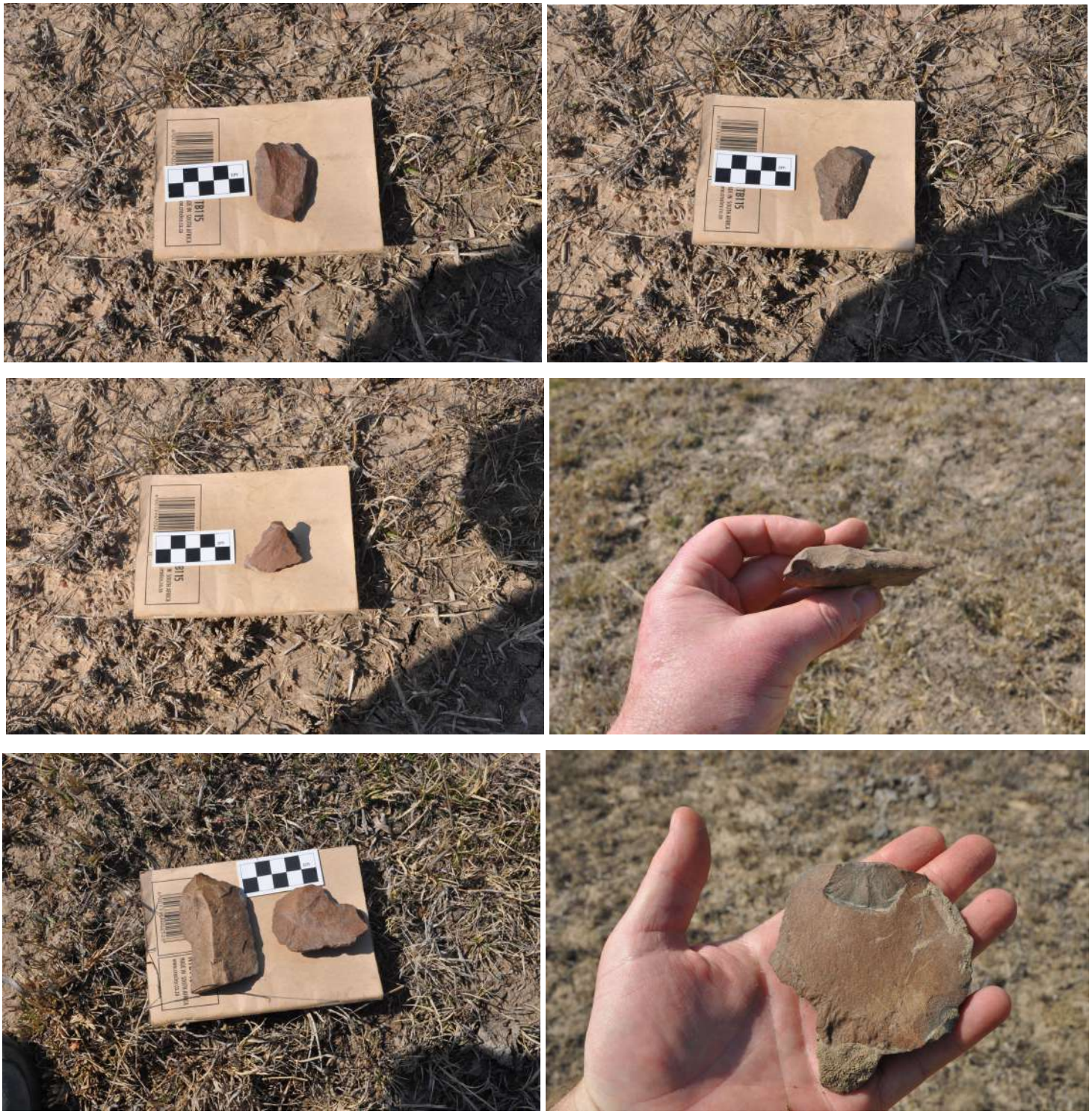

Figure 7.3 Middle and Early Stone Age artefacts at KS3

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Figure 7.4: Middle Stone Age laminar technology at KS4.

Figure 7.5: Isolated MSA cores at KS5

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Figure 7.6: Dense Early Stone Age artefact scatter with bifacial tools and large cores at KS6.

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Figure 7.7: ESA and MSA site with partially submerged artefacts on a koppie ridge at KS7

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Figure 7.8: Large ESA flake blank production site at KS8.

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The survey proceeded with two minor constraints and limitations, yet the project area was comprehensively surveyed for heritage resources, and only two archaeological heritage resources of significance were identified as being impacted in the layout provided - KS3 and KS4. These sites have been graded IIIC for their contextual scientific value and it is recommended that these sites are not impacted by the proposed development through the implementation of a 50m buffer around these sites.

Further, highly significant Early and Middle Stone Age open sites were identified within the property but are not impacted directly in the layout provided - KS6, KS7 and KS8. These sites are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposits. It is recommended that none of these sites be impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area. The present layout assessed in this report does not impact on this archaeologically sensitive area.

No mitigation recommendations are made for KS1 and KS5 as these sites have limited to zero scientific value.

Based on surface observations of the footprint of the proposed Bonsmara PV facility, excavation associated with the development should be aware of the potential for sub-surface Stone Age materials if activities encroach in any way on the koppies associated with the sites KS6-KS8. Apart from KS6-KS8, the documented archaeology at Bonsmara PV is classified as scientifically low significance. Should significant archaeological remains – such as well-preserved subsurface artefacts or fossils – be exposed during construction, the on-duty Environmental Control Officer should protect these (preferably in primary exposed context), and should immediately consult a professional archaeologist. In this circumstance, the South African Heritage Resources Authority should be immediately alerted so that appropriate mitigation measures by a professional archaeologist can be implemented, at the expense of the developer. In such a scenario, mitigation measures would normally involve the application for an excavation permit and the digital documentation of the occurrences with modern archaeological recording standards, as well as the collection of a reflective sample of material to be deposited in a locally approved curation facility.

Concerning the Stone Age archaeology within the prospective layout of the proposed Bonsmara PV facility, there are no objections to the authorization of the development provided that the buffering described is adhered to. Further, that if any evidence of human remains are exposed during excavation, that development activities cease in the area of the identified remains.

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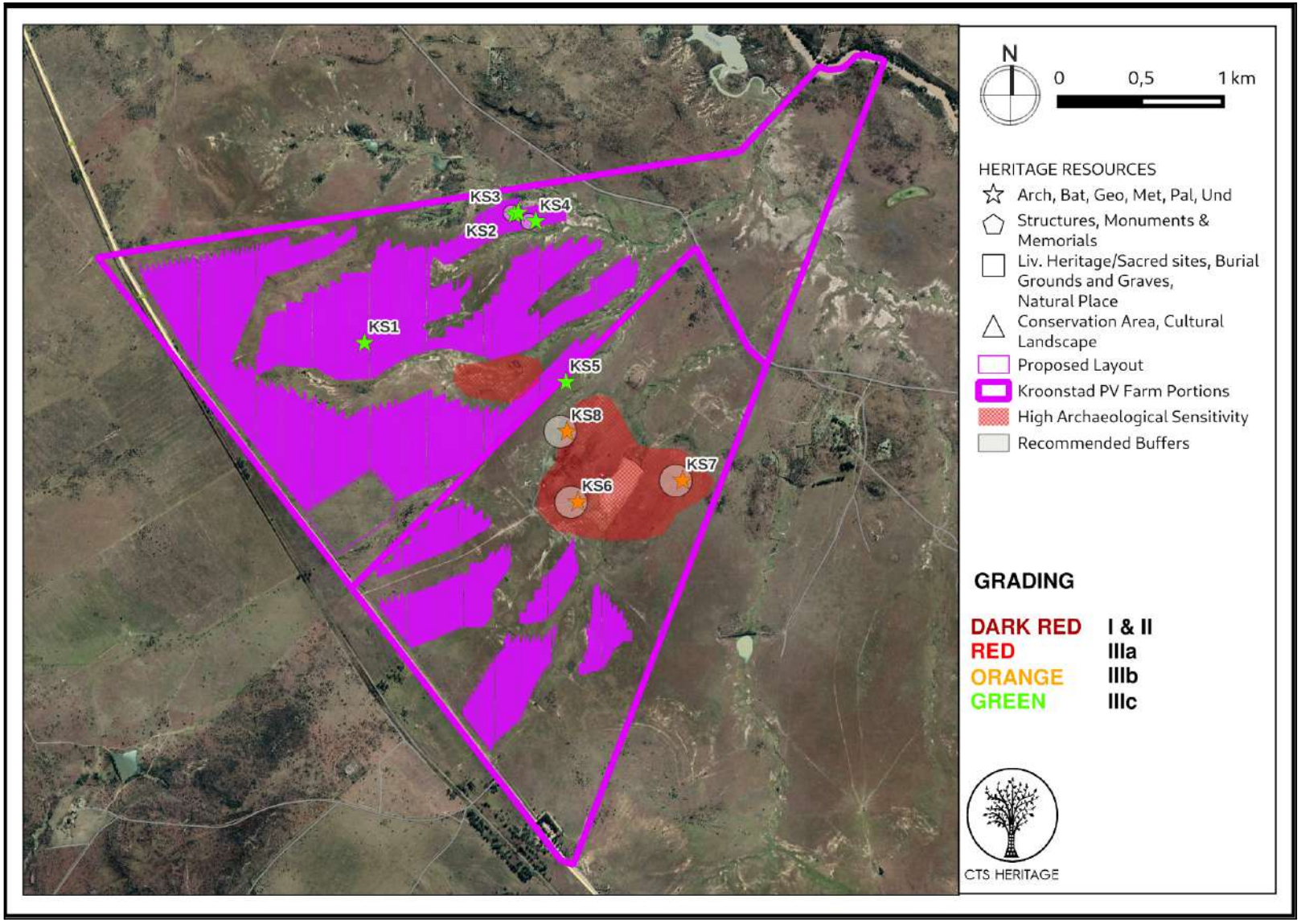

Figure 8: Heritage Observations made during field assessment with recommended mitigation measures

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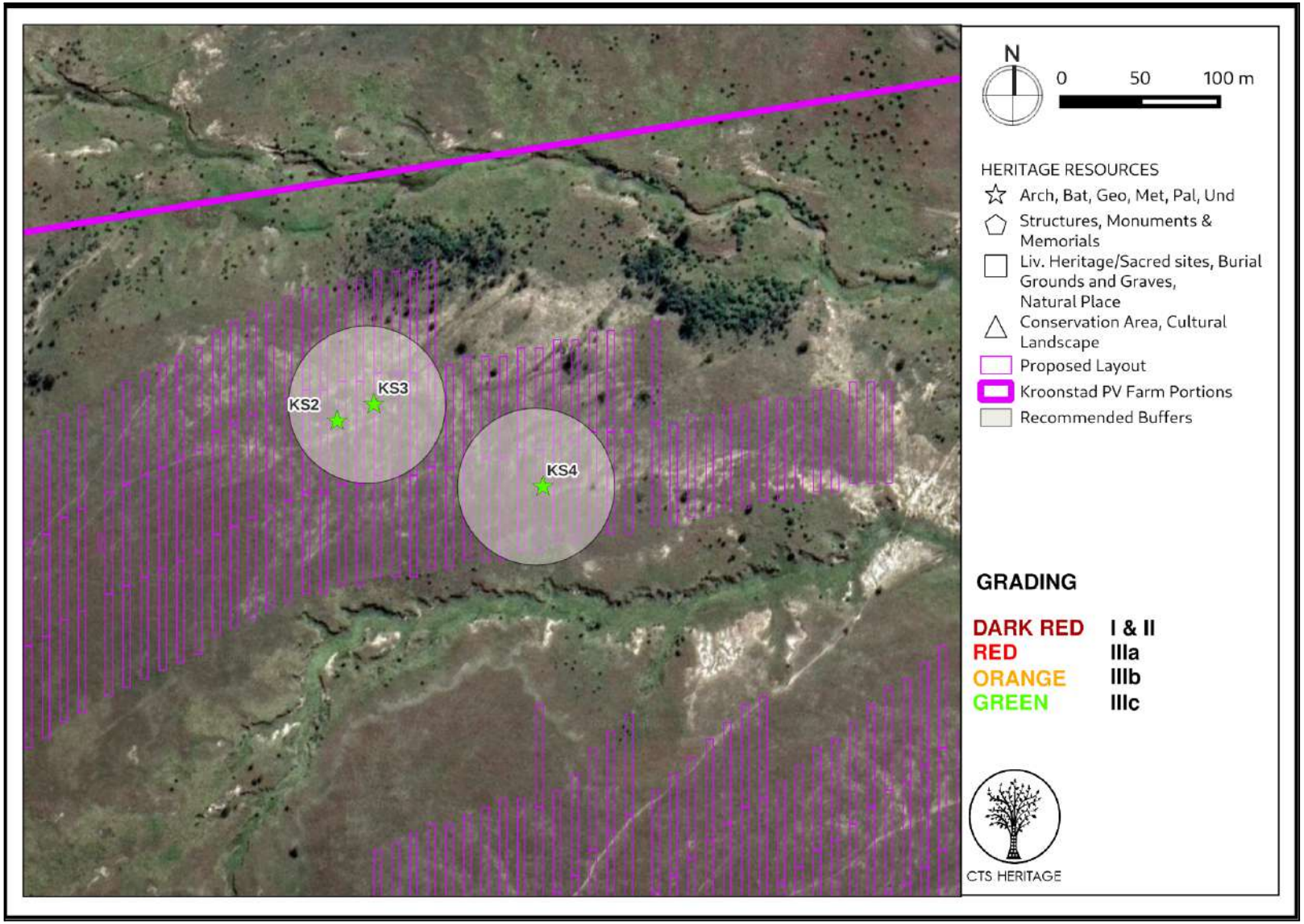

Figure 8.1: Heritage Observations made during field assessment with recommended mitigation measures

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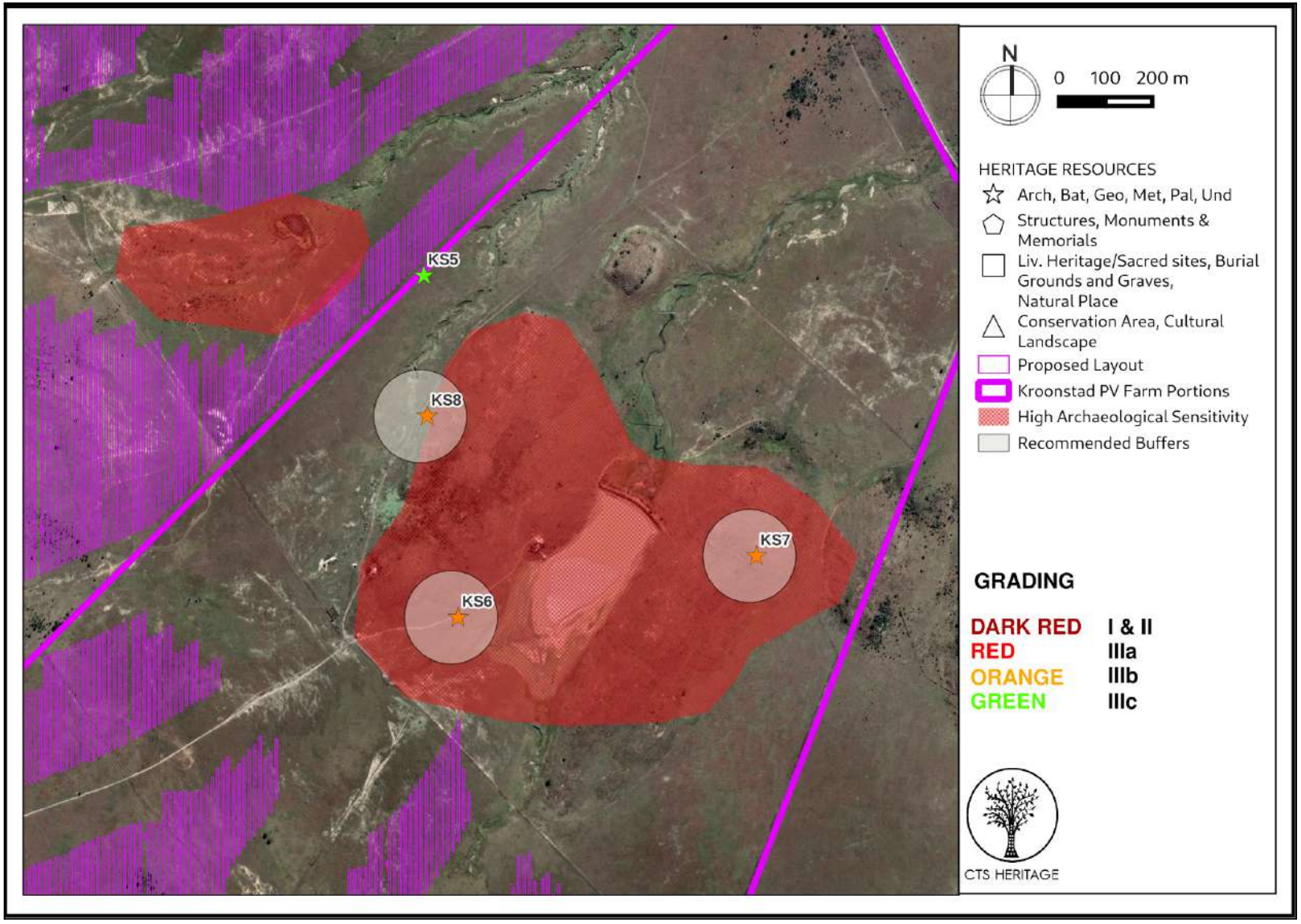

Figure 8.2: Heritage Observations made during field assessment with recommended mitigation measures

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6. CONCLUSION AND RECOMMENDATIONS

The survey proceeded with two minor constraints and limitations, yet the project area was comprehensively surveyed for heritage resources, and only two archaeological heritage resources of significance were identified as being impacted in the layout provided - KS3 and KS4. These sites have been graded IIIC for their contextual scientific value and it is recommended that these sites are not impacted by the proposed development through the implementation of a 50m buffer around these sites.

Further, highly significant Early Stone Age open sites were identified within the property but are not impacted directly in the layout provided - KS6, KS7 and KS8. These sites are graded IIIB for their greater scientific value associated with their sub-surface and, likely *in-situ*, deposit. It is recommended that none of these sites be impacted by the development through the implementation of a 100m no-development buffer around these sites. Furthermore, areas of higher archaeological sensitivity have been identified around the koppies and the pan located within the broader development area. It is recommended that no development takes place within this identified area. The present layout assessed in this report does not impact on this archaeologically sensitive area. No mitigation recommendations are made for KS1 and KS5.

Should significant archaeological materials – such as well-preserved subsurface artefacts or fossils – be exposed during construction, the on-duty Environmental Control Officer should protect these (preferably in primary exposed context), and should immediately consult a professional archaeologist. In this circumstance, the South African Heritage Resources Authority should be immediately alerted so that appropriate mitigation measures by a professional archaeologist can be implemented, at the expense of the developer. In such a scenario, mitigation measures would normally involve the application for an excavation permit and the digital documentation of the occurrences with modern archaeological recording standards, as well as the collection of a reflective sample of material to be deposited in a local approved curation facility.

Recommendations

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated grid connection infrastructure will negatively impact on significant archaeological heritage on condition that:

- A no development buffer of 50m is implemented around sites KS3 and KS4
- A no development buffer of 100m is implemented around sites KS6, KS7 and KS8
- The area identified as having higher levels of archaeological sensitivity in Figure 6 must not be impacted by any development activities.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other

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categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
5968	Cobus Dreyer	20/06/2005	AIA Phase 1	Archaeological and Historical Investigation of the Proposed New Filling Station at Kroonstad, Free State
5969	Cobus Dreyer	25/08/2005	AIA Phase 1	Historical Investigation of the Existing Outbuildings at the Farm Smaldeel 202, Kroonstad, Free State
5970	Cobus Dreyer	29/05/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Middenspruit 151, Kroonstad, Free State
5971	Cobus Dreyer	12/07/2006	AIA Phase 1	Archaeological and Historical Investigation of the Proposed Township Developments at Maokeng, Kroonstad, Free State
5972	Cobus Dreyer	26/10/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Boschpunt 2218 Kroonstad, Free State

Lavin and Wiltshire. November 2020. ARCHAEOLOGICAL SPECIALIST STUDY In terms of Section 38(8) of the NHRA for a Proposed development of the Vrede and Rondavel Solar Energy Facilities near Kroonstad, Free State Province. Unpublished. Section 38(8) Heritage Impact assessment process.

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CTS HERITAGE

APPENDIX 2: Palaeontological Assessment

PALAEONTOLOGICAL IMPACT ASSESSMENT

PROPOSED BONSMARA SOLAR PHOTOVOLTAIC RENEWABLE ENERGY FACILITY

NEAR KROONSTAD, FREE STATE PROVINCE

2022

COMPILED for: CTS HERITAGE

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE: 

The Palaeontological impact assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended)

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 3 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to **Appendix A**	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Objective	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1;9 & 11	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 7 Approach and Methodology	-
(f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1; & 11	
(g) An identification of any areas to be avoided, including buffers	Section 1 & 11	
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 11	
(k) Any mitigation measures for inclusion in the EMPr	Section 12	
(l) Any conditions for inclusion in the environmental authorisation	Section 12	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 12	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 & 11	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 1 and 11	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) process.
(p) A summary and copies of any comments that were received during any consultation process	N/A	Not applicable. To date, no comments regarding

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
		heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 4 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by CTS Heritage to conduct the Palaeontological Impact Assessment (PIA) to assess the Bonsmara Solar Photovoltaic (PV) Renewable Energy Facility near Kroonstad in the Free State Province. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to confirm if fossil material could potentially be present in the planned development area, to evaluate the potential impact of the proposed development on the Palaeontological Heritage and to mitigate possible damage to fossil resources.

The proposed Bonsmara Solar PV Facility The proposed development is underlain by Quaternary alluvium, the Adelaide Subgroup of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of Quaternary sediments is Moderate, that of the Adelaide Subgroup is Very High while that of the Klipriviersberg Group is Low (blue) (Almond and Pether, 2009; Almond *et al*., 2013). Updated Geology (Council of Geosciences) indicates that the proposed development is mainly underlain by alluvium, colluvium, eluvium, gravel; the Balfour Formation of the Adelaide Subgroup and the Klipriviersberg Group of the Ventersdorp Supergroup.

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 1 October 2022. No fossiliferous outcrop was detected in the proposed development. However, loose, fragmented and weathered tree fossils and well-preserved loose, trace fossils were detected. The latter was probably brought in from nearby areas and placed near the homestead (now in ruins). However, the apparent rarity of well-preserved fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

Recommendations:

- The ECO for this project must be informed that the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) has a Very High Palaeontological Sensitivity.
- The well-preserved trace fossils will be located in the solar footprint. It is recommended that these slabs are removed and placed near the offices of the PV as an informative example of trace fossils found on the development.
- If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the ECO/site manager must report to South African Heritage

Resources Agency (SAHRA) (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out.

- Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).
- These recommendations should be incorporated into the Environmental Management Plan for the Bonsmara Solar PV Facility.

Impact Summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Planning Phase Bonsmara Solar PV Facility	No Impact	0	No Impact	0	No Impact
Construction Stage Bonsmara Solar PV Facility Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	48	Negative Medium impact	16	Negative Low impact
Operational Phase Bonsmara Solar PV Facility	No Impact	0	No Impact	0	No Impact
Decommissioning Phase Bonsmara Solar PV Facility	No Impact	0	No Impact	0	No Impact
Planning Phase Power Line	No Impact	0	No Impact	0	No Impact
Construction Stage Power Line Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the surface that are then no longer	48	Negative Medium impact	16	Negative Low impact

	available for scientific study				
Power Line Operational Phase	No Impact	0	No Impact	0	No Impact
Power Line Decommissioning Phase	No Impact	0	No Impact	0	No Impact

It is therefore considered that the proposed Bonsmara Solar PV Facility is deemed appropriate and will not lead to detrimental impacts on the palaeontological reserves of the area. Thus, the construction of the development may be authorised in its whole extent.

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Appendix A: CV

1 INTRODUCTION

SiVEST Environmental has been appointed by WKN Windcurrent SA (Pty) Ltd to commence with the required EIA / BA Processes for the construction of the 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure on Portion 0 of Farm 636 and Portion 1 of Farm 636 in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The proposed development will be located about 12 km south-east of Kroonstad in the Free State.

The proposed development will entail the following

- Bonsmara Solar Energy Facility (SEF) (up to 100MW)
- Bonsmara Grid Connection Infrastructure (up to 132kV).

The Facility will consist of several arrays of PV panels, and the infrastructure will include a BESS with a 100MW capacity. The Solar Facility will be connected via a 2 km, 132 KV power line from the on-site substation to the Kroonstad Switching Station. The aim of the project is to generate renewable energy feeding it into the National Grid.

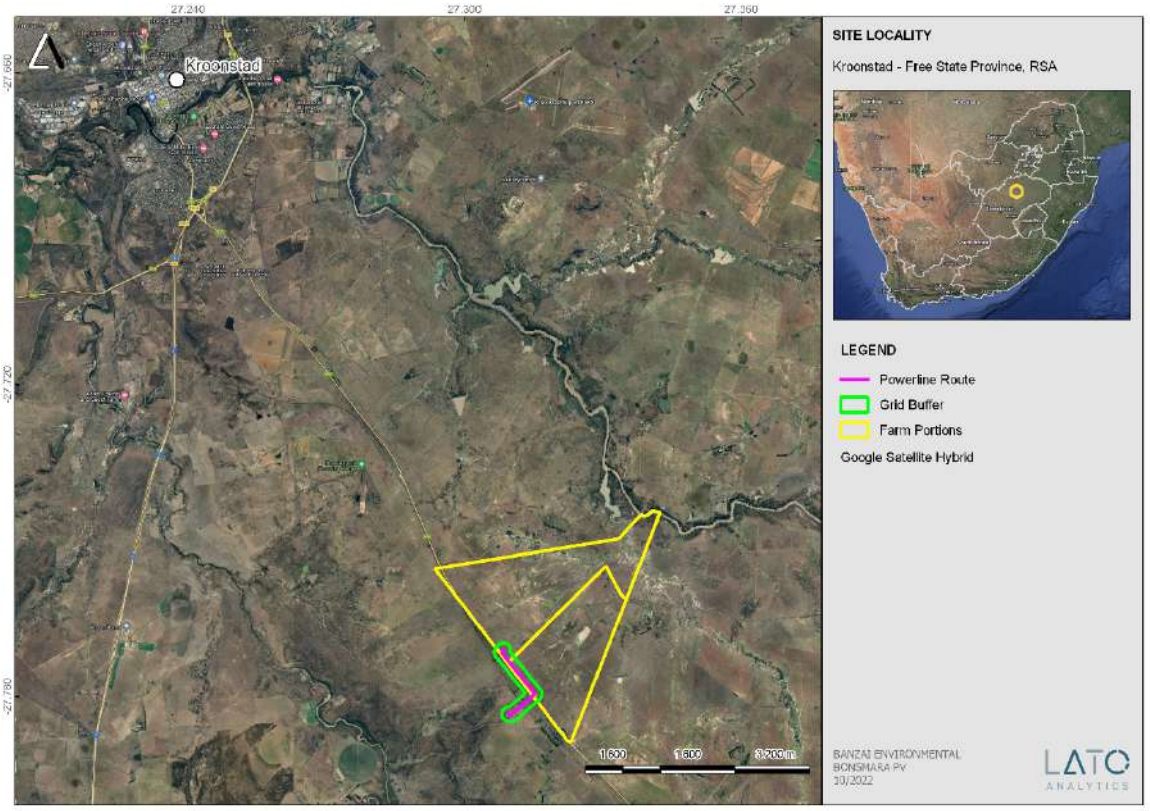


Figure 1:*Regional locality of the proposed Bonsmara Solar PV Renewable Energy Facility near Kroonstad in the Free State Province.*

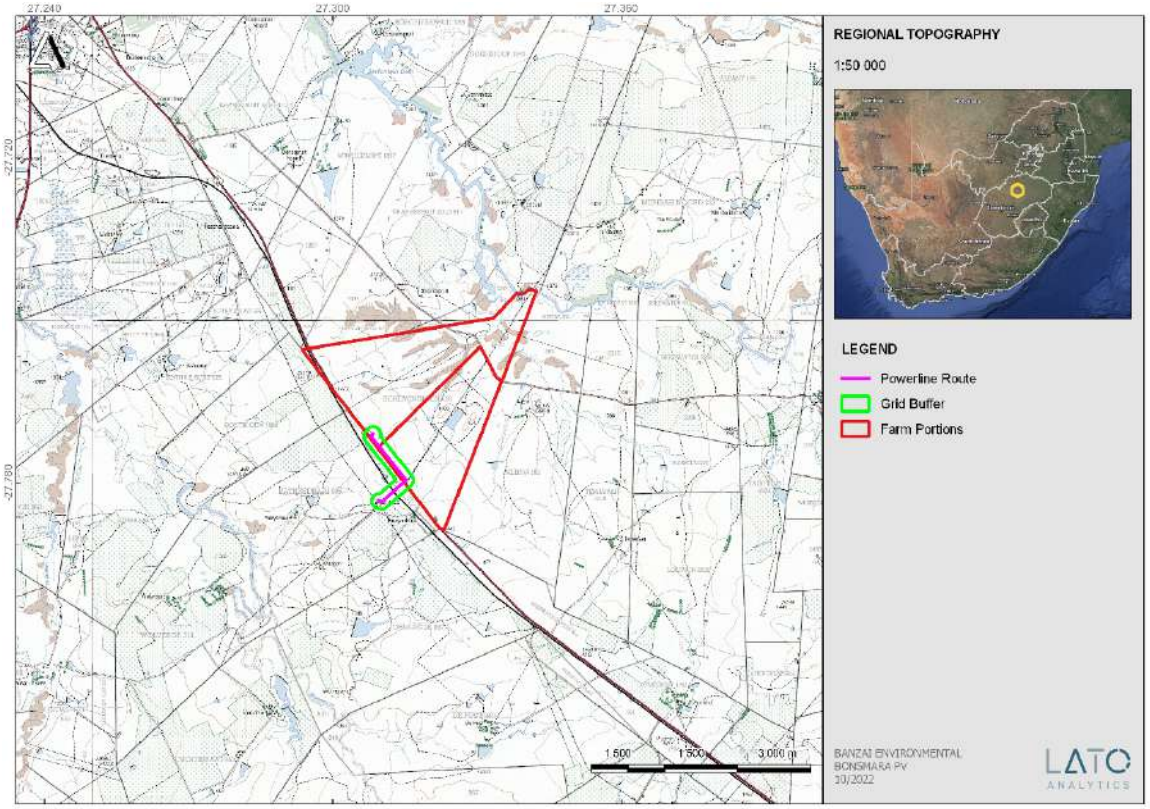


***Figure 2**:Locality map of the proposed Bonsmara Solar PV Renewable Energy Facility near Kroonstad in the Free State Province.*

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This study has been conducted by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-eight years. She has experience in locating, collecting, and curating fossils. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

3. LEGISLATION

National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **"all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**".

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

MPRDA Regulations of 2014

Environmental reports to be compiled for application of mining right – Regulation 48

- Contents of scoping report – Regulation 49
- Contents of environmental impact assessment report – Regulation 50
- Environmental management programme – Regulation 51
- Environmental management plan – Regulation 52

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to Section 38 (1), an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.
- the construction of a bridge or similar structure exceeding 50 m in length.
- any development or other activity which will change the character of a site—
- (Exceeding 5 000 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m^2 in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4. OBJECTIVE

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the PIA are: 1) to identify the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the palaeontological importance of the formations 3) to determine the impact on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;

- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study,
- Description and location of the proposed development and provide geological and topographical maps
- Provide palaeontological and geological history of the affected area.
- Identification of sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity.
    c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

5. GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The geology of the proposed Bonsmara Solar PV near Virginia in the Free State is depicted on the 1: 250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria) (Figure 3, Table 2). The proposed development is underlain by Quaternary alluvium (yellow single bird figure), the Adelaide Subgroup (Pa, green) of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup (brown). According to the PalaeoMap (Figure 4) of the South African Heritage Resources Information System (SAHRIS) the Palaeontological

Sensitivity of Quaternary sediments is Moderate (green), that of the Adelaide Subgroup is Very High while that of the Klipriviersberg Group is Low (blue) (Almond and Pether, 2009; Almond *et al*., 2013,) (Figure 5). Updated Geology (Council of Geosciences) indicates that the proposed development is mainly underlain by alluvium, colluvium, eluvium, gravel; the Balfour Formation of the Adelaide Subgroup and the Klipriviersberg Group of the Ventersdorp Supergroup (Figure 6, Groenewald *et al.,* 2014).

The Quaternary Era is also known as the "Age of the Mammals" and is preserved on coastal plains (Langebaanweg), cave systems (Makapan), and river gravel terraces (Cornelia), as well as other basins. These deposits have been subdivided in six African Land Mammal Ages, namely Recent, Florisian, Cornelian, Makapanian, Langebaanian, and Namibian (MacRae 1999). Quaternary deposits best known in the Free State is the Florisbad and Cornelia localities. Fossils recovered from these sites include teeth and bones of mammals, fish, reptiles, freshwater mollusks, trace fossils, wood, rhizoliths and diatom floras (Groenewald and Groenewald 2014).

The district is known for the presence of fluvial deposits along the present river courses that are terrestrial sediments and includes diatomite (diatom deposits), calcareous tufa, pedocretes, peats, spring deposits, soils and gravel and other Tertiary calcrete deposits, that is very important for understanding the Early and Late Pliocene period in this region (De Ruiter et al, 2010). The late Cenozoic (Plio-Pleistocene) floodplain deposits (overbank sediments) found near the Sand, Doring-, Vals- and Vet River systems including pan sites, contain confined but abundant mammal vertebrate fossil sites. In 1955, Meiring, described an *in situ* proboscidian fossil (mammoth), comprising of a lower molar, large part of a tusk as well as a proximal portion of an ulna from the Sand River near Virginia. This specimen was found in pebbly channel-fill sediments about 40m above the current riverbed. Originally described as *Archidiskodon scotti* (Meiring 1955) this specimen was later assigned to the Pliocene species *Mammuthus subplanifrons* (Coppens et al. 1978). Later investigations uncovered diverse fauna that include amphibians, birds, fish, reptiles, as well as several proboscideans, perissodactyls and artiodactyls from the same site (De Ruiter 2010).

Terrace gravels above the Vet River, southwest of Welkom have uncovered Pliocene fossils while surveys along the Doring, Vals, Sand and Vet Rivers produced moderately fossiliferous overbank sediments and erosional gullies that comprise of a variety of Quaternary-aged mammals (Brink et al. 1999; De Ruiter et al. 2011) Ancient pan sites, for example near Whites, produced rich Quaternary-aged mammal fossil remains. Quaternary fossils are usually very rare but may also include mammalian teeth and bone, ostrich eggshells, tortoise remains, ostracods, diatoms, and reptilian skeletons, trace fossils include burrows, vertebrate tracks, rhizoliths as well as calcretised termitaria (termite heaps). Plant remains include foliage, pear, wood, pollens. Microfossils and vertebrate remains are often found in Quaternary deposits near water courses and drainage lines.

The superficial deposits (represented by yellow on the geological maps, Qs, /Qc, /Qd) are the youngest geological deposits formed during the most recent geological period (approximately 2.6

million years ago to present). Most of the superficial deposits are unconsolidated sediments and consist of clay, gravel, sand, silt, that form relatively thin, discontinuous patches of sediments or larger spreads onshore. These sediments comprise of channel, floodplain and stream deposits, talus gravels and glacial drift sediments. Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter et al., 2006). During the climate fluctuations in the Quaternary Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Quaternary but states that climatic changes during the Quaternary, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

Underlying the superficial deposits is a series of Karoo sandstones, mudstones, and shales, that was deposited under fluvial environments of the Adelaide Subgroup (Beaufort Group). The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000 km^2 in South Africa and is the first fully continental sequence in the Karoo Supergroup and is divided into the Adelaide subgroup and the overlying Tarkastad subgroup (**Figure 6)**. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments. The Adelaide Subgroup is approximately 5 000m thick in the southeast, but this decreases to about 800m in the centre of the basin which decreases to about 100 to 200m in the north.

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium-grained, grey lithofeldspathic sandstones. Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and-fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are extensive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units. The mudrocks of the Adelaide Subgroup usually have massive and blocky weathering. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early "reptiles" to mammals. The Beaufort Group is subdivided into a series of biostratigraphic units

based on its faunal content (Kitching1977, 1978; Keyser *et al*, 1977, Rubidge 1995, Smith *et al,* 2020; Viglietti 2020) (**Figure 6**). A portion of the proposed development is underlain by the Balfour Formation (**Figure 5**) which is divided in the *Daptocephalus* (DAZ) which in turn is divided in the upper (younger) *Lystrosaurus maccaigi - Moschorhinus* and lower (older) *Dicynodon-Theriognathus Subzones* (**Figure 7-11**; Viglietti, 2020).

The dicynodont, *Daptocephalus leoniceps* is the main biozone defining fossil of the D*aptocephalus* Assemblage Zone **(Figure 7).** The *Daptocephalus* Assemblage Zone (DaAZ) is characterised by the co-occurrence of the dicynodontoid *Daptocephalus leoniceps*, the therocephalian *Theriognathus* microps, and the cynodont *Procynosuchus delaharpeae*. The DaAZ comprise of two subzones representing the two distinct faunal assemblages in this assemblage zone. The Dicynodon -Theriognathus Subzone (**Figure 8**) (in co-occurrence with *Daptocephalus*) is present in the lower *Daptocephalus* Assemblage Zone while the *Lystrosaurus maccaigi* – Moschorhinus kitchingi Subzone (**Figure 9**) is present in the upper DaAZ. The defining taxa of the latter subzone is *L. maccaigi, Daptocephalus* and *Moschorhinus*. This Zone is characterized by the co-occurrence of the two therapsids namely *Dicynodon* and *Theriognathus (**Figure 8**)*. The *Daptocephalus* Assemblage Zone of the Beaufort Group shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida. Captorhinid Reptilia are also present while eosuchian Reptilia, Amphibia and Pisces are rarer in occurrence. Trace fossils of vertebrates and invertebrates as well as *Glossopteris* flora plants have also been described.

The *Daptocephalus Assemblage Zone* (AZ) expands into the lower Palingkloof of the Upper Balfour Formation. The lower Palingkloof Member is of special importance as it precedes the Permo-Triassic Extinction Event which destroyed the vertebrate fauna and extinguished the diverse glossopterid plants. The lower *Lystrosaurus* declivis AZ forms part of the Katberg Formation. Fauna and flora from this assemblage zone is rare as few genera survived the Permo-Triassic Extinction Event. The *Lystrosaurus* declivis AZ is characterized by the dicynodont, *Lystrosaurus*, and captorhinid reptile, *Procolophon,* biarmosuchian and gorgonopsian Therapsida that did not survive into the *Lystrosaurus* Assemblage Zone although the therocephalian and cynodont Therapsida are present in moderate quantities. Captorhinid Reptilia is reduced, but this interval is characterised by a unique diversity of oversize amphibians while fossil fish, millipedes and diverse trace fossils have also been recorded.

The Ventersdorp Supergroup in the development footprint is represented by the Klipriviersberg Group. This Supergroup comprise of the biggest and most wide-spread system of volcanic rocks in the Kaapvaal Craton. This Supergroup unconformably overlies the Witwatersrand Supergroup and is also unconformably overlain by the Transvaal Supergroup. The elliptical basin is approximately 300 000km^2 in extent. The type-area is located between Klerksdorp (North West), and Welkom and

Bothaville (Free State). This Supergroup mantles most of the distribution area of the Witwatersrand Supergroup as well as the Dominion Group.

The best exposures of the Ventersdorp Supergroup are in the North West Province as well as in the Northern Cape Province, Gauteng, and southern Botswana. This Supergroup is divided in the Klipriviersberg Group (oldest) which is overlain by the Platberg Group followed by the sedimentary Bothaville Formation and the volcanic Allanridge Formation (uppermost Ventersdorp unit, youngest Formation) (Figure 12). Stromatolites may be present in the Klipriviersberg Group as in the rest of the Ventersdorp Supergroup.

The Platberg Group is subdivided in four formations namely the Kameeldoorns-, Goedgenoeg-, Makwassie-, and Rietgat Formations. These formations consist of heterogenous rock varying from chemical and classic sediments, to felsic and mafic volcanics. These rocks were deposited in linear vault troughs during grabed developments (Visser et al, 1975-1976, Buck, 1980). These deep intermontane grabens formed in older underlying andesitic terranes and formed areas of alluvial fan deposits and debris as well as scree flows. Ooids and stromatolites accumulated under lacustrine conditions in fine-grained chemical and terrigenous sediments. (Buck, 1980) Stromatolites were identified in the Rietgat Formation between Prieska and Britstown. In time fluvial processes prevailed causing widespread prograding of alluvial fans across basins (Buck, 1980).

The Platberg is mostly absent in the north-east of the Ventersdorp depository while the outcrops are erratic with changes in thickness. The type-area of the Platberg Group is between Welkom and Klerksdorp and was described by Winter (1976), while the Klerksdorp area was described by J.M. Myers (1990). The Rietgat Formation crops out in the, north, northwest, and southwest of Vryburg, south-southeast of Douglas, Taungs-Hartswater area, west of Klerksdorp, T'Kuip in the Northern Cape Province and southwest of Ventersdorp. The Rietgat Formation consist of alternating sedimentary and volcanic rocks which varies in thickness across the basin.

The uppermost volcanic Allanridge Formation crops out in the North West, Northern Cape, and Free State Provinces. Witmer (1976) came to the conclusion that the Allanridge Formation has a conformable relationship with the Bothaville Formation (deeper parts of the basin) while Keyser (1998), found a very prominent unconformable relationship in the direction of the northwestern boundary of the Ventersdorp depository. The Allanridge formations consists primary of light green–grey porphyritic lava and pyroclastic rocks as well as dark-green amygdaloidal lava. The dark-green lava is the thickest unit in the Allanridge Formation. Both lava types consist of amygdales but is more widespread in the dark-green lava.

Stromatolites may be present in the Klipriviersberg Group as in the rest of the Ventersdorp Supergroup.

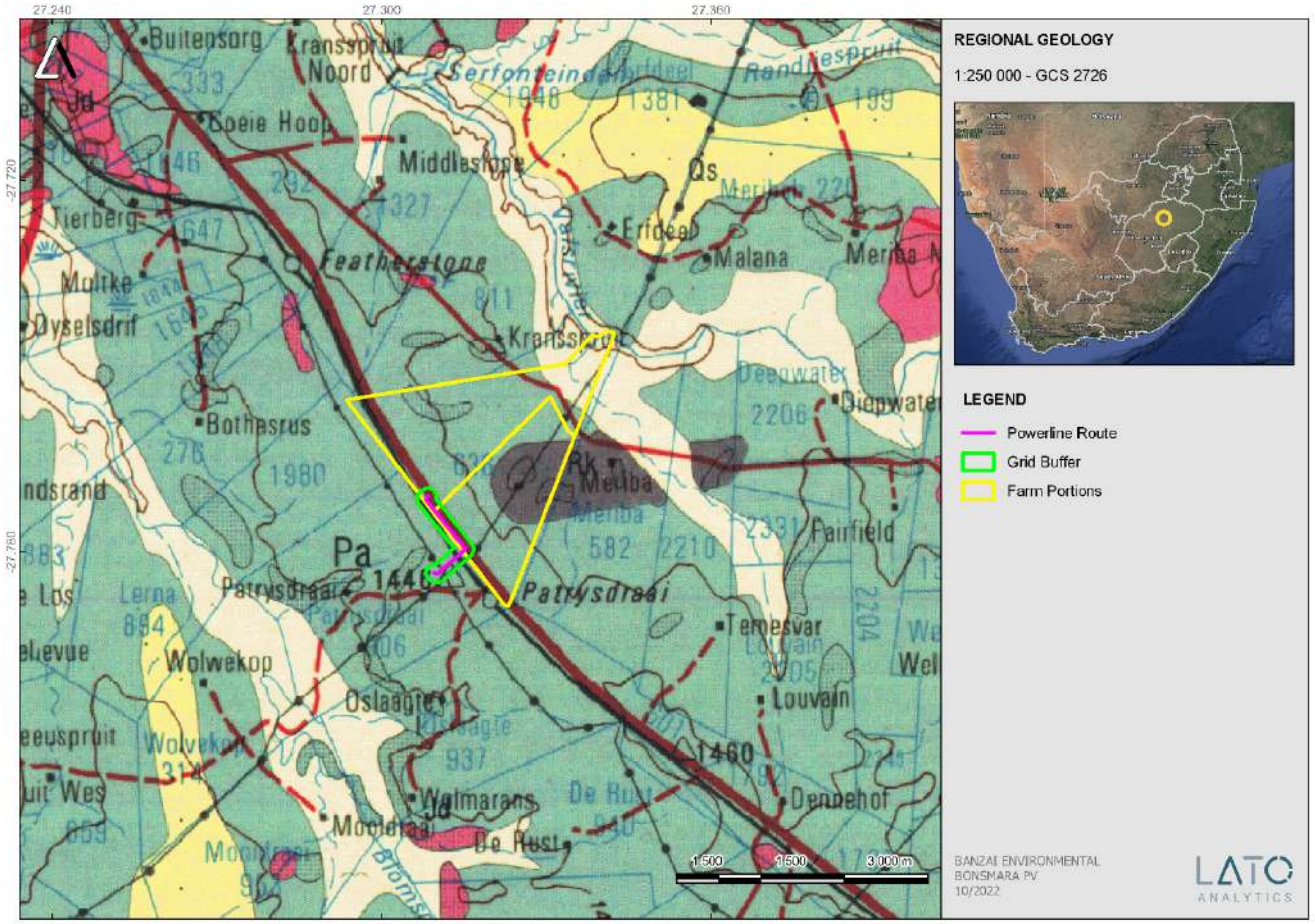
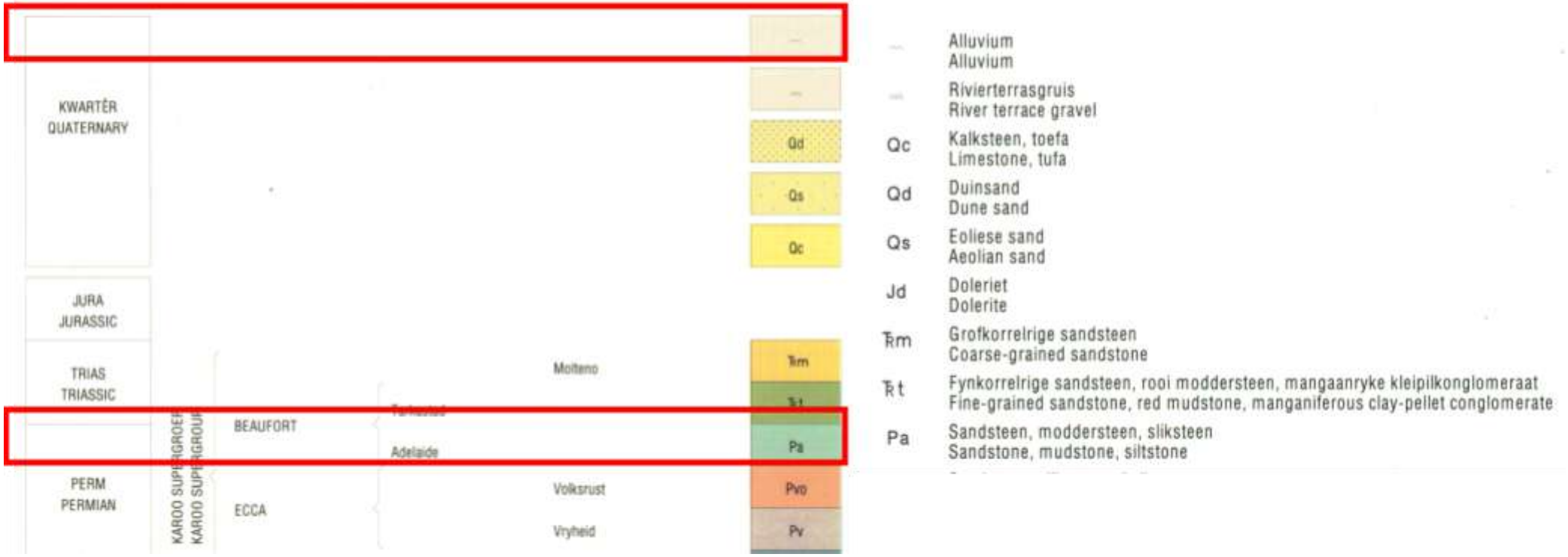


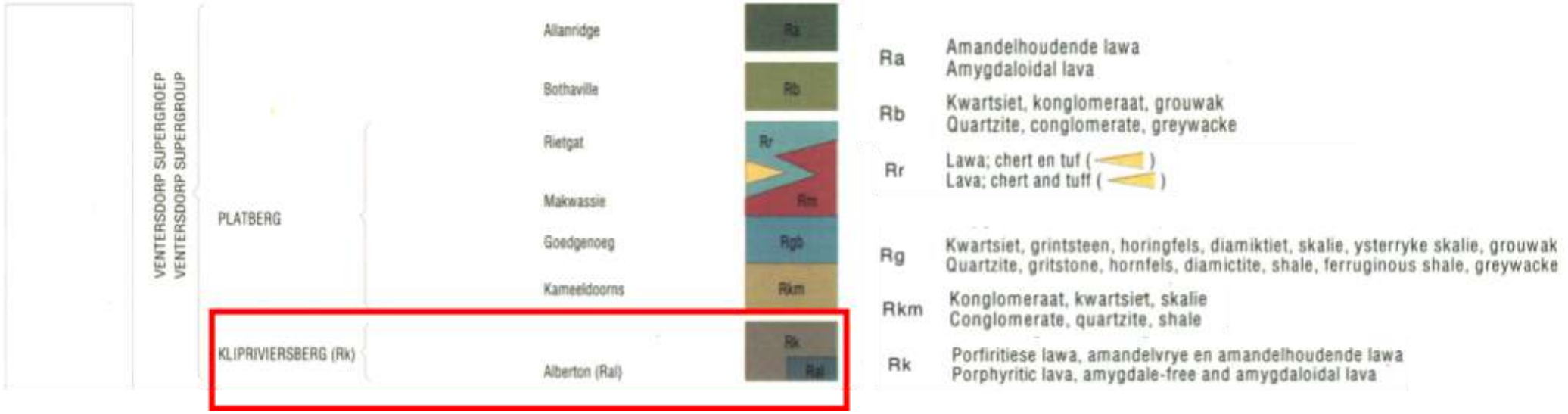
***Figure 3**: Extract of the 1:250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria) indicating the proposed Bonsmara Solar PV development near Kroonstad in the Free State.*

The proposed development is underlain by Quaternary alluvium (yellow single bird figure), the Adelaide Subgroup (Pa, green) of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup.

Table 2: Legend to the Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria).

Relevant sediments are indicated in a red square




VENTERSDORP SUPERGROEP
VENTERSDORP SUPERGROUP
PLATBERG
KLIPRIVIERSBERG (Rk)
Allanridge
Bothaville
Rietgat
Makwassie
Goedgenoeg
Kameeldoorns
Alberton (Ral)
Ra
Rb
Rr
Rm
Rgb
Rkm
Rk
Ral
Ra Amandelhoudende lawa
Amygdaloidal lava
Rb Kwartsiet, konglomeraat, grouwak
Quartzite, conglomerate, greywacke
Rr Lawa; chert en tuf ( )
Lava; chert and tuff ( )
Rg Kwartsiet, grintsteen, horingfels, diamiktiet, skalie, ysterryke skalie, grouwak
Quartzite, gritstone, hornfels, diamictite, shale, ferruginous shale, greywacke
Rkm Konglomeraat, kwartsiet, skalie
Conglomerate, quartzite, shale
Rk Porfiritiese lawa, amandelvrye en amandelhoudende lawa
Porphyritic lava, amygdale-free and amygdaloidal lava

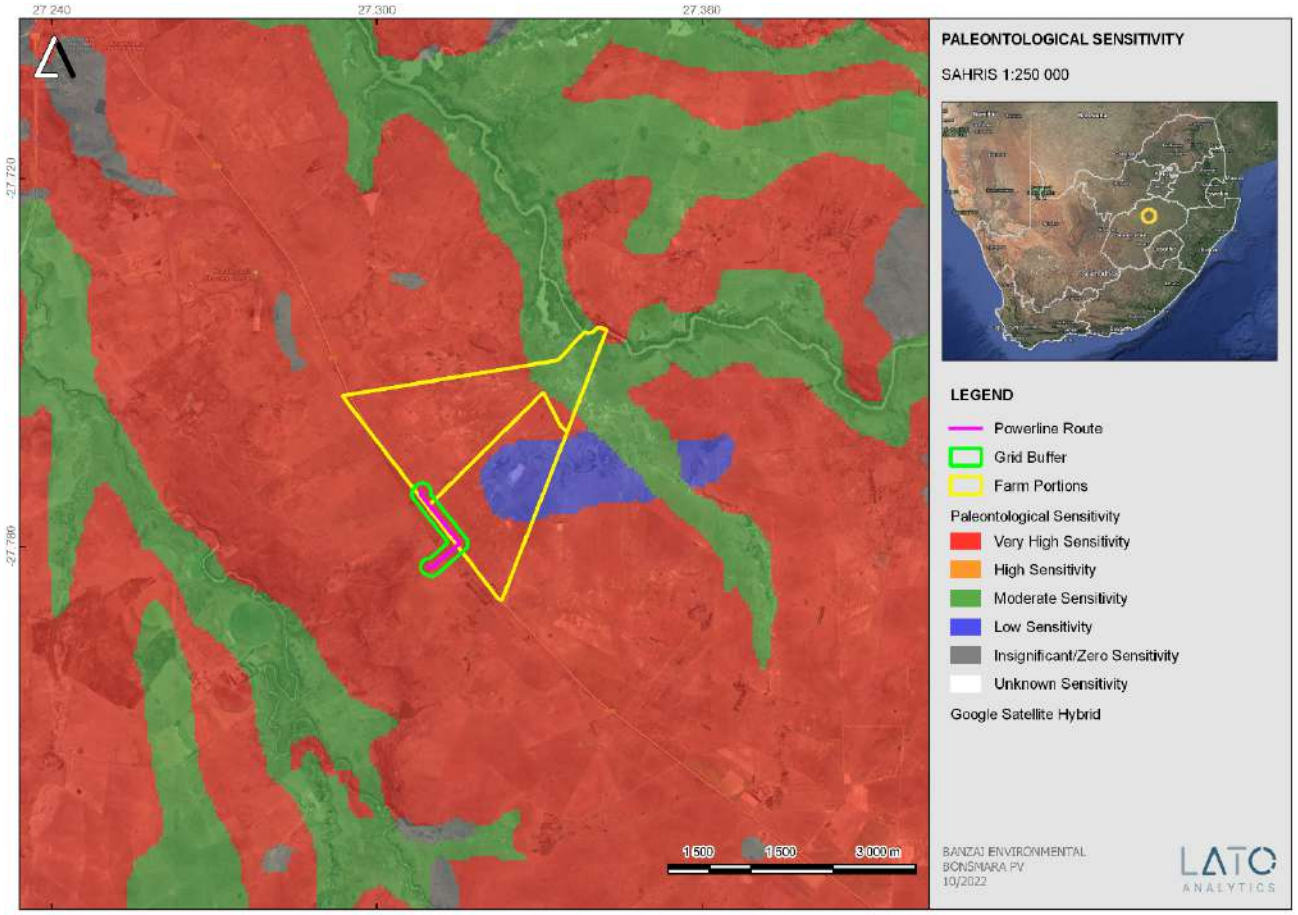


***Figure 4**: Extract of the 1 in 250 000 SAHRIS PalaeoMap (Council of Geosciences) indicating the proposed Bonsmara Solar PV development near Kroonstad in the Free State*

Table 3:Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website

Colour	Sensitivity	Required Action
RED	**VERY HIGH**	**Field assessment and protocol for finds is required**
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	**MODERATE**	**Desktop study is required**
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required

WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

According to the SAHRIS Palaeosensitivity map (**Figure 4**) the proposed development is underlain by sediments with a Very High (red) moderate (green) and Low (blue) Palaeontological Significance.

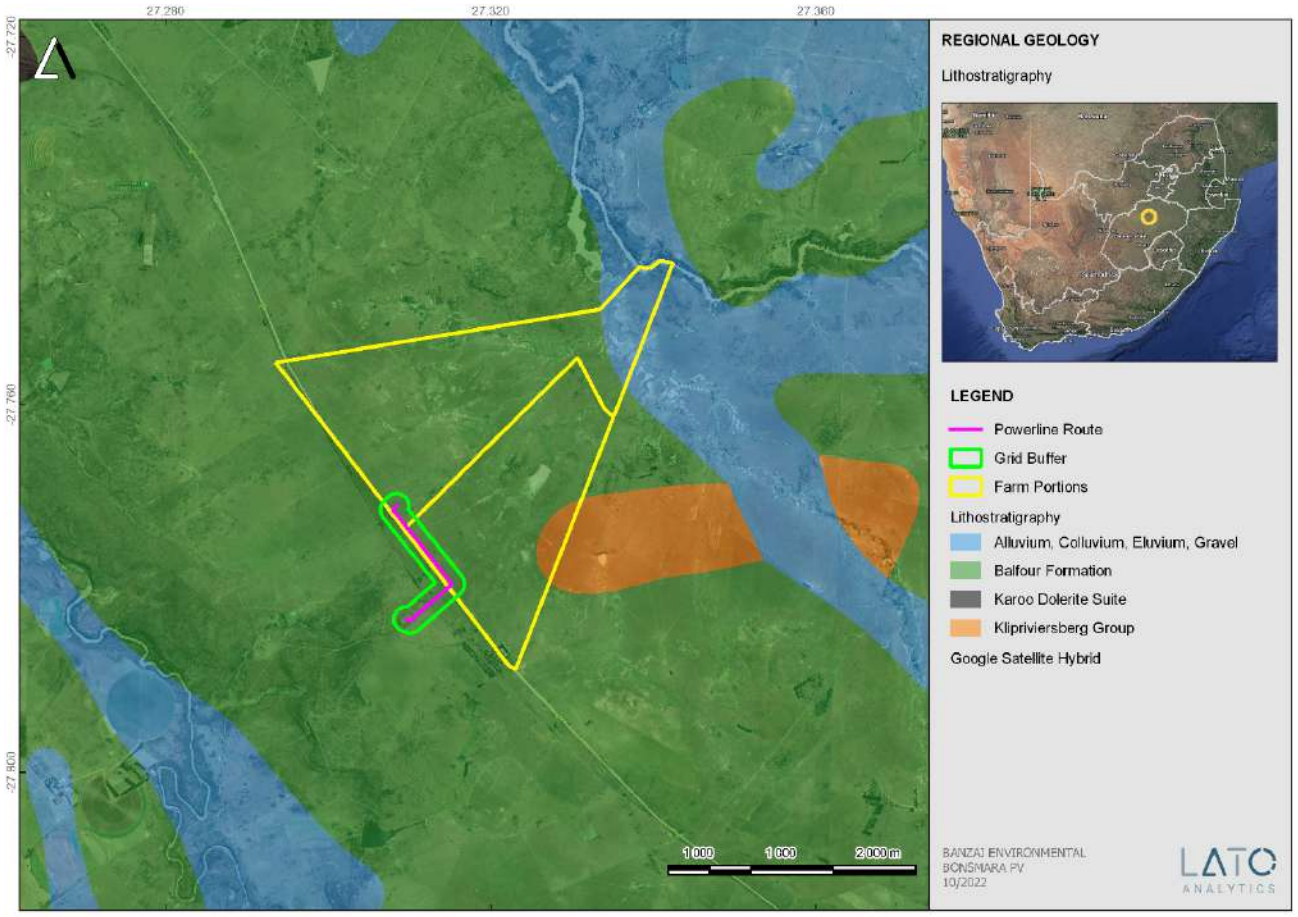


Figure 5: *Updated Geology (Council of Geosciences, Pretoria) of the proposed Bonsmara Solar Facility indicates that development is underlain by superficial alluvium, colluvium, eluvium and gravel, the Balfour Formation of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) and the Klipriviersberg Group of the Ventersdorp Supergroup.*

Groenewald *et al*, 2014, allocated the following Sensitivities to these sediments:

Alluvium, alluvium, colluvium, eluvium and gravel - Moderate

Adelaide Subgroup (Beaufort Group, Karoo Supergroup - Very High

Klipriviersberg Group (Ventersdorp Supergroup) - Low

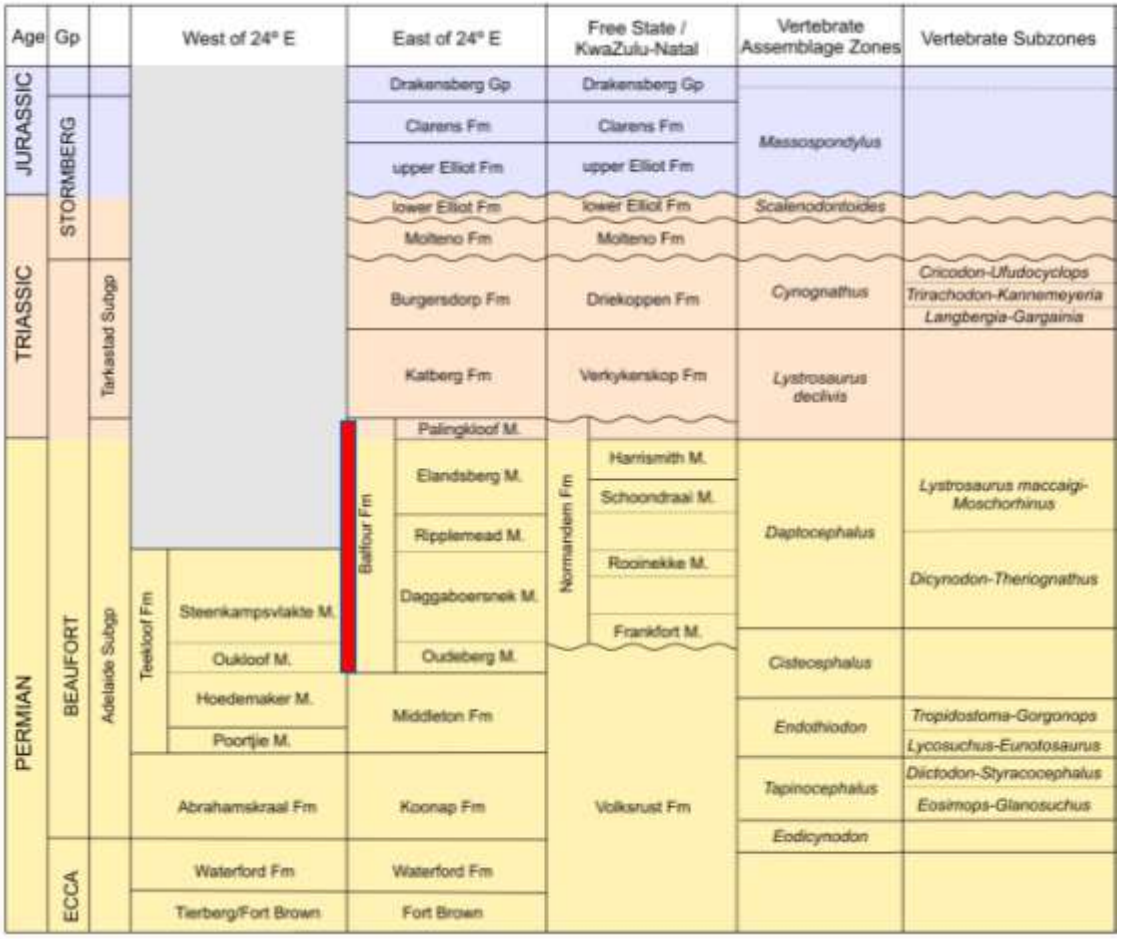


***Figure 6**: Vertebrate biozonation range chart for the Main Karoo Basin of South Africa.*

Solid lines indicate known ranges, dotted lines indicate suspected but not confirmed ranges, single dot represents the stratigraphic position of the taxa that have only been recovered from a single bed.

Wavy lines indicate unconformities. (PLYCSR=Pelycosauria and MAMMFMES+Mammaliaformes. Gp=group, Subgp-Supbroup, Fm=Formation, M=Member

The geology of the proposed development is indication by the red line

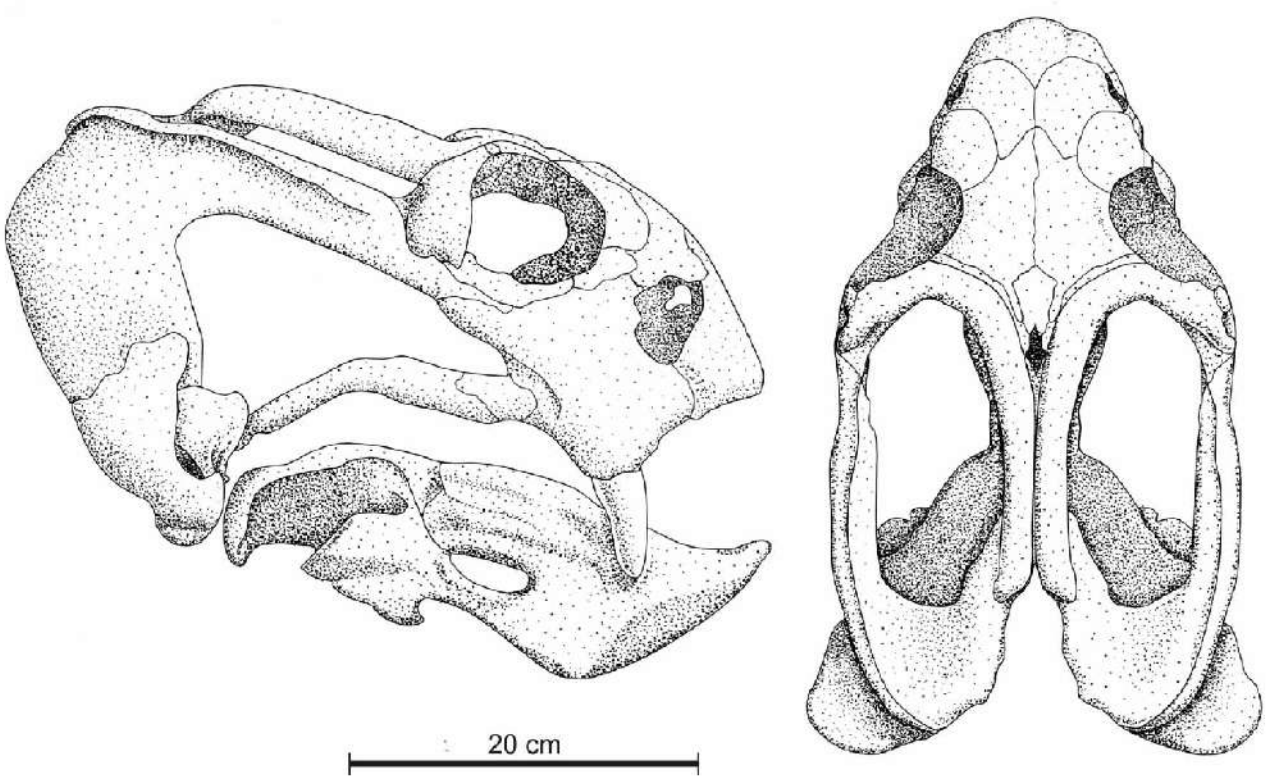


Figure 7: *Lateral and dorsal views of skull of the dicynodont Daptocephalus leoniceps, the main biozone defining fossil (Image taken from Viglietti, 2020) and dorsal views (Image taken from Viglietti, 2020).*

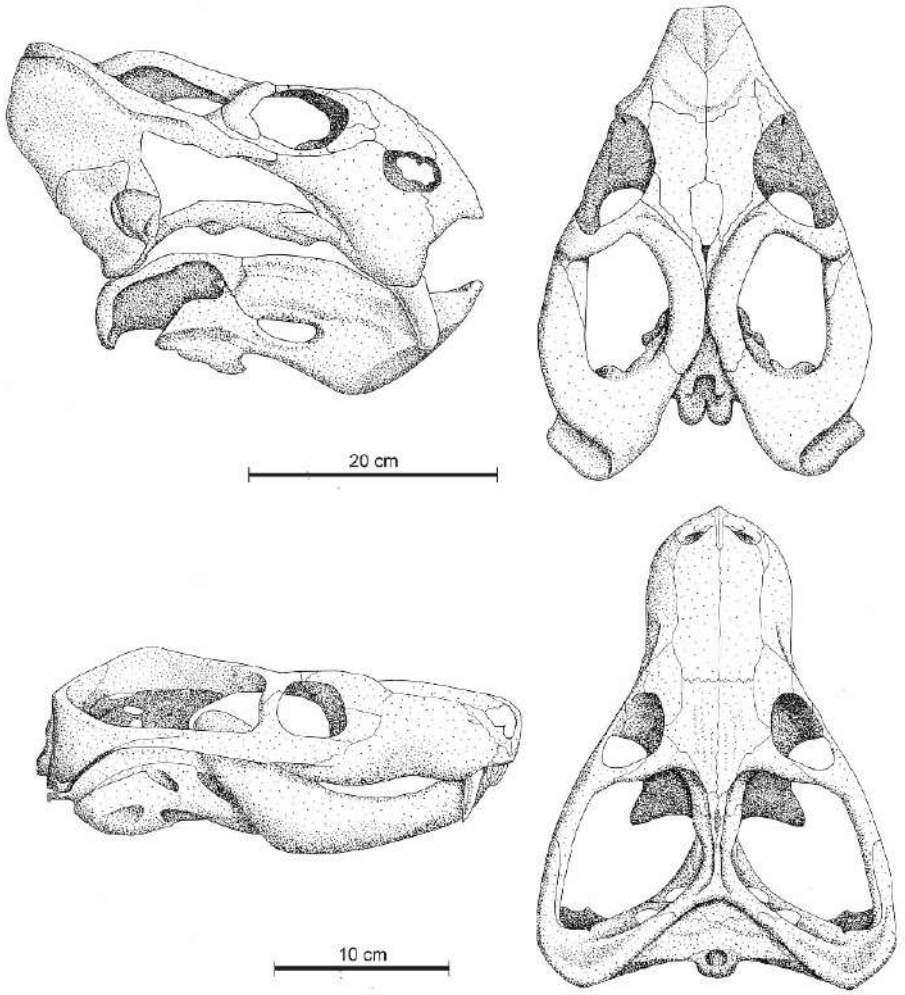


***Figure 8**:Skulls of the biozone defining fossils of the Dicynodon-Theriognathus Subzone in lateral and dorsal views. Dicynodon lacerticeps (top), Theriognathus microps (bottom) (Image taken from Viglietti, 2020).*

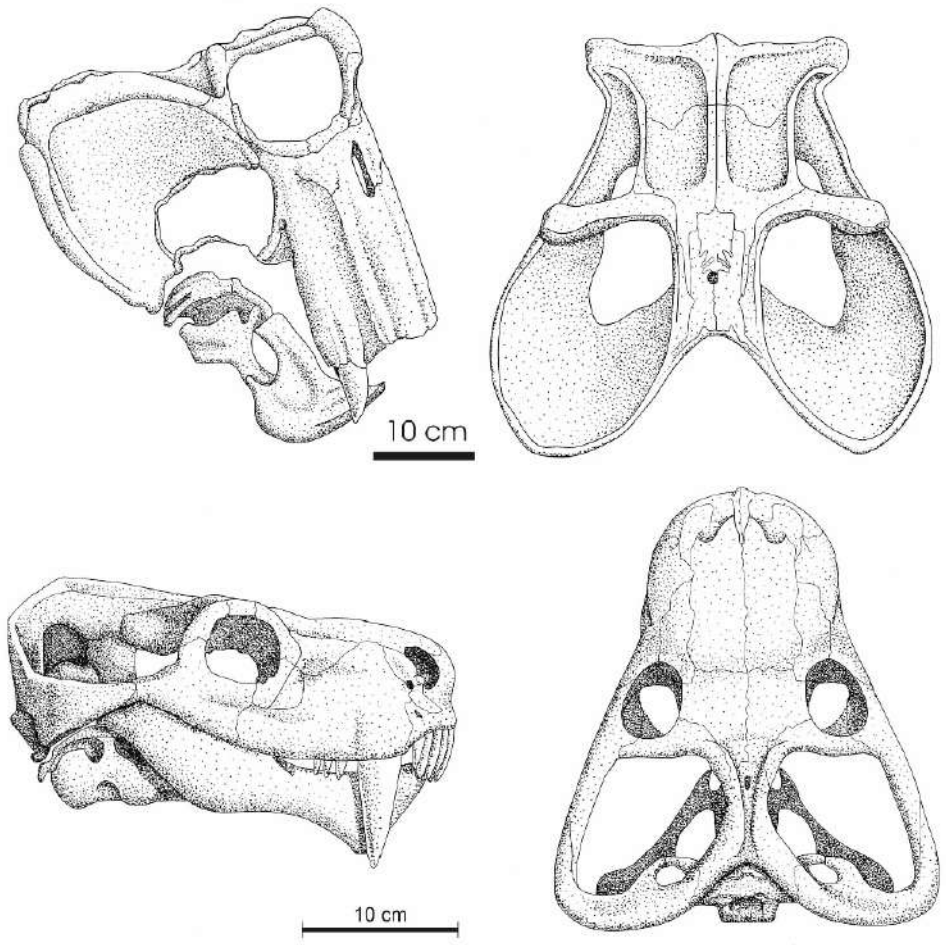


***Figure 9**: Biozone defining fossils of the Lystrosaurus maccaigi- Moschorhinus Subzone. The skulls of the Lystrosaurus maccaigi (top) and Moschorhinus kitchingi (bottom) in lateral (Image taken from Viglietti, 2020).*

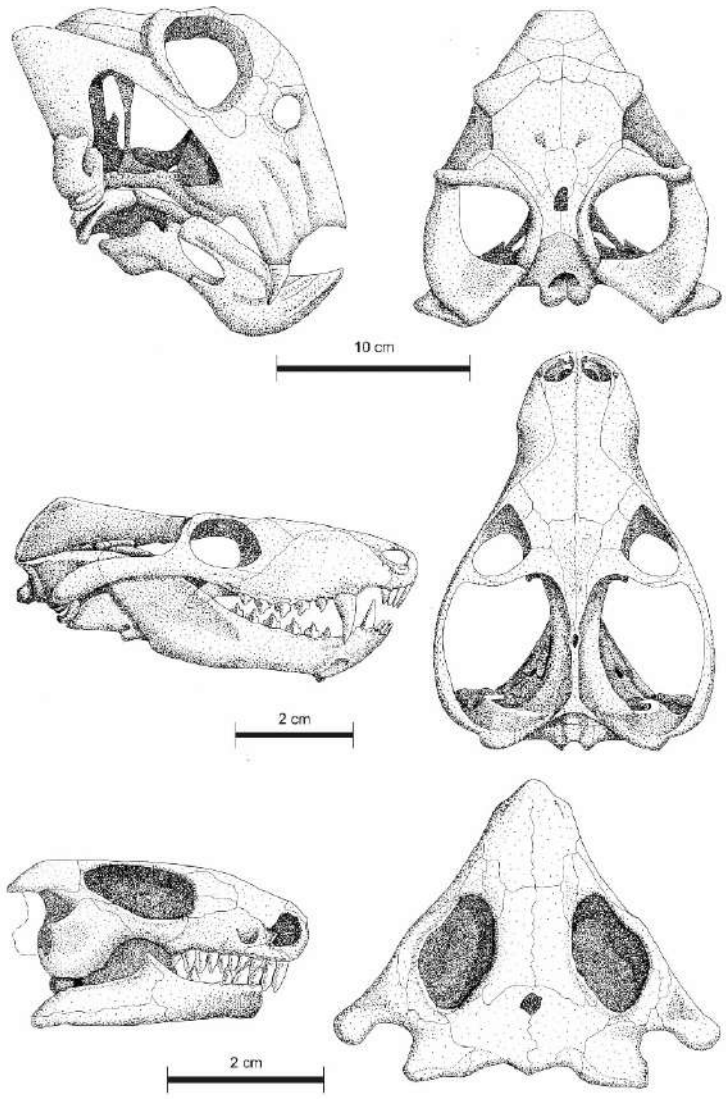


***Figure 10**: Lateral and dorsal views of the index taxa defining the Lystrosaurus declivis Assemblage Zone. (top) Lystrosaurus declivis, (centre) Thrinaxodon liorhinus, (bottom) Procolophon trigoniceps (Image taken from Botha and Smith, 2020). Image taken from Viglietti, 2020*

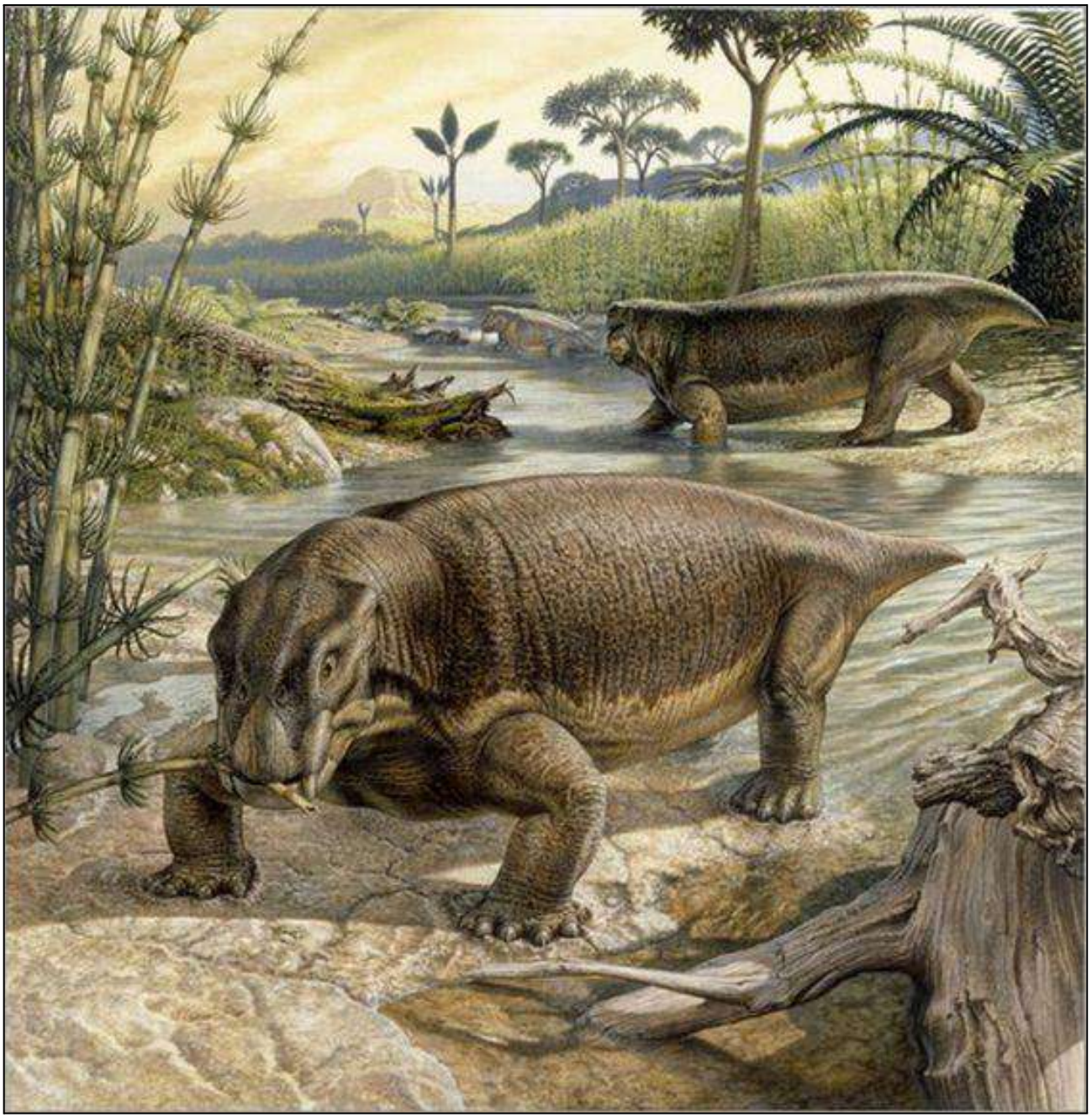


***Figure 11**: Reconstruction of Lystrosaurus sp.*

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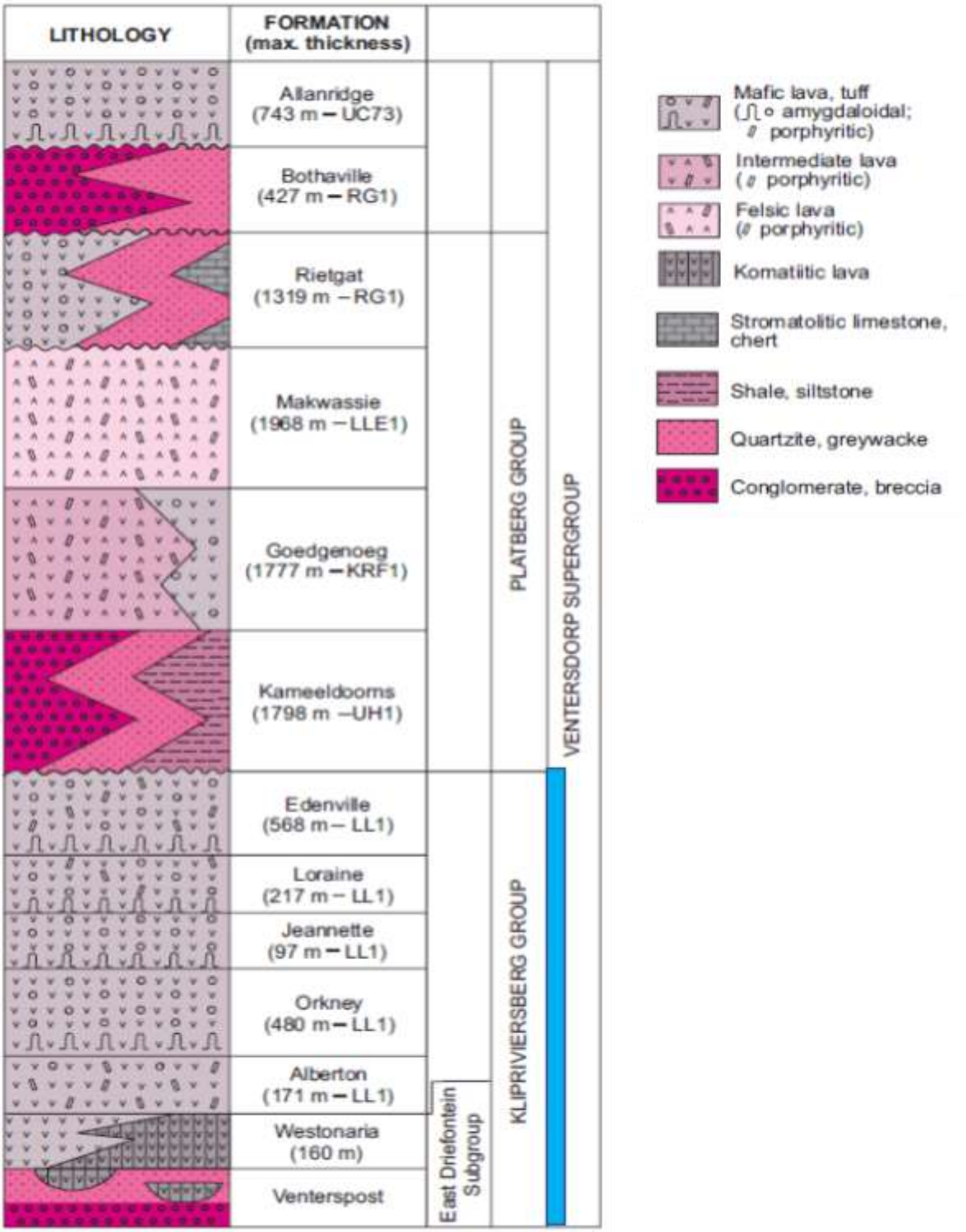

Figure 12: *Ventersdorp stratigraphy (Taken from Van Der Westhuizen and Bruiyn, 2006 after Winter, 1965, 1976; Linton et al., 1990 Meyers, 1990 and Meintjes, 1978).*

The Klipriviersberg Group is indicated by the blue line.

6. GEOGRAPHICAL LOCATION OF THE SITE

The 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure is located on Portion 0 of Farm 636 and Portion 1 of Farm 636 in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The proposed development will be located about 12 km south-east of Kroonstad in the Free State and is located just south of the Vals River (Figure 1-2).

7. METHODS

The aim of a desktop study is to evaluate the possible risk to palaeontological heritage in the proposed development. This includes all trace fossils as well as all fossils in the proposed footprint. All possible information is consulted to compile a desktop study, and this includes the following: all Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

7.1 Assumptions and Limitations

The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment will thus improve the accuracy of the desktop assessment.

Access to the Power line was not allowed. But as the whole of the development is not deemed highly fossiliferous it is assumed that it is also the case in the power line footprint.

8. ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- A Google Earth map with polygons of the proposed development was obtained from SiVEST.
- 1:250 000 2726 Kroonstad (2000) Geological Map (Council for Geosciences, Pretoria)

- Updated geological shape files (Council for Geosciences, Pretoria)

9. SITE VISIT

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 1 October 2022. No fossiliferous outcrops were identified during the site visit.

***Figure 13**:General view of the proposed development indicates a low topography with grassveld vegetation*

***Figure 14**:Alluvium deposits in the northern section of the development*

***Figure 15**: Klipriviersberg Group outcrop on the western margin of the development footprint*

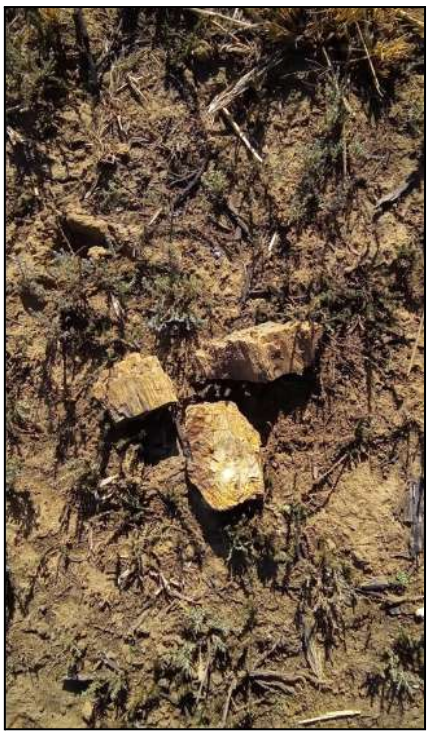

Figure 16: Isolated fragments of tree fossils

-27.760419; 27.310406

***Figure 17**: Trace fossils, well preserved*

-27.760036; 27.309569

The trace fossils are grouped near the ruins of an old homestead and most probably was brought in from a nearby locality as this was the only locality with trace fossils

10. ASSESSMENT METHODOLOGT

10.1 Method of Environmental Assessment

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national, or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table below.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

10.2 Impact Rating System

Impact assessment must take account of the nature, scale, and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 4:The rating system

NATURE
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.
GEOGRAPHICAL EXTENT

This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be

		mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.

2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96		The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity

Table 5: Summary of Impacts

Impacts	Extent	Duration	Magnitude	Reversibility	Irreplaceable loss	Cumulative effect	Impact
Pre-mitigation	1	4	3	4	4	2	45
Post mitigation	1	4	1	4	4	2	15

11. FINDINGS AND RECOMMENDATIONS

The proposed Bonsmara Solar PV Facility The proposed development is underlain by Quaternary alluvium, the Adelaide Subgroup of the Beaufort Group (Karoo Supergroup) as well as the Klipriviersberg Group of the Ventersdorp Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of Quaternary sediments is Moderate, that of the Adelaide Subgroup is Very High while that of the Klipriviersberg Group is Low (blue) (Almond and Pether, 2009; Almond *et al*., 2013). Updated Geology (Council of Geosciences) indicates that the proposed development is mainly underlain by alluvium, colluvium, eluvium, gravel; the Balfour Formation of the Adelaide Subgroup and the Klipriviersberg Group of the Ventersdorp Supergroup.

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A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 1 October 2022. No fossiliferous outcrop was detected in the proposed development area. However, loose, fragmented and weathered tree fossils and well-preserved trace fossils were detected. The latter was probably brought in from nearby areas and placed near the homestead (now in ruins). However, the apparent rarity of well-preserved fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

Recommendations:

- The ECO for this project must be informed that the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) has a Very High Palaeontological Sensitivity.
- The well-preserved trace fossils will be located in the solar footprint. It is recommended that these slabs are removed and placed near the offices of the PV as an informative example of trace fossils found on the development
- If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the ECO/site manager must report to South African Heritage Resources Agency (SAHRA) (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out.
- Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).

- These recommendations should be incorporated into the Environmental Management Plan for the Bonsmara Solar PV Facility.

12. CHANCE FINDS PROTOCOL

The following procedure will only be followed if fossils are uncovered during the excavation phase of the development.

Legislation

Cultural Heritage in South Africa (includes all heritage resources) is protected by the National Heritage Resources Act (Act No 25 of 1999) (NHRA). According to Section 3 of the Act, all Heritage resources include "all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens".

Palaeontological heritage is unique and non-renewable and is protected by the NHRA and are the property of the State. It is thus the responsibility of the State to manage and conserve fossils on behalf of the citizens of South Africa. Palaeontological resources may not be excavated, broken, moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

A fossil is the naturally preserved remains (or traces thereof) of plants or animals embedded in rock. These organisms lived millions of years ago. Fossils are extremely rare and irreplaceable. By studying fossils, it is possible to determine the environmental conditions that existed in a specific geographical area millions of years ago.

This informational document is intended for workmen and foremen on construction sites. It describes the actions to be taken when mining or construction activities accidentally uncovers fossil material.

It is the responsibility of the Environmental Site Officer (ESO) or site manager of the project to train the workmen and foremen in the procedure to follow when a fossil is accidentally uncovered. In the absence of the ESO, a member of the staff must be appointed to be responsible for the proper implementation of the chance find protocol as not to compromise the conservation of fossil material.

Chance Find Procedure

- If a chance find is made the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager

must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa.

- Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.
- Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.
- The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- If the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO. Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once the Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

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Appendix A

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 29 years in Palaeontology

EDUCATION:

B.Sc Botany and Zoology, 1988

University of the Orange Free State

B. Sc (Hons) Zoology, 1991

University of the Orange Free State

Management Course, 1991

University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009

University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part-time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part-time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

TECHNICAL REPORTS

Butler, E. 2014. Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. Bloemfontein.

Butler, E. 2014. Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, Northern Cape Province. 2014. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed consolidation, re-division, and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. Bloemfontein.

Butler, E. 2015. Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. Bloemfontein.

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within the uMkhanyakude District Municipality and the Mtubatuba Local Municipality, KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

CTS HERITAGE

APPENDIX 3: Visual Impact Assessment and Visual Statement

Bonsmara Solar PV (RF) (Pty) Ltd

Bonsmara Solar PV Facility near Kroonstad, Free State Province

Visual Impact Assessment

DFFE Reference: **TBC**
Report Prepared by: Kelly Armstrong and Chris Dalgliesh
Issue Date: 3 October 2022
Version No.: 2

Bonsmara Solar PV (RF) (Pty) Ltd

Bonsmara Solar PV Facility near Kroonstad, Free State Province

Visual Impact Assessment

EXECUTIVE SUMMARY

Bonsmara Solar PV (RF) (Pty) Ltd proposes to develop the 100 MW Bonsmara Solar Photovoltaic (PV) Facility, Battery Energy Storage System and associated infrastructure on a site ~12 km south-east of Kroonstad, in the Free State Province (project). The PV Facility will occupy ~390 ha across Portion 0 and Portion 1 of Farm 636 in Moqhaka Local Municipality. A 2 km long 132 kV powerline will evacuate power to the grid by connecting the on-site substation to the Kroonstad Switching Station.

SRK Consulting (South Africa) (Pty) Ltd has been appointed by SiVEST (SA) (Pty) Ltd to undertake the Visual Impact Assessment to inform the Environmental Impact Assessment process required in terms of the National Environmental Management Act 107 of 1998, conducted by SiVEST.

Impacts of the PV Facility components and the grid connection component (132 kV powerline and on-site substation) are assessed separately and are likely to be associated with visual intrusion and visual quality.

Construction (and decommissioning) activities associated with the PV Facility and the 132 kV powerline are anticipated to be visually intrusive. The impact is assessed to be of *medium* significance and with implementation of mitigation is reduced to *low*.

During the operational phase it is anticipated that the PV array, BESS, internal grid infrastructure, substation and 132 kV powerline will alter the sense of place and be visually intrusive. These impacts are assessed to be of *high, medium* and *low* significance respectively, and with the implementation of mitigation is reduced to *medium* or *low*. The visual impact of nightglow is anticipated to be of *medium* significance and with the implementation of mitigation is reduced to *low*.

Key mitigation measures include:

- Limit vegetation clearance and the footprint of construction to what is absolutely essential;
- Consolidate the footprint of the construction camp to a functional minimum;
- Avoid excavation, handling and transport of materials which may generate dust under very windy conditions;
- Keep stockpiled aggregate and sand covered to minimise dust generation;
- Keep construction site tidy;
- Plant vegetation (that will reach >3 m in height) or establish a vegetated berm (>3 m) along the south-western boundary of the site bordering the R76;
- Install the 33 kV powerlines underground, where possible;
- Fence the perimeter of the site with a green or black fencing;
- Ensure that the roof colour of the proposed buildings blends into the landscape;

- Do not install or affix lights on pylons;
- Reduce the height of lighting masts to a workable minimum; and
- Direct lighting inwards and downwards to limit light pollution.

The visual quality and sense of place is already affected by existing substations and powerlines within the visual landscape. As such, the proposed powerlines, BESS and substations associated with this project will not be the first of their kind. A number of other PV facilities are proposed in the 35 km radius of the proposed project, however, are located far apart and do not constitute a spatially concentrated, high-density network of PV facilities. Therefore, the cumulative impact of the PV facility and 132 kV powerline is assessed to be of medium significance and with the implementation of mitigation is reduced to low.

This project will be largely incongruent with the existing agricultural landscape. As such, visual impacts include altered sense of place, visual intrusion and light pollution. This VIA demonstrates that the project will generally result in a moderate visual impact, despite not being located within a REDZ. The construction, operational, decommissioning and cumulative impacts are deemed to be acceptable on the assumption that the mitigation measures listed in this VIA are implemented.

Based on the assessment and the assumption that the proposed mitigation measures will be implemented, the specialist is of the opinion that the visual impacts of the project are acceptable and, from a visual perspective, there is no reason not to authorise the project.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	1.3
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 6
c) an indication of the scope of, and the purpose for which, the report was prepared;	1
(cA) an indication of the quality and age of base data used for the specialist report;	1.4.3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	6
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	1.4.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	1.4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	6 and 7
g) an identification of any areas to be avoided, including buffers;	7
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	7, and 8
k) any mitigation measures for inclusion in the EMPr;	7.9

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
l) any conditions for inclusion in the environmental authorisation;	8.1
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	7.9
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	8.1
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Bonsmara Solar PV Facility near Kroonstad, Free State Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SRK Consulting (South Africa) (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition	125%
Specialist name:	Kelly Armstrong			
Specialist Qualifications:	BSocSc (Hons) Environmental Science			
Professional affiliation/registration:	N/A			
Physical address:	183 Main Road, Albion Spring Close, Rondebosch, 7700			
Postal address:	Postnet Suite #206, P. Bag X18, Rondebosch, 7701			
Postal code:	7700	Cell:	076 114 9254	
Telephone:	021 659 3060	Fax:	086 530 7003	
E-mail:	karmstrong@srk.co.za			

2. DECLARATION BY THE SPECIALIST

I, ____Kelly Armstrong_____, 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 Act, 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 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd

Name of Company:

Date:

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _____ Kelly Armstrong _____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd

Name of Company

Date

Signature of the Commissioner of Oaths

Date

Bonsmara Solar PV (RF) (Pty) Ltd

Bonsmara Solar PV Facility near Kroonstad, Free State Province

Visual Impact Assessment

Contents

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Glossary of Terms

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

Landscape Integrity	The compatibility of the development/visual intrusion with the existing landscape.
Sense of Place	The identity of a place related to uniqueness and/or distinctiveness. Sometimes referred to as genius loci meaning 'spirit of the place'.
Viewshed	The topographically defined area from which the project could be visible.
Visibility	The area from which the project components would actually be visible and which depends upon topography, vegetation cover, built structures and distance.
Visual Absorption Capacity	The potential for the area to conceal the proposed development.
Visual Character	The elements that make up the landscape including geology, vegetation and land-use of the area.
Visual Exposure	The zone of visual influence or viewshed. Visual exposure tends to diminish exponentially with distance.
Visual Impact	A change to the existing visual, aesthetic or scenic environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Visual Intrusion	The effect of the artificial insertion (construction) of an object into a landscape, typically – but not always - reducing the visual quality of the environment, and sense of place.
Visual Quality	The experience of the environment with its particular natural and cultural attributes.
Visual Receptors	Potential viewers (individuals or communities) who are subjected to the visual influence of a project.

List of Abbreviations

BESS	Battery Energy Storage System
CSP	Concentrated Solar Power
DEA&DP	Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
mamsl	Metres Above Mean Sea Level
MW	Megawatt
NEMA	National Environmental Management Act 107 of 1998
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SiVEST	SiVEST Environmental
SRK	SRK Consulting (South Africa) (Pty) Ltd
ToR	Terms of Reference
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VP	Viewpoint
WEF	Wind Energy Facility

Bonsmara Solar PV (RF) (Pty) Ltd

Bonsmara Solar PV Facility near Kroonstad, Free State Province

Visual Impact Assessment

1. INTRODUCTION

Bonsmara Solar PV (RF) (Pty) Ltd proposes to develop the 100 MW Bonsmara Solar Photovoltaic (PV) Facility, Battery Energy Storage System (BESS) and associated infrastructure on a site approximately 12 km south-east of the town of Kroonstad, in the Free State Province (the project - Figure 1-1) The PV Facility and BESS will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. A 2 km long 132 kV powerline will evacuate power to the grid by connecting the on-site substation to the Kroonstad Switching Station.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by SiVEST Environmental (SiVEST) to undertake the Visual Impact Assessment (VIA) to inform the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA), conducted by SiVEST.

1.1 Scope and Objectives

The primary aims of the study are to describe the visual baseline, assess the visual impacts of the project and identify effective and practicable mitigation measures. The VIA informs the EIA process required in terms of NEMA, and conducted by SiVEST.

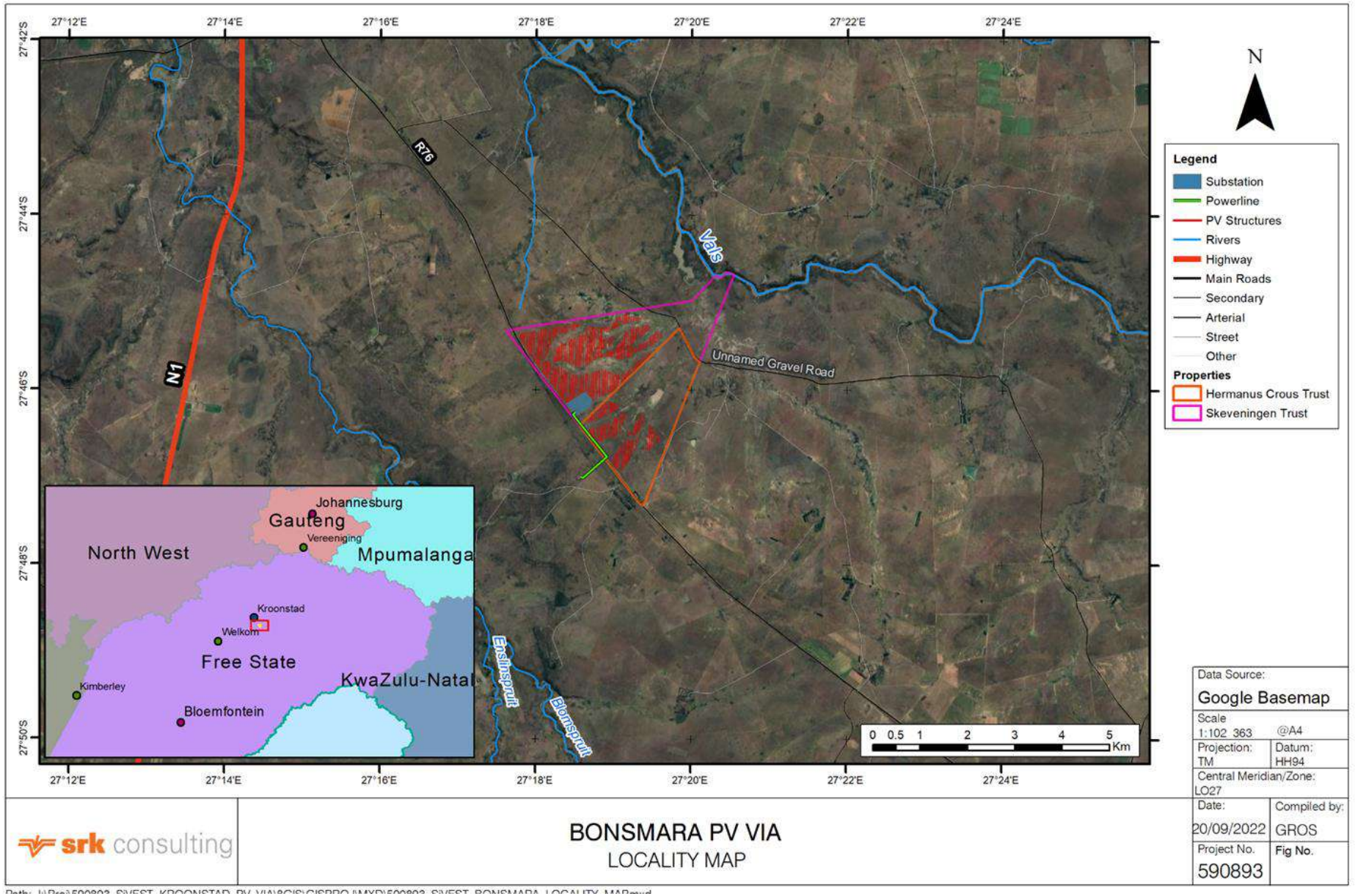


Figure 1-1: Locality map

1.2 Terms of Reference

The Terms of Reference (ToR) for the study are as follows:

- Describe the baseline visual characteristics of the study area, including landform, visual character and sense of place, and place this in a regional context;
- Identify potential impacts of the project on the visual environment through analysis and synthesis of the following factors:
    - Visual exposure;
    - Visual absorption capacity (VAC);
    - Sensitivity of viewers (visual receptors);
    - Viewing distance and visibility; and
    - Landscape integrity;
- Assess potential the impacts of the project on the visual environment and sense of place using SiVEST's impact assessment methodology (see Appendix B);
- Identify and assess the direct, indirect and cumulative impacts (pre- and post-mitigation) of the proposed project (and alternatives, if applicable) on visual resources in relation to other proposed and existing developments in the surrounding area;
- Compile a report compliant with Appendix 6 of the EIA Regulations and any relevant legislation and guidelines; and
- Recommend practicable mitigation measures to avoid and/or minimise impacts and/or optimise benefits.

1.3 Specialist Credentials

The VIA was conducted by staff listed in Table 1-1.

Table 1-1: VIA staff

Staff	Role	Qualification
Christopher Dalgliesh	Project Review and Director	Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 35 years' experience, primarily in South Africa, Southern Africa, West Africa and South America (Suriname). Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure (including rail and ports) and industrial sectors. He has managed and regularly reviews Visual Impact Assessments. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs) and associated management plans, in accordance with international standards. He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies for lenders, and also has a depth of experience in Strategic Environmental Assessment, State of Environment Reporting and Resource Economics. He

		holds a BBusSci (Hons) and M Phil (Env) and is a registered Environmental Assessment Practitioner.
Kelly Armstrong	Specialist Consultant	Kelly Armstrong is an Environmental Consultant at SRK Consulting. She has four years' experience in managing Basic Assessment, Environmental Impact Assessment and Water Use Authorisation processes and acting as an Environmental Control Officer in the renewable energy, residential, aquaculture, marine and mining sectors. She also manages and contributes to Visual Impact Assessments for infrastructure, renewable energy and mining projects. Kelly holds a BSocSc (Hons) in Environmental and Geographical Studies from the University of Cape Town.

1.4 Assessment Methodology

Visual impacts are a function of the physical transformation of a landscape on account of the introduced object, and the experiential perceptions of viewers.

Given the subjective nature of visual issues, assessing the visual impacts of a project in absolute and objective terms is not achievable. Thus, qualitative as well as quantitative techniques are required.

In this VIA, emphasis has therefore been placed on ensuring that the methodology and rating criteria are clearly stated and transparent. The focus of the study is to determine the character and sensitivity of the visual environment, identify visual receptors and viewing corridors and identify and assess potential visual impacts and mitigation measures.

1.4.1 Approach

The approach adopted for the VIA is intended to be as accurate and thorough as possible. Analytical techniques are selected to endorse the reliability and credibility of the assessment.

The approach to and reporting of the VIA study comprises three major, phased elements (as summarised in Figure 1-2 below):

- Description of the visual context;
- Identification and discussion of the potential visual impacts; and
- Assessment of those potential impacts.

Visual impacts are assessed as one of many interrelated effects on people (i.e. the viewers and the impact of an introduced object into a particular view or scene) (Young, 2000). In order to assess the visual impact the project has on the affected environment, the visual context (baseline) in which the project is located must be described. The inherent value of the visual landscape to viewers is informed by geology / topography, vegetation and land-use and is expressed as Visual Character (overall impression of the landscape), Visual Quality (how the landscape is experienced) and Sense of Place (uniqueness and identity).

Visual impact is measured as the change to the existing visual environment caused by the project as perceived by the viewers (Young, 2000). The visual impact(s) may be negative, positive or neutral (i.e. the visual quality is maintained). The magnitude or intensity of the visual impacts is determined through analysis and synthesis of the VAC of the landscape (potential of the landscape to absorb the project), zone of visual

influence or exposure[1], visibility (viewing distances), compatibility of the project with landscape integrity (congruence) and the sensitivity of the viewers (receptors).

Sources of visual impacts are identified for the construction, operational and decommissioning phases of the project. The significance of those visual impacts is then assessed using the prescribed impact rating methodology, which includes the rating of:

- Impact consequence, determined by extent, duration and magnitude/intensity of impact (see above);
- Impact probability;
- Impact significance, determined by combining the ratings for consequence and probability; and
- Confidence in the significance rating.

The significance rating methodology is described in more detail in Appendix B.

Mitigation measures recommended to avoid and/or reduce the significance of negative impacts, or to optimise positive impacts, are identified for the project. Impact significance is re-assessed assuming the effective implementation of mitigation measures.

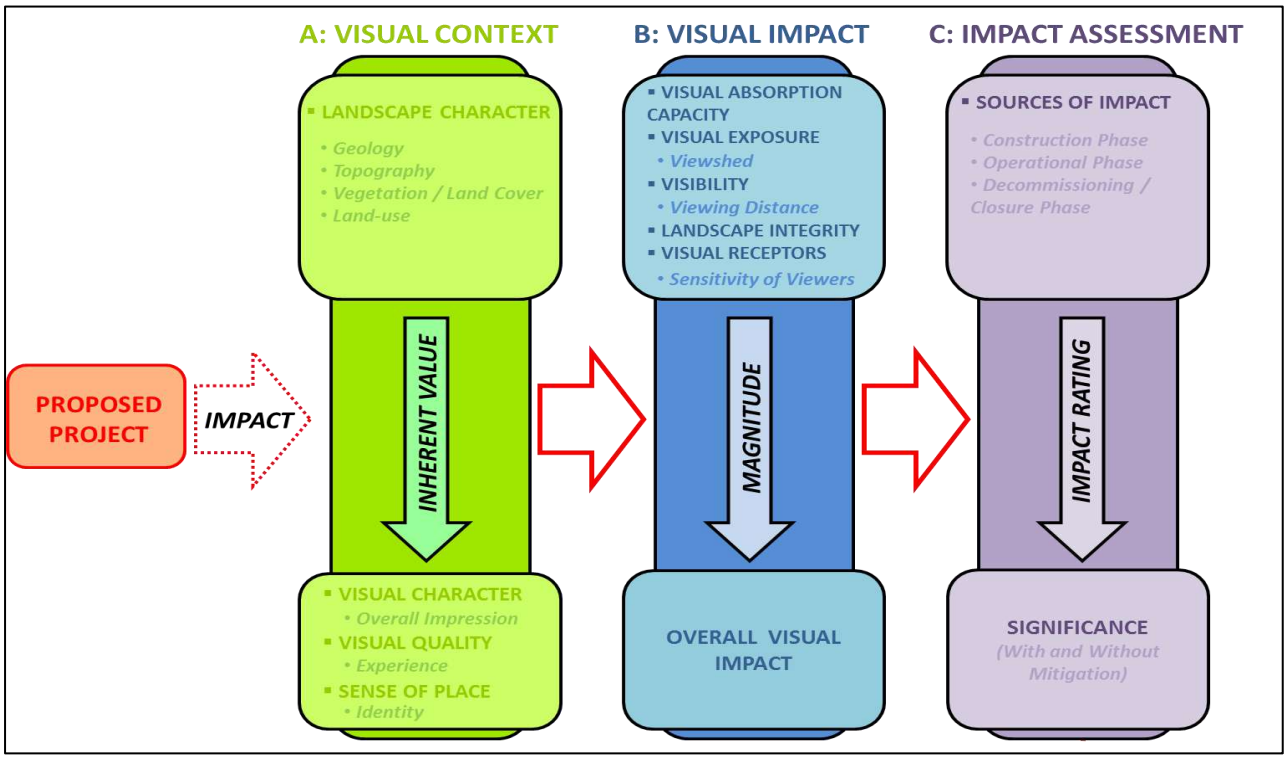


Figure 1-2: Approach to and method for the VIA

1.4.2 Method

The following method was used to assess the visual context (baseline) for the project:

1. Describe the project using information supplied by the proponent and EIA team;

[1] Visual exposure of a project can be determined through the analysis of viewsheds, however due to the existing road infrastructure and congruence of the proposed project with the existing infrastructure in the project area viewshed analysis will not be undertaken.

2. Collect and review visual data, including data on topography, vegetation cover, land-use and other background information;
3. Undertake fieldwork, comprising a reconnaissance of the study area, particularly the project site and key viewpoints. The objectives of the fieldwork were to:

- Familiarise the specialist with the site and its surroundings;
- Identify key viewpoints / corridors; and
- Determine and groundtruth the existing visual character and quality in order to understand the sensitivity of the landscape.

  Visual 'sampling' using photography was undertaken to illustrate the likely zone of influence and visibility. The location of the viewpoints was recorded with a GPS;

4. Undertake a mapping exercise to define the visual character of the study area; and
5. Identify sensitive receptors.

The following method was used to assess the visual impact of the project:

1. Determine the visual zone of influence or exposure by superimposing the proposed development on aerial imagery, and verified during the site visit;
2. Make field observations at key viewpoints to determine the likely distance at which visual impacts will become indistinguishable;
3. Rate impacts on the visual environment and sense of place based on professional opinion and the prescribed impact rating methodology;
4. Recommend practicable mitigation measures to avoid and/or minimise impacts; and
5. Provide environmental management measures to be included in the Environmental Management Programme for the project (EMPr).

1.4.3 Site Visit and Data Acquisition

A site visit was undertaken on 13 September 2022. The site visit duration and timing were appropriate to provide the specialist with a representative impression of the site and surroundings.

The following additional information sources were used:

- Maps indicating the location and layout of the project;
- Topographic data, including spatial files with 5 m contours obtained from the Department of Rural Development and Land Reform;
- Aerial images; and
- Other available data on geology, vegetation, land use, receptors etc.

The information is sufficiently recent and detailed to provide appropriate inputs into the VIA.

2. ASSUMPTIONS AND LIMITATIONS

As is standard practice, the VIA is based on a number of assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. These assumptions and limitations include:

- VIA is not, by nature, a purely objective, quantitative process, and depends to some extent on subjective judgments. Where subjective judgments are required, appropriate criteria and motivations for these have been clearly stated;
- The study is based on technical information supplied to SRK, which is assumed to be accurate. This includes the proposed locations, dimensions and layouts of the project components;
- This study conservatively assumes a single contiguous PV array of approximately ~390 ha;
- The study area is defined as the area within a 5 km radius of the site, as the visual impact beyond this distance is considered negligible; and
- This study does not provide motivation for or against the project, but rather seeks to give insight into the visual character and quality of the area, its VAC and the potential visual impacts of the project.

The findings of the VIA are not expected to be affected by these assumptions and limitations.

3. TECHNICAL DESCRIPTION

This section provides a concise description of the proposed project as provided at the time of assessment, focusing on elements relevant to the VIA. The general project description may still be refined, and a more detailed description is provided in the EIA Report for the project. Unless changes to the project description affect aspects directly assessed in this VIA, they are not expected to affect the findings of this study.

3.1 Project Location

Bonsmara Solar PV (RF) (Pty) Ltd is proposing the construction of the 100MW Bonsmara PV Facility, BESS and associated infrastructure, ~12km south-east of Kroonstad, in the Free State Province (Figure 1-1). The facility will occupy a footprint of ~390 ha and will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality.

The project is located over the following farm portions as detailed in Table 3-1 and Table 3-2 below.

Table 3-1: Affected properties for the PV facility

Farm Name	SG Code
Farm Scheveningen No. 636 Portion 0	F02000000000063600000
Farm Scheveningen No. 636 Portion 1	F02000000000063600001

Table 3-2: Affected properties for the 132 kV powerline

Farm Name	SG Code
Farm Scheveningen No. 636 Portion 0	F02000000000063600000
Farm Scheveningen No. 636 Portion 1	F02000000000063600001
Farm Oslaagte No. 2564 Portion 0	F02000000000256400000

This project is not located within one of the 11 designated Renewable Energy Development Zones (REDZ) in South Africa. The REDZ are geographically defined areas in which the South African Government has encouraged the development of PV and wind renewable energy projects by promulgating a streamlined authorisation approach. As such, the REDZ have become areas in which the development of PV projects is considered more acceptable, though sites outside REDZ are not precluded.

3.1.1 Location Alternatives

No other location alternatives are being considered. The site is located approximately 2 km from a grid connection point that has been confirmed to have sufficient capacity to evacuate the generated electricity. The land has been confirmed as available by private landowners. A prefeasibility study by an agricultural specialist found the site to be suitable in terms of agricultural sensitivity.

3.2 Project Description

The 100 MW PV Facility will compromise several arrays of PV panels, BESS and associated infrastructure. An on-site substation and a 2 km 132 kV powerline will evacuate the power to the grid.

Preliminary PV Facility components include:

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- BESS;
- Site and internal access roads (up to 6 m wide);
- Temporary laydown area during the construction phase for the construction camp and laydown area (which will be a permanent laydown area for the BESS during the operational phase);
- Infrastructure including offices, operational control centre, operation and maintenance area, ablution facilities etc;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical (up to 33 kV));
- Perimeter fencing; and
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

The on-site 33 kV/132 kV substation (facility substation) will step up power from 33 kV to 132 kV for transmission to the national grid. The power will then be evacuated to the national grid by the proposed ~2 km 132 kV powerline that connects the on-site substation to the Kroonstad Switching Station. A 300 m powerline corridor was assessed (150 m on either side).

3.2.1 Technology Alternatives

No other activity alternatives are being considered. Concentrated Solar Power (CSP) technology has not been considered suitable for this site because it requires a flat surface, has a high visual impact and requires large volumes of water. In addition, CSP has not been catered for in the IRP2019.

A wind energy facility has not been considered as a technology alternative, as the climatic conditions show that wind resources in the area are not suitable.

3.2.2 Layout Alternatives

The design and layout alternatives will be considered and assessed as part of the EIA taking into consideration the environmental constraints identified by the specialists.

The BESS, laydown area and substation are optimally located in the south-east corner of the site closest to the grid connection point and access road. The powerline follows the shortest route to the grid connection point and follows an existing 132 kV powerline.

3.2.3 No Go Alternative

The 'no-go' alternative is the option of not undertaking the development of the proposed PV Facility and / or grid connection infrastructure. Hence, if the 'no-go' option is implemented, there would be no development. The 'no-go' option assumes that the site remains in its current state and the status quo would be preserved.

This alternative would result in no environmental impacts from the proposed project on the site or the surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

4. LEGAL REQUIREMENTS AND GUIDELINES

Relevant guidelines that provide direction for visual assessment include the Department of Environmental Affairs and Development Planning's (DEA&DP) "Guideline for Involving Visual and Aesthetic Specialists in EIA Processes" (DEA&DP, 2005) and the Landscape Institute's "Guidelines for Landscape and Visual Impact Assessments" (2013), which have been considered in this VIA.

DEA&DP's Guideline (2005) identifies typical components of a visual study:

- Identification of issues and values relating to visual, aesthetic and scenic resources through involvement of stakeholders;
- Identification of landscape types, landscape character and sense of place, generally based on geology, landforms, vegetation cover and land use patterns;
- Identification of viewsheds, view catchment area and the zone of visual influence, generally based on topography;
- Identification of important viewpoints and view corridors within the affected environment, including sensitive receptors;
- Indication of distance radii from the proposed project to the various viewpoints and receptors;

- Determination of the VAC of the landscape, usually based on topography, vegetation cover or urban fabric in the area;
- Determination of the relative visibility, or visual intrusion, of the proposed project;
- Determination of the relative compatibility or conflict of the project with the surroundings; and
- A comparison of the existing situation with the probable effect of the proposed project.

Projects that warrant a visual specialist study include those:

- Located in a receiving environment with:
- Protection status, such as national parks or nature reserves;
- Proclaimed heritage sites or scenic routes;
- Intact wilderness qualities, or pristine ecosystems;
- Intact or outstanding rural or townscape qualities;
- A recognized special character or sense of place;
- Outside a defined urban edge line;
- Sites of cultural or religious significance;
- Important tourism or recreation value;
- Important vistas or scenic corridors;
- Visually prominent ridgelines or skylines; and/or
- Where the project is:
- High intensity, including large-scale infrastructure;
- A change in land use from the prevailing use;
- In conflict with an adopted plan or vision;
- A significant change to the fabric and character of the area;
- A significant change to the townscape or streetscape;
- A possible visual intrusion in the landscape; or
- Obstructing views of others in the area.

In terms of the guideline, the proposed PV Facility and associated infrastructure can be classified as a Category 5 development, which includes powerlines and large-scale infrastructure. As the project is situated in an area of medium scenic, cultural, and historical significance, a high visual impact is expected (see Table 4-1), since the project introduces:

- Potential intrusion on protected landscapes or scenic resources;
- Noticeable change in the visual character of the area; and
- Establishes a new precedent for development in the area.

Such a project typically warrants a Level 4 assessment (see Table 4-2), which includes the following generic steps:

- Identification of issues and site visit;

- Description of receiving environment and proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes; and
- Completion of 3D modelling and simulations, with and without mitigation.

Table 4-1: Expected visual impact significance

Type of environment	**Type of development**				
	Cat 1	**Cat 2**	**Cat 3**	**Cat 4**	**Cat 5**
Protected / wild areas	Moderate	High	High	Very high	Very high
High scenic, cultural, historical value	Minimal	Moderate	High	High	Very high
Medium scenic, cultural, historical value	Little or none	Minimal	Moderate	High	**High**
Low scenic, cultural, historical value / disturbed	Little or none Possible benefits	Little or none	Minimal	Moderate	High
Disturbed or degraded sites	Little or none Possible benefits	Little or none Possible benefits	Little or none	Minimal	Moderate

Table 4-2: Recommended approach for visual assessment

Approach	**Type of issue expected**				
	Little or no visual impact	**Minimal visual impact**	**Moderate visual impact**	**High visual impact**	**Very high visual impact**
Level of visual impact recommended	Level 1 visual input	Level 2 visual input	Level 3 visual assessment	**Level 4 visual assessment**	

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT – VISUAL CONTEXT

The following description of the affected environment focuses on the Visual Character of the area surrounding and including the project (the study area) and discusses the Visual Quality and Sense of Place[2]. This baseline information provides the context for the visual analysis.

5.1 Landscape Character

Landscape character is the description of the pattern of the landscape, resulting from particular combinations of natural (physical and biological) and cultural (land use) characteristics. It focuses on the inherent nature of the land rather than the response of a viewer (Young, 2000).

[2] These terms are explained in the relevant sections below.

5.1.1 Geology and Topography

The geology and topography of the area, together with the temperate climate, provide the framework for the basic landscape features and visual elements of the study area.

The site is located on a relatively flat portion of land, on the crest of a hill, in an undulating landscape between the Blomspruit and Vals Rivers (Figure 5-2). The ~ 600 ha site gently slopes from ~1450 m above mean sea level (mamsl) in the south-west of the site to ~1371 mamsl in the north-east.

The project is underlain by the sandstones of the Normadien Formation, of the Beaufort Group.

5.1.2 Vegetation

The project is located within the original extent of the Central Free State Grassland, one of the vegetation types that dominates the Dry Highveld Grassland Biome spatially. The Dry Highland Grassland Biome occurs at mid-altitudes of 1 300 – 1 600 mamsl, characterised by undulating topography with small rocky outcrops and river valleys. The biome comprises grasses (veld) and low shrubby vegetation with small clusters of trees and bushes, partially reminiscent of African savannah landscapes (Figure 5-1).

Figure 5-1: Vegetation in the project area. Photo taken at Viewpoint (VP) 4 looking toward the project site.

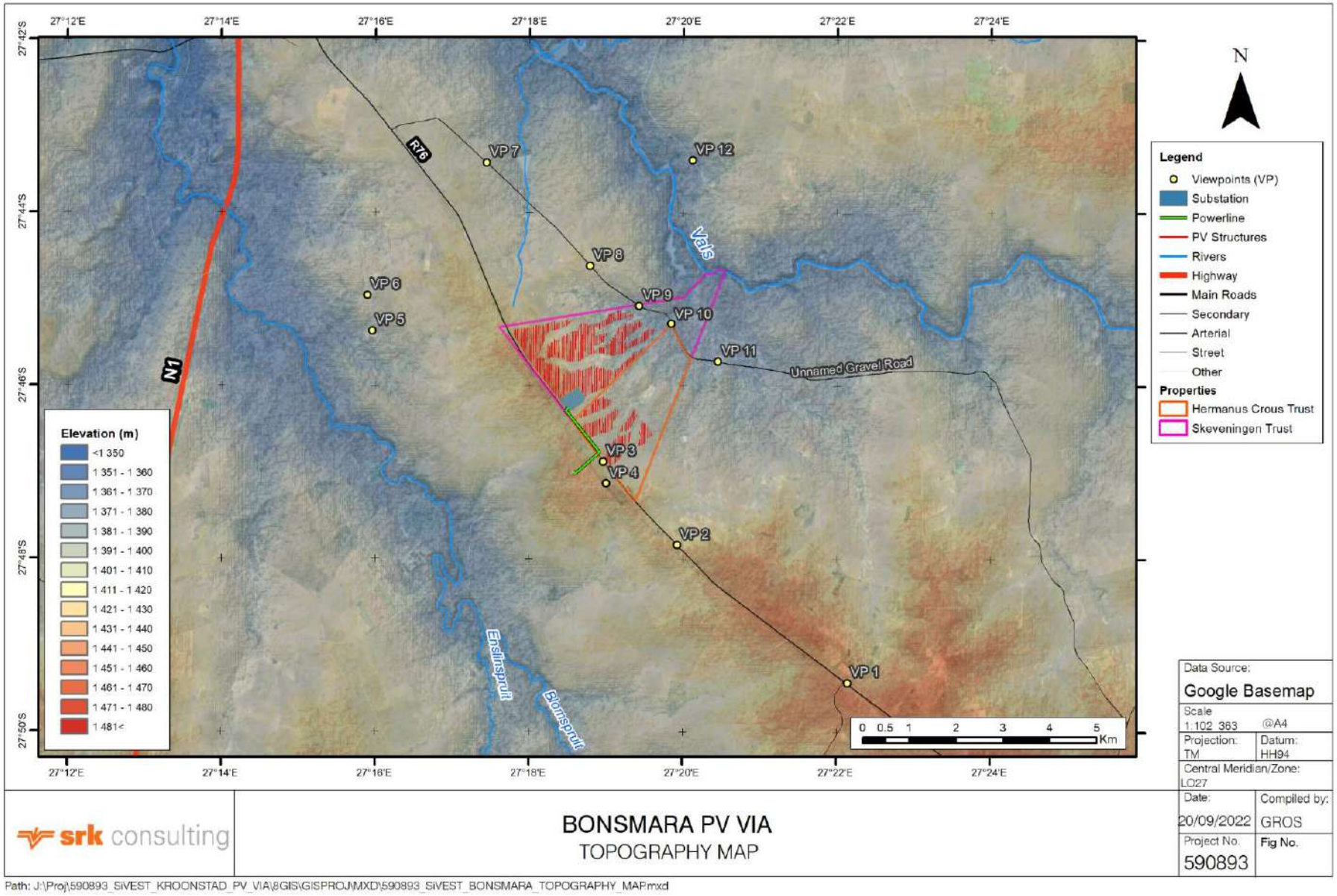


Figure 5-2: Topography map

5.1.3 Land Use

The highveld is home to some of South Africa's most important commercial farming areas, as well as its largest concentration of metropolitan centres. Kroonstad, located ~ 12 km north-west of the site, is the third largest city in the Free State Province. The Free State Province's key economic sectors include agriculture and mining activities, with the province producing over 70% of South Africa's grain.

The area surrounding the site is predominantly characterised by agricultural activities, small urban centres, infrastructure (roads and rail) and natural highveld grassland. Agriculture, mainly crop and cattle farming, is the predominant land use surrounding the site, with farmsteads interspersed throughout the area. National, regional and provincial roads criss-cross the region, converging in Kroonstad. A railway line runs parallel to the R76 (regional road) to the south-west of the site. An existing 132 kV powerline traverses the site in a northeasterly – southwesterly direction (Figure 5-4).

The site is located adjacent to the R76 road connecting the towns of Kroonstad and Steynrus. Surrounding land use includes:

- Agricultural activities including livestock farming (cattle and sheep (Figure 5-3));
- Farmsteads;
- Electrical grid infrastructure including a substation and powerlines (Figure 5-4);
- Serfontein Dam;
- Bossiespruit Military Base;
- Bossiespruit Shooting Range; and
- Kroonstad Airport.

Figure 5-3: Agricultural land to the east of the site. Photo taken at VP11 looking toward the project site.

Figure 5-4: Existing 132 kV powerline extending across the site and over the R76. Photo taken at VP3 looking toward the project.

The two farms that constitute the project site are undeveloped, covered in grasslands and small clusters of trees and used for grazing.

5.2 Visual Character

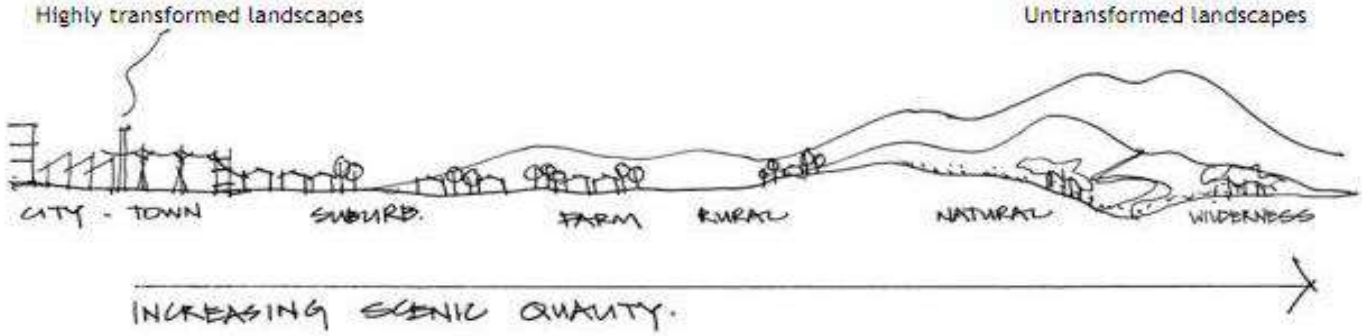
Visual character is descriptive and non-evaluative, which implies that it is based on defined attributes that are neither positive nor negative. It refers to the overall experience and impression of the landscape, such as natural or transformed.

A change in visual character cannot be described as having positive or negative attributes until the viewer's response to that change has been taken into consideration. The probable change caused by the project is assessed against the existing degree of change caused by previous development.

The basis for the visual character is provided by the topography, vegetation and land use of the area, which is a predominantly rural environment characterised by the undulating, vegetated landscape, albeit with pockets of settlements and regional and national roads routed through the surrounding area. The rolling expanse of vegetated landscape surrounding the site evokes a rural, undeveloped environment. The project area can therefore be defined as a modified rural landscape as it is mostly rural but settlements, powerlines and roads and railway are visible in the landscape (Figure 5-5 and Figure 5-6).

Figure 5-5: Modified rural landscape

Highly Transformed Landscape – Urban/Industrial	Transition Landscape	Modified Rural Landscape	Natural Transition Landscape	Untransformed Landscape – Natural
Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure (e.g. powerlines).	Transitional landscape associated with the interface between, rural, agricultural area and more developed suburban or urban zones.	Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings.	A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones.	No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas.



Source: (CNDV, 2006)

(Shan Ding Lu, 2009)

(Night Jar Travel South Africa, 2012)

(Boschkloof, 2012)

Figure 5-6: Typical visual character attributes

5.3 Visual Quality

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Topographic ruggedness and relative relief increases;
- Water forms are present;
- Diverse patterns of grasslands, shrubs and trees occur;
- Natural landscape increases and man-made landscape decreases; and
- Where land use compatibility increases.

The visual quality of the area can be experienced through rolling views of the gentle hills in the landscape, especially from and across the site (Figure 5-7). The study area is defined by the fabric of the agricultural grazing activity taking place in the area. The naturally undulating landscape is intermittently interrupted by powerlines and railway lines which detract from the visual quality of the surrounding area. The streams, rivers and dams in the area add to the somewhat unspectacular visual quality.

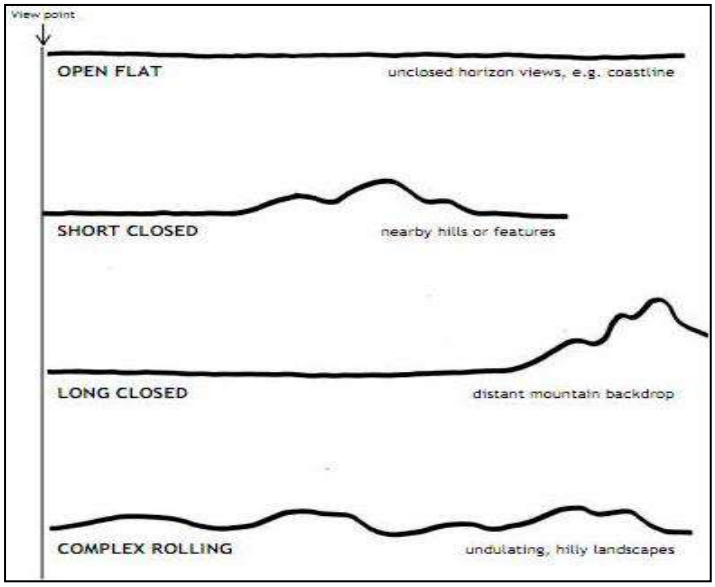


Figure 5-7: Typical views in the landscape

Sources: (CNDV, 2006)

Figure 5-8: Rolling views of the undulating landscape. Photo taken from VP 8 looking toward the project site.

5.4 Visual Receptors

Visual receptors have been identified based on surrounding land uses, including the residential and recreational areas (see Section 5.1.3). The visual receptors are briefly described below and linked to viewpoints (VP) indicated in Table 6-4 and Figure 6-3:

- Surrounding Residents (VP 1, VP 4 - VP 7, VP 11 - VP 12): Isolated farmsteads are interspersed throughout the area surrounding the PV Facility in all directions.
- Railway Passengers and Personnel (VP 1 and VP 4): A railway line extends parallel to the R76 to the south-west of the site.
- Motorists (VP 2 - VP 3, VP 6 - VP 12): Two roads are located in close proximity to the project site; the R76 and the Unnamed Gravel Road. The south-western boundary of the site directly abuts the tarred R76[3], which extends in a north-westerly to south-easterly direction, connecting Kroonstad and Steynrus. The Unnamed Gravel Road branches off from the R76 to the north of the site, then extends in a south-easterly direction, and borders the site to the north-east.

The Serfontein Dam, Bossiespruit Shooting Range and Military Base and Kroonstad Airport were identified within ~10 km from the site. However, the viewshed (Figure 6-1), topographical map (Figure 5-2) and site verification, indicate that receptors at these locations will not have a view of the proposed facility and therefore are not considered to be visual receptors, nor considered further in this VIA.

5.5 Sense of Place

Our sense of a place depends not only on spatial form and quality, but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of 'sense of place' or *genius loci* is identity. An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own" (Lynch, 1992).

[3] At the time of the site visit, the R76 was being re-sealed.

It is often the case that sense of place is linked directly to visual quality and that areas / spaces with high visual quality have a strong sense of place. However, this is not an inviolate relationship and it is plausible that areas of low visual quality may have a strong sense of place or – more commonly – that areas of high visual quality have a weak sense of place. The defining feature of sense of place is uniqueness, generally real or biophysical (e.g. trees in an otherwise treeless expanse), but sometimes perceived (e.g. visible but unspectacular sacred sites and places which evoke defined responses in receptors). In this context Cross (2001) identified six categories of relationships with place: biographical, spiritual, ideological, narrative, cognitive and dependent (Table 5-1).

The region has scenic value in terms of its undulating natural landscape and the views over large portions of agricultural land. The natural landscape and rustic character contrast with the anthropogenic influence in the region, *viz*. urban development, albeit, some 12 km away.

Table 5-1: Relationship to place

Type of Relationship	Process
Biographical (historical and familial)	Being born in and living in a place. Develops over time
Spiritual (emotional, intangible)	Feeling a sense of belonging
Ideological (moral and ethical)	Living according to moral guidelines for human responsibility to place Guidelines may be religious or secular
Narrative (mythical)	Learning about a place through stories, family histories, political accounts and fictional accounts
Cognitive (based on choice and desirability)	Choosing a place based on a list of desirable traits and lifestyle preferences
Dependent (material)	Constrained by lack of choice, dependency on another person or economic opportunity

Sources: Adapted from Cross (2001)

The sense of place of the surrounding area is strongly influenced by the surrounding land use, which can generally be described as a rural agricultural area. The sense of place is not particularly distinct from the rest of the wider region and is not overly memorable.

The relationship of receptors in the study area (Section 5.4) to place may be predominantly biographical and dependent. A family, for example, whose has farmed in this area for a few generations will have a biographical and dependent attachment to the area.

6. ANALYSIS OF THE MAGNITUDE OF THE VISUAL IMPACT

The following section outlines the analysis that was undertaken to determine the **magnitude or intensity** of the overall visual impact resulting from the project. Various factors were considered in the assessment, including:

- Visual exposure;
- Visual absorption capacity;
- Sensitivity of visual receptors;
- Visibility and viewing distance; and

- Integrity with existing landscape / townscape.

The analysis of the magnitude or intensity of the visual impact, as described in this section, is summarized and integrated in Table 6-6 and forms the basis for the assessment and rating of the impact as documented in Section 6.

6.1 Visual Exposure

Visual exposure is determined by the zone of visual influence or viewshed. The viewshed is the topographically defined area that includes all the major observation sites from which the project *could* be visible. The viewshed analysis assumes maximum visibility of the project in an environment stripped bare of vegetation and structures. The viewshed indicates the visibility of the project, accounting for the decrease in visibility as distance from the project increases (Figure 6-1).

It is anticipated that visibility of the PV array will be moderate due to the size and nature of the project (i.e. a large ~390 ha reflective PV array located in a rural area). It is anticipated that the BESS and on-site substation will be visible to receptors to the north-west, south-east and west of the site due to the location of this infrastructure along the south-western boundary of the site. The smaller dimensions of these components are expected to limit their visibility from across the site to the north. The visual exposure of the proposed ~2 km powerline is limited due its short length (~2 km). Furthermore, existing powerlines within close proximity to the proposed powerline route are expected to have inured receptors to powerlines within the landscape.

The viewshed analysis shows the proposed PV array will be highly visible from the few elevated areas to the north-east, east and south-east of the site. Few of the isolated farmsteads surrounding the site are located within areas identified as having visibility of the site (Figure 6-4). Motorists on the R76 will have a view of the project when travelling adjacent to the south-western boundary of the site, however beyond this portion of the R76 motorists will have limited visibility of the project.

The visual exposure of proposed infrastructure is thus deemed ***moderate.***

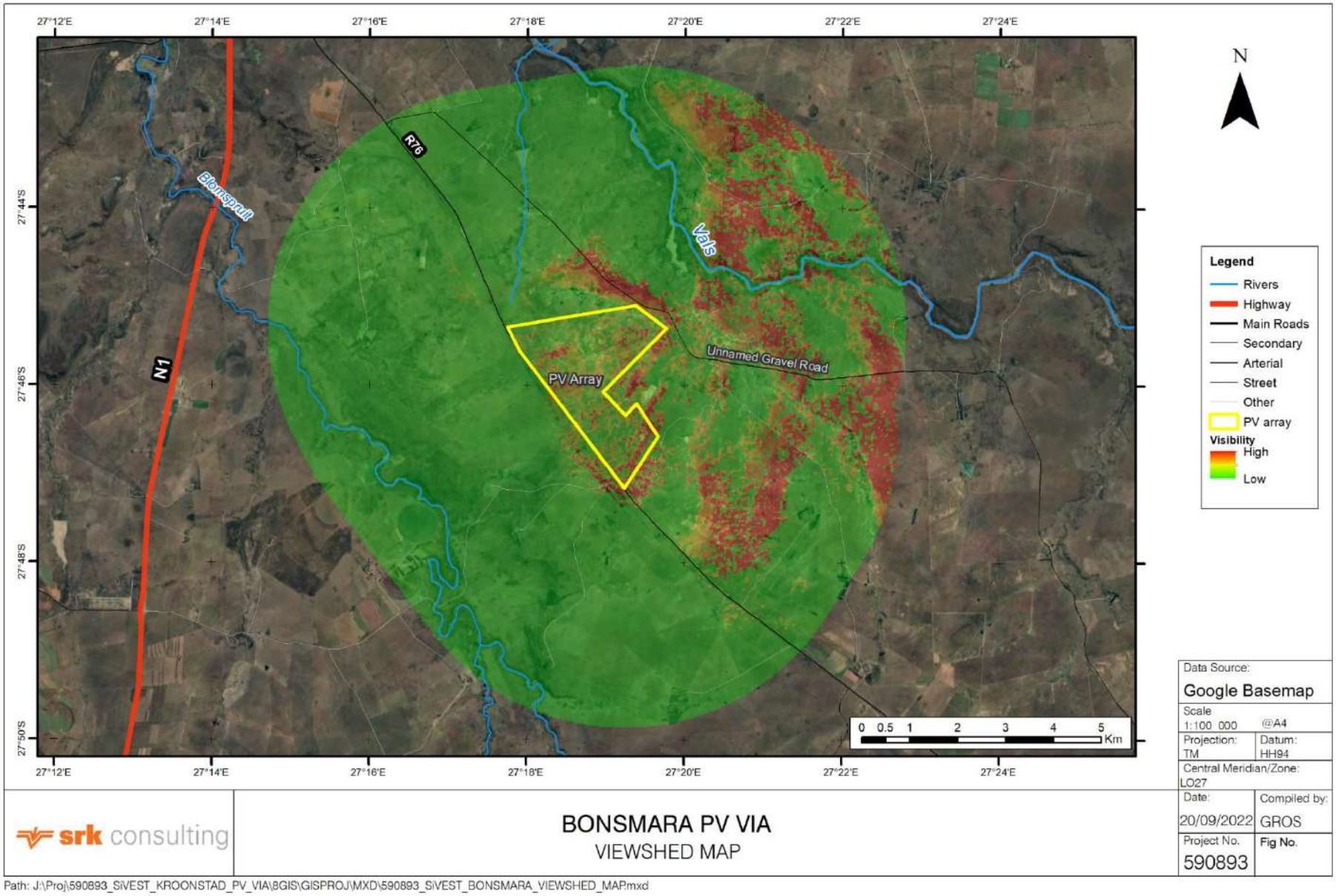


Figure 6-1: Viewshed

6.2 Visual Absorption Capacity

The VAC is the potential for an area to conceal and assimilate the proposed project. Criteria used to determine the VAC of the affected area are defined in Table 6-1. The VAC of an area is increased by:

1. Topography and vegetation that is able to provide screening and increase the VAC of a landscape;
2. The degree of urbanisation compared to open space. A highly urbanised landscape is better able to absorb the visual impacts of similar developments, whereas an undeveloped rural landscape will have a lower VAC; and
3. The scale and density of surrounding development.

These factors frequently apply at different scales, by influencing the VAC in the foreground (e.g. dense bush, existing roads and bridges, small structures), middleground and background (e.g. tall forests, hills, cityscapes).

Generally rural areas have a lower VAC, however the VAC of the project area is marginally increased by undulating topography and - to a far more limited extent - by grassland (veld) and small clusters of trees, providing screening to the project. The low vertical profile of the PV panels is anticipated to increase the screening potential of the vegetation and topography. However, vegetation is not able to provide screening to the associated infrastructure such as the substation and pylons (associated with the powerline). The undulating topography will marginally absorb the associated infrastructure.

Urban development can help to increase VAC, but is some distance from the project site, reducing this effect. In addition, the large ~390 ha footprint of the PV array also reduces the VAC.

The study area has a ***low*** VAC for the PV Facility and a ***moderate*** VAC for the proposed powerline.

Table 6-1: Visual absorption capacity criteria

High	Moderate	Low
The area is able to absorb the visual impact as it has: ▪ Undulating topography and relief ▪ Good screening vegetation (high and dense) ▪ Is highly urbanised in character (existing development is of a scale and density to absorb the visual impact).	The area is moderately able to absorb the visual impact, as it has: ▪ Moderately undulating topography and relief ▪ Some or partial screening vegetation ▪ A relatively urbanised character (existing development is of a scale and density to absorb the visual impact to some extent.	The area is not able to absorb the visual impact as it has: ▪ Flat topography ▪ Low growing or sparse vegetation ▪ Is not urbanised (existing development is not of a scale and density to absorb the visual impact to some extent.)
 http://www.franschhoek.co.za	 http://wikipedia.org	 http://www.butbn.cas.cz
 http://commons.wikimedia.org	 http://blogs.agu.org	 http://fortheinterim.com

6.3 Sensitivity of Visual Receptors

Receptors are important insofar as they inform visual sensitivity. The sensitivity of viewers is determined by the number and nature of viewers.

Viewers can be deemed to have:

1. High sensitivity if they view the project from e.g. residential areas, nature reserves and scenic routes or trails;
2. Moderate sensitivity if they view the project from e.g. sporting or recreational areas or places of work; and
3. Low sensitivity if they view the project from or within e.g. industrial, mining or degraded areas, or are transient viewers on roads.

The sensitivity of potential viewers identified in Section 5.4 is described below:

- **Surrounding Residents:** Residents of the surrounding farmsteads are considered to have sensitivities ranging from low to medium depending on the proximity to the project site. Residents located more than 1km away from the site are anticipated to view the site in the background.
- **Railway passengers and personnel:** Passengers and personnel travelling by rail are anticipated to have a view of the site from certain sections of the railway route where screening by vegetation and topography does not exist. Railway passengers and personnel are considered to have relatively low sensitivity as their views of the project are transient (fleeting) and temporary.
- **Motorists:** Two roads are located in close proximity to the project site (Figure 1-1). The R76 extends in a north-westerly and south-easterly direction and is directly adjacent to the ~4 km long south-western boundary of the site. The R76 connects Kroonstad and Steynrus. Gravel roads branch off the R76 and lead to farms set back from the R76. The Unnamed Gravel Road connecting to the R76 to the north of the site, abuts to the north-eastern boundary of the site. This gravel road leads to various farms located between the R76, to the south, and the Vals River to the north (Figure 1-1).

  Motorists are considered to have relatively low sensitivity as their view of the project is fleeting and temporary.

The sensitivity of the visual receptors potentially affected by the visual impact of the project is considered to be ***moderate*** due to the distance from farmsteads, and proximity to roads and rail infrastructure. It is anticipated that the visual receptors will be more sensitive to the PV array, on-site substation and BESS than the proposed powerline due to the (familiarity with) existing powerlines in the landscape.

6.4 Viewing Distance and Visibility

The distance of a viewer from an object is an important determinant of the magnitude of the visual impact. This is because the visual impact of an object diminishes / attenuates as the distance between the viewer and the object increases. Thus, the visual impact at 1 000 m would, nominally, be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m (Hull and Bishop, 1988 in (Young, 2000)).

Three basic distance categories can be defined for a project of this scale (as discussed and represented in Table 6-2): foreground, middleground and background.

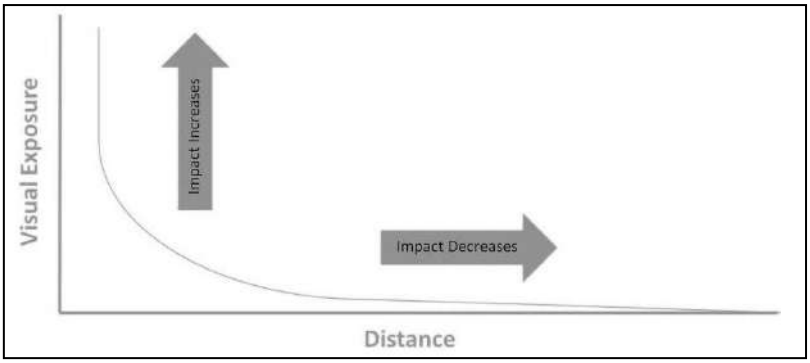


Figure 6-2: Visual exposure vis-à-vis distance

Sources: Adapted from Hull and Bishop, 2998 in (Young, 2000)

Table 6-2: Distance categories

FOREGROUND (0 – 2 km)	The zone where the proposed project will dominate the frame of view. The project will be *highly visible* unless obscured.
MIDDLEGROUND (2 - 5 km)	The zone where colour and line are still readily discernible. The project will be *moderately visible* but will still be easily recognisable.
BACKGROUND (5 -10 km)	This zone stretches from 2 km to 5 km. Objects in this zone can be classified as *marginally visible* to *not visible*.

A number of viewpoints were selected to indicate locations from where receptors may (or may not) view the project. The viewpoints are shown in Figure 6-3 and listed in Table 6-4. Current views from these points are shown in Appendix C.

The predicted visibility of (any element of the project) from each viewpoint is described in Table 6-4, based on visibility and the distance categories in Table 6-2. Note that unlike visual exposure (Section 6.1) which describes areas from which the project may be visible without taking local screening into account (i.e. the viewshed), visibility describes predicted, actual visibility. The visibility of the project can be summarised as follows:

- The project will be highly visible in the foreground to motorists travelling to the east and west of the site (VP 3, VP 9, VP 10);
- The project will be partially screened to motorists and railway passengers travelling to the west and south-east of the site by an vegetation; and
- The project will marginally visible / not visible to surrounding residents largely due to topography screening the site and distance from the site.

Overall, the visibility of the project is ***moderate*** due to the number of receptors in the foreground and middleground, albeit transient and temporary receptors.

Table 6-3: Visibility criteria

NOT VISIBLE	Project cannot be seen	
MARGINALLY VISIBLE	Project is only just visible / partially visible (usually in the background zone)	
VISIBLE	Project is visible although parts may be partially obscured (usually in middleground zone)	
HIGHLY VISIBLE	Project is clearly visible (usually in foreground or middleground zone)	

Table 6-4: Visibility from viewpoints

Viewpoint #	Location	Co-ordinates	Direction of view	Potential Receptors	Visibility
VP 1	Dennehof Farm	27° 49' 25.79"S 27° 22' 8.58"E	Looking north-west	Farmsteads on Dennehof Farm and motorists on R76.	**Not Visible** The site is visible from the farmstead and R76 due the undulating topography.
VP 2	R76 south	27° 47' 50.49"S 27° 19' 55.40"E	Looking north	Motorists on R76.	**Marginally Visible** The site is screened by tall, mature trees, limiting visibility of the site in the background from this VP.
VP 3	R76 Bonsmara	27° 46' 52.61"S 27° 18' 57.81"E	Looking north-east	Motorists on R76.	**Highly Visible** The site is visible to motorists in the foreground.
VP 4	Patrijsdraai Farm	27° 47' 7.95"S 27° 18' 59.98"E	Looking north-east	Residents of farms to the west of the R76, e.g. Patrijsdraai and individuals travelling on the railway.	**Visible** The site is visible to motorists travelling to and from the farmsteads to the west and receptors travelling by train. The project will not be visible to the residents to the west of the site as they are located at a lower elevation than the site.
VP 5	Farmstead 1	27° 45' 22.08"S 27° 15' 57.63"E	Looking south-east	Residents of Farmstead.	**Not Visible** The site is not visible to the residents of this farmstead as it is located at a lower elevation than the site.
VP 6	Lan Crest	27° 44' 57.43"S 27° 15' 53.72"E	Looking south- east	Residents of Lan Crest and motorists.	**Not Visible** The site is not visible to the residents or motorists as the farmstead and road are located at a lower elevation than the site
VP 7	Farmstead 2	27° 43' 25.46"S 27° 17' 26.58"E	Looking south	Motorists travelling on the gravel road and residents of the farmstead in close proximity to VP 7.	**Not Visible** The site is not visible to the farmstead due to screening provided by the topography.
VP 8	Unnamed Gravel Road	27° 44' 36.89"S 27° 18' 47.25"E	Looking south	Motorists on unnamed gravel road.	**Visible** The site is visible to the motorists in the background.
VP 9	Unnamed Gravel Road	27° 45' 4.81"S 27° 19' 25.68"E	Looking south-west	Motorists on unnamed gravel road	**Highly Visible** The site is visible to the motorists in the foreground.
VP 10	Unnamed Gravel Road	27° 45' 16.95"S 27° 19' 50.77"E	Looking west	Motorists on unnamed gravel road.	**Highly Visible** The site is visible to the motorists in the middleground.

Viewpoint #	Location	Co-ordinates	Direction of view	Potential Receptors	Visibility
VP 11	Farmstead 3	27° 45' 43.29"S 27° 20' 27.21"E	Looking west	Residents of the farmstead and motorists on unnamed gravel road.	**Marginally Visible** The site will be marginally visible to the motorists in the background.
VP 12	Farmstead 4	27° 43' 23.84"S 27° 20' 7.01"E	Looking south-west	Residents of farmstead and motorists.	**Not Visible** The site is not visible to the farmstead and motorists due to screening provided by the topography.

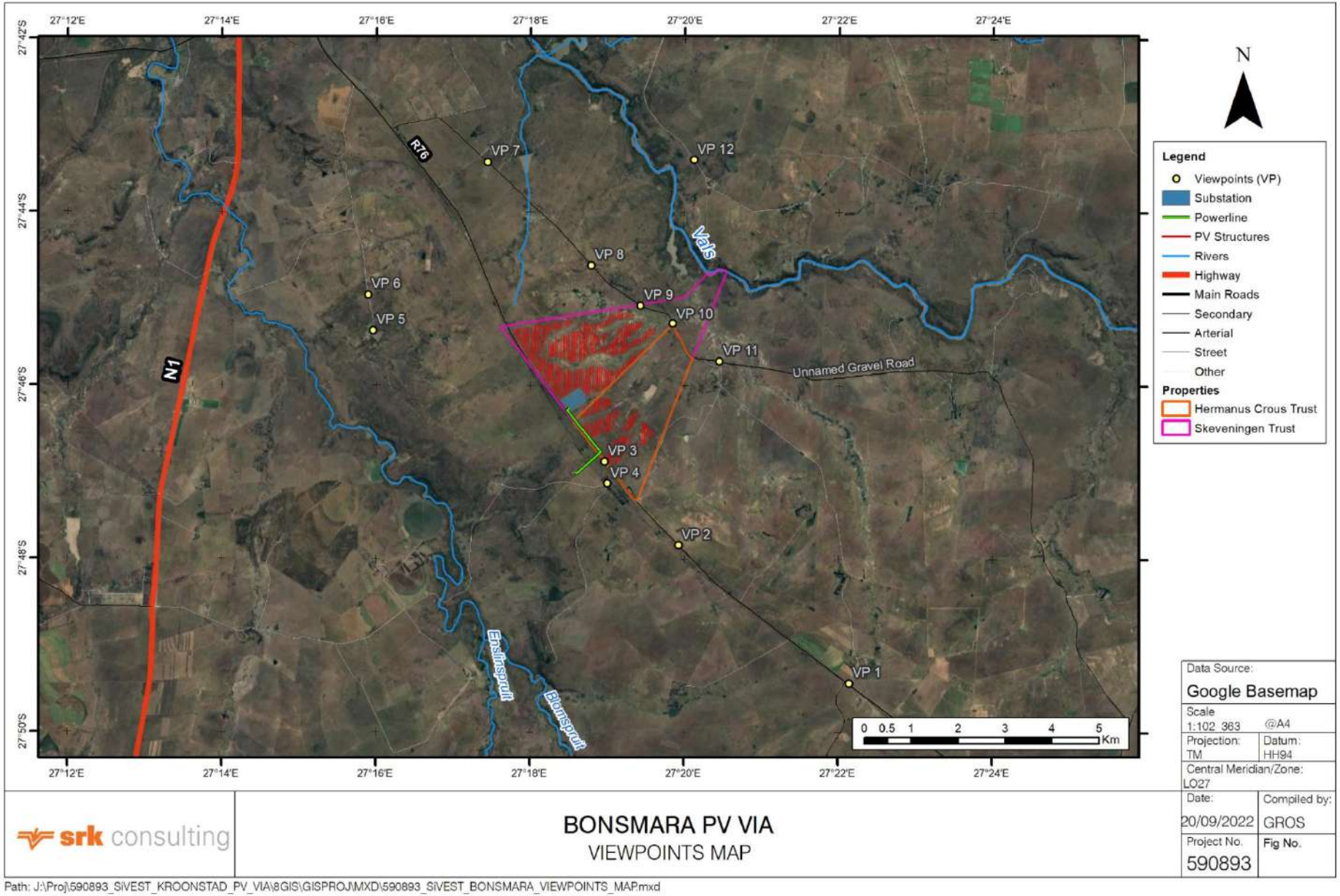


Figure 6-3: Viewpoints

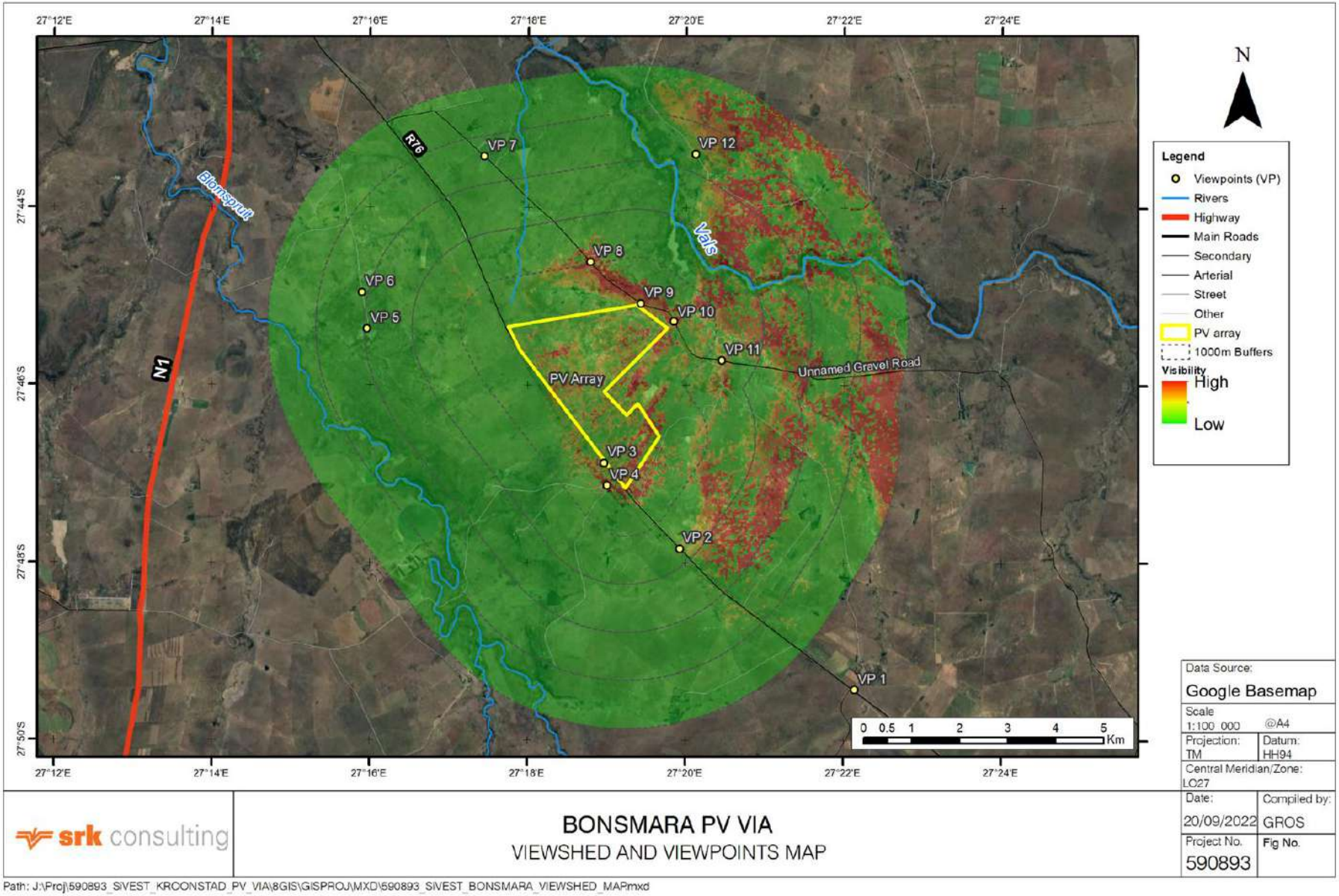


Figure 6-4: Viewshed and viewpoints

6.5 Compatibility with Landscape Integrity

Landscape (or townscape) integrity refers to the compatibility of the development / visual intrusion with the existing landscape. The landscape integrity of the project is rated based on the relevant criteria listed in Table 6-5.

Table 6-5: Landscape integrity criteria

Criterion	Landscape integrity		
	High	**Moderate**	**Low**
	The project is:		
Consistency with existing land use of the area	Consistent	Moderately consistent	Not consistent / very different
Sensitivity to natural environment	Highly sensitive	Moderately sensitive	Not sensitive
Consistency with urban texture and layout	Consistent	Moderately consistent	Not consistent / very different
Congruence of buildings / structures with / sensitivity to existing architecture / buildings	Congruent / sensitive	Moderately congruent / sensitive	Not congruent / sensitive
Scale and size relative to nearby existing development	Similar	Moderately similar	Different

The proposed project is located within a rural, agricultural area with sprawling grasslands surrounding the proposed project site. A railway line extends parallel to the R76, directly adjacent to the south-western boundary of the site. Existing powerlines, of varied sizes, criss-cross the area surrounding the site, and a substation is located adjacent to the R76 ~ 3 km to the south of the site.

The proposed PV array will introduce a large, uniform, reflective facility into the area and will be discordant with the current land use, scale and texture of the surrounding area. The BESS will also introduce a novel structure into the landscape that is different and incongruent to the type, size and scale of the existing land use and development in the area. However, the on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site.

The project is deemed to have ***low*** integrity with the surrounding landscape.

6.6 Magnitude of the Overall Visual Impact

Based on the above criteria, the magnitude or intensity of the overall visual impact that is expected to result from the project has been rated. Table 6-6 provides a summary of the criteria, a descriptor summarising the status of the criteria and projected impact magnitude ratings.

The overall magnitude of the visual impact that is expected to result from the project is rated as ***moderate***. The moderate visual exposure, low compatibility with landscape integrity and low VAC (for the PV Facility) are moderated by the moderate viewer sensitivity and viewing distance, with the project largely screened by vegetation and / or landscape to residents of the surrounding farmsteads.

Table 6-6: Magnitude of overall visual impact

Criteria	Rating	Comments
Visual Exposure (Viewshed)	Moderate	The project area will be highly visible from the few elevated areas to the north-east, east and south-east of the site. Few of the isolated farmsteads surrounding the site are located within areas identified as having visibility of the site. Motorists on the R76 will have a view of the site when travelling adjacent to the south-western boundary of the site, however beyond this portion of the R76 motorists will have limited visibility.
Visual Absorption Capacity	Low (PV Facility) and Moderate (Powerline)	The VAC of the area is marginally increased by the undulating topography, and - to far more limited extent – by the grassland (veld) and small clusters of trees, providing screening to the project. The low vertical profile of the PV panels is anticipated to increase the screening potential of the vegetation and topography. However, the vegetation is not able to provide screening to the associated infrastructure such as the substation and pylons. The undulating topography will marginally absorb the associated infrastructure.
Viewer Sensitivity (Receptors)	Moderate	Due to the distance of the project from farmsteads (moderately sensitive receptors) and the proximity to roads and rail infrastructure, the viewer sensitivity is considered moderate. It is anticipated that the visual receptors will be more sensitive to the PV array, on-site substation and BESS than the proposed powerline due to the (familiarity with) existing powerlines in the landscape.
Viewing Distance and Visibility	Moderate	A number of receptors in the foreground and middleground are affected.
Landscape Integrity	Low	The proposed PV array will introduce a large, uniform, reflective facility into the area and will be discordant with the current land use, scale and texture of the surrounding area. The BESS will also introduce a novel structure into the landscape that is different and incongruent to the type, size and scale of the existing land use and development in the area. The on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site.

7. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

The following section describes the potential visual impacts during the construction and operational phases, and assesses the significance of these impacts utilising the impact rating methodology presented in Appendix B.

Possible measures to avoid, mitigate or compensate visual impacts are considered and recommended, depending on the severity of impacts and the feasibility of measures. The mitigation hierarchy and generic, guideline measures are provided below (DEA&DP, 2005):

- Avoid, e.g. by re-examining the need for the proposed project, relocating the project or re-designing the project;
- Mitigate (reduce), e.g. through adjustments to the siting and design of the project, careful selection of finishes and colours, use of earthworks (such as berms) and planting to provide visual screening and dust control where required;
- Rehabilitate and restore, e.g. through on-site and off-site landscape rehabilitation of areas affected by the project, which may include re-instating landforms and natural vegetation, provision of landscaped open space etc.;
- Compensate and offset, where avoidance or mitigation cannot achieve the desired effect; and
- Enhance, where the proposed project is located in run-down areas or degraded landscapes.

The project relates to the greenfield development of a PV Facility and associated infrastructure (i.e. powerline, on-site substation and BESS) and the potential visual impacts are more extensive than they would be for a brownfield project.

Direct visual and aesthetic impacts are likely to result from the following project interventions and/or activities:

- Earthworks and construction activities (including clearing of vegetation and associated generation of dust);
- Altered sense of place caused by the project;
- Visual intrusion diminishing vistas across the project area; and
- Increased light pollution.

The visual and aesthetic impacts generated by the project are likely to be associated with visual intrusion and visual quality.

Impacts of the PV Facility components[4] and the grid connection component (132 kV powerline and on-site substation) are assessed separately.

7.1 Construction Phase – PV Facility Components

7.1.1 Altered Sense of Place and Visual Intrusion caused by Construction of the PV Facility

Visual impacts will be generated by construction activities such as earthworks (which can generate dust) and from construction infrastructure, plant and materials on site (e.g. site camp, plant and machinery, and stockpiles of excavated material). Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.

Construction activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

[4] As noted in Section 3.2, the PV Facility components include the PV array, BESS, auxiliary buildings and internal grid connection infrastructure.

These construction phase impacts are anticipated to affect adjacent residential receptors to a larger degree than motorists on the R76 or the Unnamed Gravel Road, as their experience of the area is fleeting.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

7.2 Construction Phase – Grid Connection

7.2.1 Altered Sense of Place and Visual Intrusion caused by Construction of the Grid Connection

Visual impacts will be generated by construction activities such as earthworks (which can generate dust) and from construction infrastructure and plant on site (e.g. plant and machinery, and stockpiles of excavated material). Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site and powerline alignment, during the construction period.

Construction activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts. Furthermore, these receptors are likely to be motorists travelling on the R76 and are less sensitivity visual receptors due to their experience of the area being fleeting.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

7.3 Operational Phase – PV Facility Components

7.3.1 Altered Sense of Place and Visual Intrusion caused by the PV Array

The PV array will have a development footprint of ~ 390 ha, and may be perceived as conflicting with the current landscape of the grassland and treescapes. While there is some evidence of anthropogenic influence within the surrounding area, there is limited development at the proposed density and type. As such, the proposed PV array is anticipated to interrupt and/or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion across the landscape.

Visual receptors north and south-west (VP 3 - VP 4, VP 8 - VP 10) are expected to experience the PV array as a significant transformation in the landscape, with the PV array visible in the foreground or middle ground (though not obstructing views).

From further afield where the PV array is visible in the background (VP 2 and VP 11), the vertical dimensions of the PV array are almost indiscernible.

The impact is assessed to be of ***high*** significance and with the implementation of mitigation is reduced to ***medium*** (Table 7-2).

7.3.2 Altered Sense of Place and Visual Intrusion caused by the BESS and Internal Grid Infrastructure

The PV Facility will include a BESS and internal grid connections (e.g. 33 kV powerlines). Where possible, the powerlines will be installed underground. While there are a few existing powerlines that traverse the landscape surrounding the site, the proposed powerlines will increase the density of powerlines.

Shipping containers are typically used to house the BESS components. Viewed from a distance, shipping containers are not dissimilar from farmstead buildings. However the BESS (containers) typically cover an area of ~2 ha. As such, the new BESS and internal grid connection are anticipated to contribute to visual clutter on the site and introduce different structures into the landscape, therefore negatively impact the sense of place and presenting as a visual intrusion across the landscape.

Visual receptors to the north-east and south of the site (VP 8, VP 9, VP 11 and VP 5) are expected to have a view of the BESS, substation and internal grid infrastructure, or part thereof, and therefore experience it as a significant transformation in the landscape.

The impact is assessed to be of ***medium*** significance with and without the implementation of mitigation (Table 7-2).

7.3.3 Altered Visual Quality caused by Light Pollution at Night

Lighting will be installed along the perimeter of the PV array(s) and / or around the BESS to improve security.

The installation of lighting on the site perimeter and / or around the BESS will generate nightglow across the natural, undeveloped site and beyond. As such, the introduction of lighting on the site alters the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.

Lighting is not easily screened by vegetation or topography, and the proposed lighting for the PV Facility is anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

7.4 Operational Phase – Grid Connection

7.4.1 Altered Sense of Place and Visual Intrusion caused by the Grid Connection

The ~2 km long 132 kV powerline will connect the on-site substation to the Kroonstad switching station ~ 1.5 km to the south of the site. The ~ 15 ha on-site substation will be located adjacent to the south-western boundary of the site.

Due to the short length of the powerline and routing adjacent to an existing powerline, the proposed powerline is not anticipated to add to visual intrusion, nor impact the views of receptors. Furthermore, the proposed powerline may be partially obscured by the existing powerline. An existing substation is located adjacent to the R76, ~2 km south of the proposed project. The proposed substation will therefore not be a novel structure, but will contribute to visual intrusion and visual clutter in the landscape.

The impact is assessed to be of ***low*** significance with and without the implementation of mitigation (Table 7-3).

7.4.2 Altered Visual Quality caused by Light Pollution at Night

Lighting will be installed around the substation to improve security.

The installation of lighting around the substation is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.

Lighting is not easily screened by vegetation or topography, and the proposed lighting for the substation is anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

7.5 Decommissioning Phase – PV Facility Components

7.5.1 Altered Sense of Place caused by Decommissioning Activities

While the proposed PV Facility and associated infrastructure are anticipated to operate in the long-term, when decommissioning is required, visual impacts will be generated.

The decommissioning of the PV Facility and associated infrastructure will include earthworks, the movement of plant and equipment on site (e.g. plant and machinery, and stockpiles of excavated and salvaged material). Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.

Decommissioning activities will have a greater affect within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

These decommissioning impacts are anticipated to impact adjacent residential receptors to a larger degree than motorists on the R76 or the Unnamed Gravel Road, as their experience of the area is fleeting.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

7.6 Decommissioning Phase – Grid Connection

7.6.1 Altered Sense of Place caused by the Decommissioning Activities

While the proposed powerline is anticipated to operate in the long-term, when decommissioning is required visual impacts will be generated.

The decommissioning of the powerline will include earthworks, the movement of plant and equipment on site (e.g. plant and machinery, and stockpiles of excavated/salvaged material). Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.

Decommissioning activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

These decommissioning impacts are anticipated to impact adjacent residential receptors to a larger degree than motorists on the R76, as their experience of the area is transient.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

7.7 Cumulative Impacts

7.7.1 Introduction

For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors'.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities, in this case effects of other renewable energy facilities and large-scale infrastructure projects.

7.7.2 Cumulative Impacts Analysis

In addition to the project, other past, present and future activities have taken place or are proposed within a 35 km radius of the project site that might have caused or may cause impacts and may interact with impacts caused by the project. These are briefly discussed in this section.

Two approved and three proposed PV facilities and associated grid connection infrastructure projects within a 35 km radius of the proposed project site are listed on the Department of Forestry, Fisheries and the Environment (DFFE) South African Renewable Energy EIA Application Database (DFFE, 2022). These projects are listed in Table 7-1 and their location shown in Figure 7-1.

Table 7-1: PV projects within a 35 km radius of the project site

Facility Name / Description	**Status**	**MW**	**Approximate Footprint**
Rondavel Solar Facility	Approved	100 MW	~3 500 ha
Steynrus Solar Facility	Under Amendment	5 MW	~350 ha
Vrede Solar Facility	In process	100 MW	~540 ha
Heuningspuit PV1 Facility	In process	5 MW	~140 ha
Heuningspuit PV2 Facility	In process	5 MW	~175 ha
		Total	**~4 705 ha**

No Wind Energy Facility (WEF) projects within 35 km of the site are listed on the DFFE South African Renewable Energy EIA Application Database.

There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations

associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV Facility and other proposed facilities listed above have a combined footprint of ~4 705ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV facilities, which mitigates cumulative impacts.

SiVEST's Impact Assessment methodology has been used to evaluate the cumulative visual impacts of the project on the sense of place of the surrounding 35 km radius. The cumulative impact of the PV Facility and the 132 kV powerline is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2 and Table 7-3).

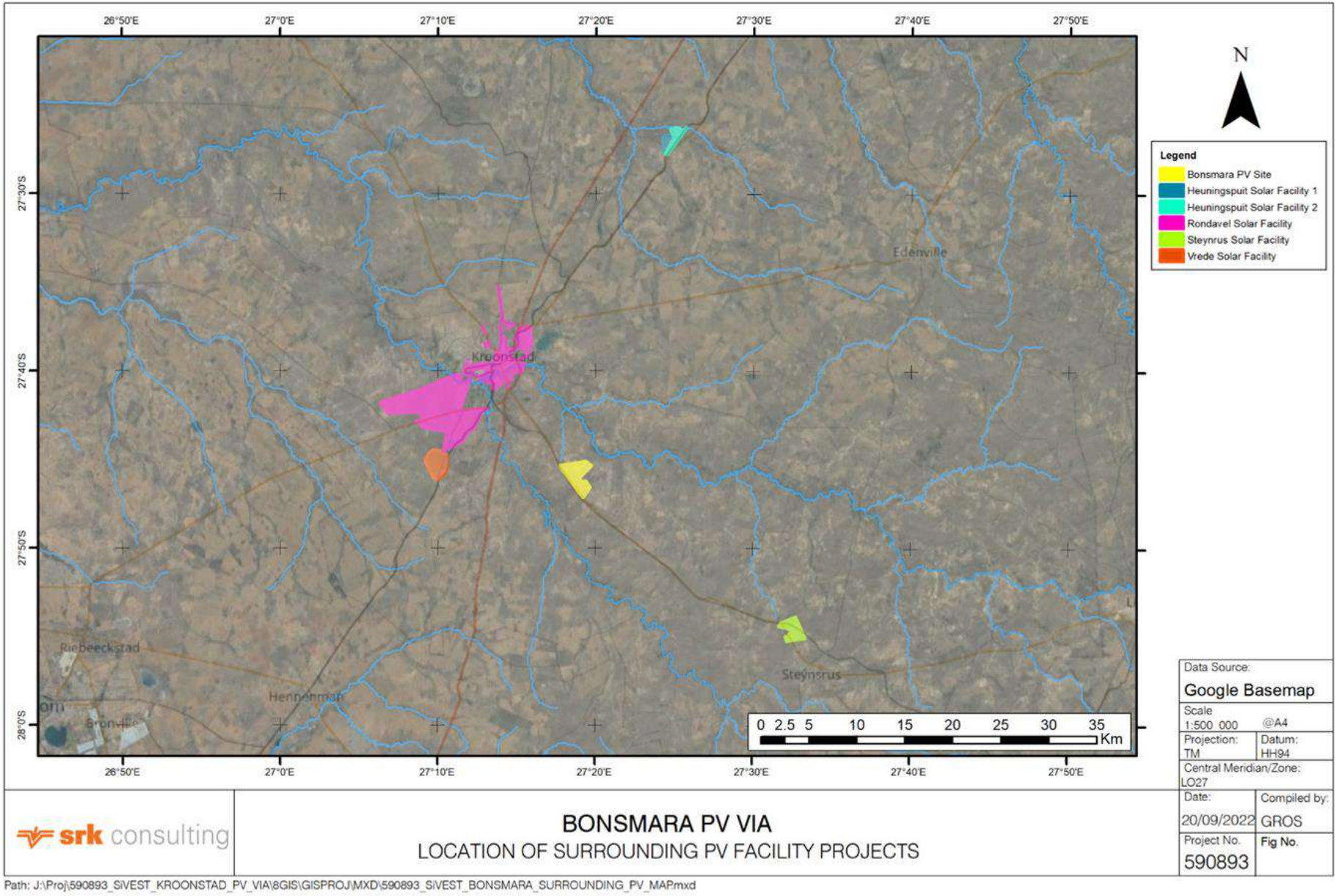


Figure 7-1: Location of surrounding PV Facility projects

7.8 Overall Impact Rating

The impact assessment and ratings for the PV Facility and 132 kV powerline are summarised in Table 7-2 and Table 7-3 below.

Table 7-2: Rating of impacts – PV Facility Components

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
Construction Phase																				
Altered Sense of Place and Visual Intrusion caused by Construction Activities	Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.	2	4	1	2	1	3	30	-	Medium	• Limit vegetation clearance and the footprint of construction to what is absolutely essential. • Consolidate the footprint of the construction camp to a functional minimum. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregates and sand covered to minimise dust generation. • Keep construction site tidy.	2	3	1	2	1	2	18	-	Low
Operational Phase																				
Altered Sense of Place and Visual Intrusion caused by the PV Array	The development of this PV array may be perceived as conflicting with the current landscape of the grassland and treescapes. The proposed PV Facility is anticipated to interrupt and/or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion across the landscape.	2	4	2	3	3	3	42	-	Medium	• Plant vegetation (that will reach >3 m in height) or establish a vegetated berm (>3 m in height) along the south-western boundary of the site bordering the R76 upon completion of construction.	2	3	2	2	3	2	24	-	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
Altered Sense of Place and Visual Intrusion caused by the BESS, Substation and Internal Grid Infrastructure	The BESS and internal grid connections (where possible will be installed underground). is anticipated to contribute to visual clutter on the site and therefore negatively impact the sense of place and present as a visual intrusion across the landscape.	2	4	2	3	3	2	28	-	Medium	• Plant vegetation (that will reach >3 m in height) or establish a vegetated berm (>3 m in height) along the south-western boundary of the site bordering the R76 upon completion of construction. • Fence the perimeter of the site with a green or black fencing. • Ensure that the roof colour of the proposed buildings blends into the landscape.	2	3	2	2	3	2	24	-	Medium
Altered Visual Quality caused by Light Pollution at Night	The installation of lighting on the site perimeter and / or around the BESS will generate nightglow across the natural, undeveloped site and beyond. Lighting is not easily screened by vegetation or topography, and the proposed lighting for the PV Facility is anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area.	2	4	1	3	3	3	39	-	Medium	• Reduce the height of lighting masts to a workable minimum. • Direct lighting inwards and downwards to limit light pollution.	2	3	1	2	3	2	22	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
Decommissioning Phase																				
Altered Sense of Place caused by the decommissioning activities	Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	2	4	1	2	1	3	30	-	Medium	• Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregates and sand covered to minimise dust generation. • Keep site tidy.	2	3	1	2	1	2	18	-	Low
Cumulative Impact																				
Altered Sense of Place caused by the PV Facility	There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV Facility and other proposed facilities listed above have a combined footprint of approximately ~4 705 ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV	2	4	1	3	3	2	26	-	Medium	• Encourage other project owners to implement measures to mitigate the impact of these projects on visual intrusion and altered sense of place, such as screening (vegetation and/or berms) and limit the light pollution generated by these facilities.	2	3	1	2	3	2	22	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
	facilities, which mitigates cumulative impacts.																			

Table 7-3: Rating of impacts – grid connection

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
Construction Phase																				
Altered Sense of Place and Visual Intrusion caused by Construction Activities	Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site and powerline alignment, during the construction period.	2	4	1	2	1	3	30	-	Medium	• Limit vegetation clearance and the footprint of construction to what is absolutely essential. • Consolidate the footprint of the construction camp to a functional minimum. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregates and sand covered to minimise dust generation. • Keep construction site tidy.	2	3	1	2	1	2	18	-	Low
Operational Phase																				
Altered Sense of Place and Visual Intrusion caused by the Grid Connection	The proposed powerline is not anticipated to add to visual intrusion, nor impact the views of receptors. The substation will not be a novel structure in the landscape, but will contribute to visual intrusion and visual clutter in the landscape.	2	3	2	2	3	1	12	-	Low	• Do not install or affix lights on pylons.	2	2	2	2	3	1	11	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
Altered Visual Quality caused by Light Pollution at Night	The installation of lighting around the substation is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.	2	4	1	3	3	3	39	-	Medium	• Reduce the height of lighting masts to a workable minimum. • Direct lighting inwards and downwards to limit light pollution.	2	3	1	2	3	2	22	-	Low
Decommissioning Phase																				
Altered Sense of Place caused by the Decommissioning Activities	Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	2	4	1	2	1	3	30	-	Medium	• Limit vegetation clearance and the footprint of construction to what is absolutely essential. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregates and sand covered to minimise dust generation. • Keep site tidy.	2	3	1	2	1	2	18	-	Low
Cumulative Impact																				
Altered Sense of Place caused by the Grid Connection	There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual	2	4	2	3	3	2	28	-	Medium	• Encourage other project owners to implement measures to mitigate impacts of the powerlines and substations on the visual intrusion and altered sense of place, such as no affixing lights to powerlines and routing the powerlines within corridors.	2	3	2	2	3	2	24	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ /-)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ / -)	S
	landscape. The Bonsmara PV Facility and other proposed facilities listed above have a combined footprint of approximately ~4 705 ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV facilities, which mitigates cumulative impacts.																			

7.9 Input into the EMPr

Table 7-4 provides a description of the key monitoring recommendations for each mitigation measure identified for each phase of the project for inclusion in the EMPr or Environmental Authorisation (EA).

Table 7-4: EMPr measures

Impact / Aspect	Mitigation / Management Actions	Responsibility	Methodology	Mitigation / Management Objectives and Outcomes	Frequency
Construction Phase					
Visual Quality (PV Facility and Grid Connection)	• Limit vegetation clearance and the footprint of construction to what is absolutely essential.	Contractor	• Plan which areas require the clearance of vegetation. • Only clear the vegetation when works in the area will be undertaken.	• Limit deterioration of visual quality.	Throughout construction
	• Consolidate the footprint of the construction camp to a functional minimum.		• Ensure that the construction camp is consolidated during the design phase		
	• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.		• During very windy conditions cease excavation, handling and transportation of materials which may generate dust.		
	• Keep stockpiled aggregates and sand covered to minimise dust generation.		• Stockpile all aggregates and sand. • Keep stockpiles covered when not in use.		
	• Keep construction site tidy.		• Implement measures to keep the site tidy.	• Limit visual clutter and deterioration of visual quality.	
Operational Phase					
Altered Sense of Place and Visual Intrusion (PV Facility)	• Plant vegetation (that will reach >3 m in height) or establish a vegetated berm (>3 m in height) along the south-western boundary of the site bordering the	Developer	• Plant vegetation to screen the site from the motorists travelling on the R76. • Incorporate the berm requirements in the design.	• Limit visual intrusion and altered sense of place.	On completion of construction activities. Throughout operation.

Impact / Aspect	Mitigation / Management Actions	Responsibility	Methodology	Mitigation / Management Objectives and Outcomes	Frequency
	R76 upon completion of construction.				
	• Install the 33 kV powerlines underground, where possible.	Developer	• Incorporate underground powerlines in the design.		
	• Fence the perimeter of the site with a green or black fencing.	Developer	• Install a perimeter fence.		
	• Ensure that the roof colour of the proposed buildings blends into the landscape.	Developer	• Incorporate colour requirements in the design.		
Altered Sense of Place and Visual Intrusion (Grid Connection)	• Do not install or affix lights on pylons.	Contractor	• Prohibit installation of lighting on pylons in the design.	• Limit light pollution.	Once the powerline is installed. Throughout operation.
Altered Visual Quality (PV Facility and Grid Connection)	• Reduce the height of lighting masts to a workable minimum.	Developer and Contractor	• Incorporate lighting requirements in the design.	• Limit light pollution.	Once construction activities have concluded. Throughout operation
	• Direct lighting inwards and downwards to limit light pollution.				
Decommissioning Phase					
Visual Quality (PV Facility and Grid Connection)	• Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential.	Contractor	• Plan which areas require the clearance of vegetation. • Only clear the vegetation when works in the area will be undertaken.	• Limit deterioration of visual quality.	Throughout decommissioning
	• Consolidate the footprint of the decommissioning camp to a functional minimum.		• Ensure that the decommissioning camp footprint is consolidated where possible.		

Impact / Aspect	Mitigation / Management Actions	Responsibility	Methodology	Mitigation / Management Objectives and Outcomes	Frequency
	• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.		• During very windy conditions cease excavation, handling and transportation of materials which may generate dust.		
	• Keep stockpiled aggregates and sand covered to minimise dust generation.		• Stockpile all aggregates and sand. • Keep stockpiles covered when not in use.		
	• Keep construction site tidy.		• Implement measures to keep the site tidy.		

7.10 No-Go Alternative

The No Go alternative entails no change to the status quo, in other words, no PV Facility and / or 132 kV powerline (see Section 3.2.3).

Should the application for the Bonsmara 100 MW PV Facility and associated infrastructure be refused the visual impacts will not be realised.

8. CONCLUSION

The VIA describes and interprets the visual context or affected environment in which the project is located: this provides a visual baseline or template and aims to ascertain the aesthetic uniqueness of the project area. To better understand the magnitude or intensity of visual and sense of place impacts, the capacity of the project area and receptors to accommodate, attenuate and absorb impacts was analysed. To assess impact significance, the project was "introduced" into the baseline, taking account of the attenuating capacity of the project area.

The following findings are pertinent:

- Bonsmara Solar PV (RF) (Pty) Ltd proposed to develop a 100 MW PV Facility and associated infrastructure, including *inter alia,* a BESS, on-site substation, internal grid connections and a 132 kV powerline to connect the proposed facility to the Kroonstad Switching Station. The proposed PV Facility will occupy ~390 ha on Portion 0 and Portion 1 of Farm 636, near Kroonstad, in the Free State.
- The basis for the visual character of the region is provided by the topography, vegetation and land use of the area, which is predominantly a rural environment characterised by undulating, vegetated landscapes, albeit with pockets of settlements and regional and national roads routed through the surrounding area. The project is defined as a modified rural landscape.
- The visual quality of the area can be experienced through the rolling views of the gentle hills in the landscape and is defined by the fabric of agricultural and grazing land use, with powerlines and a railway line intermittently interrupting views of over the undulating landscape.
- The region has modest scenic value in terms of its undulating natural landscape and the views over large portions of agricultural land. The natural landscape and rustic character contrast the anthropogenic influence in the region, *viz.* urban development some 12 km away.
- The visual exposure of the PV array will be moderate. The viewshed shows that the PV array will be highly visible from the few elevated areas to the north-east, east and south-east of the site. Few of the isolated farmsteads surrounding the site are located in these areas with visibility. Motorists travelling on the R76 will have a view of the site when travelling adjacent to the south-western boundary of the site. The proposed ~2 km powerline will be partially visible due to the short length of the powerline. Furthermore, existing powerlines near the proposed powerline route are expected to have inured receptors to powerlines within the landscape.
- The VAC of the area is generally low due to its rural nature. However, the VAC is increased by the undulating topography and – to a far more limited extent – by the grassland (veld) and small clusters

of trees providing screening. The vegetation is not able to provide screening to the associated infrastructure. The undulating topography will marginally absorb the associated infrastructure.

- The potential receptors of the project include surrounding residents of farmsteads, individuals travelling by rail and motorists on the R76 and the Unnamed Gravel Road. The residents are considered moderately sensitive visual receptors. Motorists and receptors travelling by rail are considered to have relatively low sensitivity as their view of the project is fleeting and temporary.
- The sensitivity of the visual receptors potentially affected by the visual impact of the project is considered to be moderate due to the distance to farmsteads. It is anticipated that the visual receptors are more sensitive to the PV array than the proposed powerline due to the existing powerlines in the landscape.
- The project will be visible in the foreground to motorists travelling directly to the east and west of the site, while the visibility of the project to motorist and railway passengers travelling to the west and south-east of the site is decreased due to screening by vegetation. The project is marginally visible / not visible to surrounding residents due to topography screening the site and the distance from the site. The visibility of the project is moderate due to the number of receptors in the foreground and middleground.
- The PV Facility and powerline are deemed to have low integrity with the surrounding landscape. The proposed PV array will introduce a large, uniform, reflective facility into the area and will be discordant with the current land use, scale and texture of the surrounding area. The BESS will also introduce a novel structure into the landscape that is different and incongruent to the type, size and scale of the existing land use and development in the area. The on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site.
- Construction activities associated with the PV Facility and 132 kV powerline will generate visual impacts related to earthworks and construction infrastructure, plant and materials on site. These activities are visually intrusive and will mostly impact receptors in the foreground (<200 m). The impact is assessed to be of medium significance and with the implementation of mitigation is reduced to low.
- The PV array will introduce what may be perceived as a low, uniform industrial artefact into the landscape that is perceived as conflicting with the current landscape. As such, the PV array is anticipated to interrupt and / or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion in the landscape. The impact is assessed to be of high significance and with the implementation of mitigation is reduced to medium.
- The PV Facility will include a BESS and internal grid connections. Where possible the powerlines will be installed underground. The infrastructure will contribute to visual clutter on the site and therefore negatively impact the sense of place and present as a visual intrusion across the landscape. The impact is assessed to be of medium significance with and without the implementation of mitigation.
- Installation of lighting at the PV Facility and on the 132 kV powerline may expose sensitive receptors (e.g. residents) to light pollution, i.e. nightglow. The impact is assessed to be of medium significance and with the implementation of mitigation is reduced to low.
- The development of the 132 kV powerline, due to its short length and routing adjacent to an existing powerline is not anticipated to future degrade views of visual receptors. The impact is assessed to be of low significance with and without the implementation of mitigation.

- The decommissioning activities associated with the PV Facility and the 132 kV powerline will include earthworks and movement of plant and equipment. Dust generated during decommissioning will be visually unappealing and detract from the visual quality and sense of place. The impact is assessed to be of medium significance and with the implementation of mitigation is reduced to low.
- Numerous substations and powerlines in the region already affect visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV Facility and other proposed PV facilities within a 35 km radius of Bonsmara PV facility have a combined footprint of ~4 705 ha, however, are located far apart and do not constitute a spatially concentrated, high density network of PV facilities. The cumulative impact of the PV Facility and the 132 kV powerline is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.

8.1 Impact Statement

The proposed project introduces a man-made artefact into an agricultural environment, changing the fabric of a large area (~390 ha). The surrounding area also features132 kV powerline traversing the landscape. As the proposed powerline will be routed adjacent to the existing powerline, it is anticipated that the powerline will not impact on the sense of place and result in visual intrusion to the visual receptors in the surrounding area.

The undulating landscape provides some VAC for the PV Facility, and is expected to marginally screen the powerline. The proposed project is anticipated to have a limited impact on highly sensitive receptors due to the limited number of highly sensitivity visual receptors directly adjacent to the project area. However, railway passengers and motorists – to a greater degree – will have the greatest visibility of the site. This visibility is anticipated to be moderated by their low sensitivity as transient and temporary receptors.

This project will be largely incongruent with the existing agricultural landscape. As such, visual impacts include altered sense of place, visual intrusion and light pollution. This VIA demonstrates that the project will generally result in a moderate visual impact, despite not being located within a REDZ. The construction, operational, decommissioning and cumulative impacts are deemed to be acceptable on the assumption that the mitigation measures listed in Table 7-4 are implemented.

Based on the assessment and the assumption that the mitigation measures will be implemented, the specialist is of the opinion that the visual impacts of the project are acceptable and, from a visual perspective, there is no reason not to authorise the project.

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Appendix A: Specialist CV

Appendix B: Impact Assessment Methodology

Appendix C: Views from Viewpoints

Viewpoint 1: Dennehof Farm - looking north-west towards the site. The proposed site is not visible due to the undulating topography.

Viewpoint 2: R76 South - looking north towards the site. The proposed site is largely screened by tall trees and vegetation, however may be visible in the background to receptors.

Viewpoint 3: R76 Bonsmara – looking north towards the site. The proposed site is visible in the forground to receptors.

Viewpoint 4: Patrijsdraai Farm – looking north-east towards the site. The site is visible to motorists travelling to and from the farmstead as well as receptors travelling by train. The view of the project will be in the background.

Viewpoint 5: Farmstead 1 – looking south-east towards the site. Due to the topography, the site is not visible to these receptors.

Viewpoint 6: Lan Crest – looking south-east towards the site. Due to the topography, the site is not visible to these receptors.

Viewpoint 7: Farmstead 2 – looking south towards the site. Due to topography, the site is not visible to receptors.

Viewpoint 8: Unnamed Gravel Road – looking south. The site will be visible in the background to receptors.

Viewpoint 9: Unnamed Gravel Road – looking south-west. The site will be visible in the foreground to receptors.

Viewpoint 10: Unnamed Gravel Road – looking west towards the site. The site will be visible in the middleground to receptors.

Viewpoint 11: Farmstead 3 – looking west towards the site. The site will be marginally visible in the background to receptors.

Viewpoint 12: Farmstead 4 – looking south-west towards the site. Due to topography and vegetation, the site is not visible to receptors.

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APPENDIX 4: Heritage Screening Assessment

CTS HERITAGE

HERITAGE SCREENER

CTS Reference Number:	**CTS22_111**
SAHRIS CaseID:	
Client:	**SiVEST**
Date:	**August 2022**
Title:	**PROPOSED BONSMARA SOLAR PHOTOVOLTAIC (PV) RENEWABLE ENERGY FACILITY NEAR KROONSTAD, FREE STATE PROVINCE**

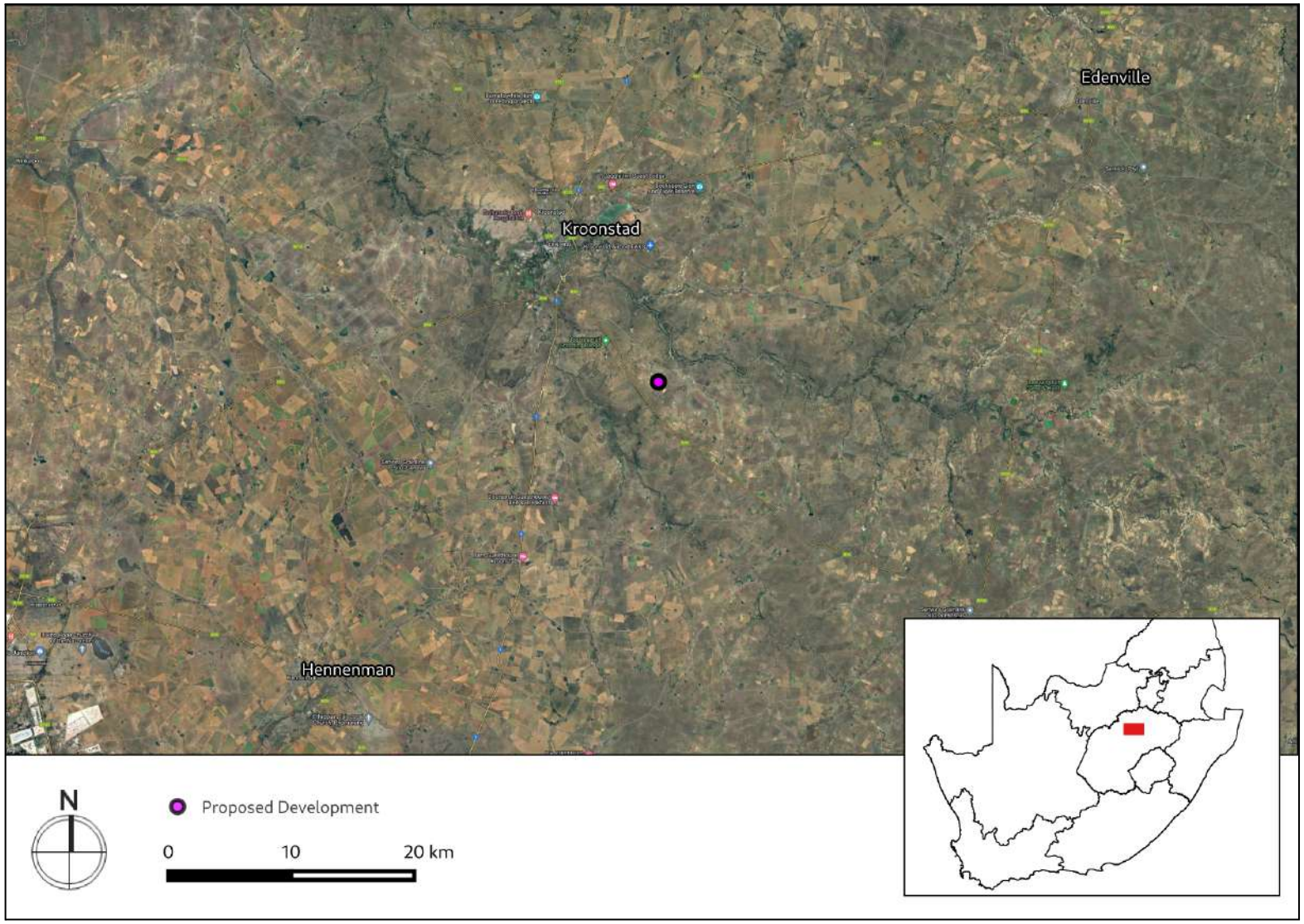

Figure 1a. Satellite map indicating the location of the proposed development in the Free State Province.

CTS Heritage
Bonne Esperance, 238 Queens Road, Simons Town
Email: info@ctsheritage.com **Web:** www.ctsheritage.com

CTS HERITAGE

1. Proposed Development Summary

Bonsmara Solar PV (RF) (Pty) Ltd has appointed SiVEST Environmental (hereafter referred to as “SiVEST”) to undertake the required EIA / BA Processes for the proposed construction of the Bonsmara Solar PV Energy Facility (SEF) and associated grid connection infrastructure near Kroonstad in the Free State Province. The distinct EA’s that are required for the Projects are as follows:

- Bonsmara SEF (up to 100MW)
- Bonsmara Grid Connection Infrastructure (up to 132kV)

The overall objective of the development is to generate electricity by means of renewable energy technology capturing energy to feed into the National Grid.

Bonsmara Solar PV (RF) (Pty) Ltd is proposing the construction of the 100MW Bonsmara Solar PV Facility, BESS and associated infrastructure on a site approximately 12km south-east from the town of Kroonstad, in the Free State Province. The facility will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. The facility will compromise of several arrays of PV panels and associated infrastructure that includes BESS and will have a contracted capacity of 100MW. The Solar PV facility will connect to the grid via a 2km 132kv powerline from the on-site substation to the Kroonstad Switching Station. This heritage screening assessment forms part of the Scoping Phase of the EIA for the Bonsmara PV Project.

2. Application References

Name of relevant heritage authority(s)	SAHRA
Name of decision making authority(s)	DFFE

3. Property Information

Latitude / Longitude	27°45'59.62"S 27°19'4.76"E
Erf number / Farm number	Remainder and Portion 1 of Farm Scheveningen 636
Local Municipality	Matjhabeng
District Municipality	Lejweleputswa
Province	Free State
Current Use	Agriculture
Current Zoning	Agriculture

4. Nature of the Proposed Development

Total Surface Area of development	TBA
Depth of excavation (m)	TBA
Height of development (m)	TBA

5. Category of Development

X	**Triggers: Section 38(8) of the National Heritage Resources Act**
	Triggers: Section 38(1) of the National Heritage Resources Act
X	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.
	3. Any development or activity that will change the character of a site-
X	a) exceeding 5 000m^2 in extent
	b) involving three or more existing erven or subdivisions thereof
	c) involving three or more erven or divisions thereof which have been consolidated within the past five years
	4. Rezoning of a site exceeding 10 000m^2
	5. Other (state):

6. Additional Infrastructure Required for this Development

NA

7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)

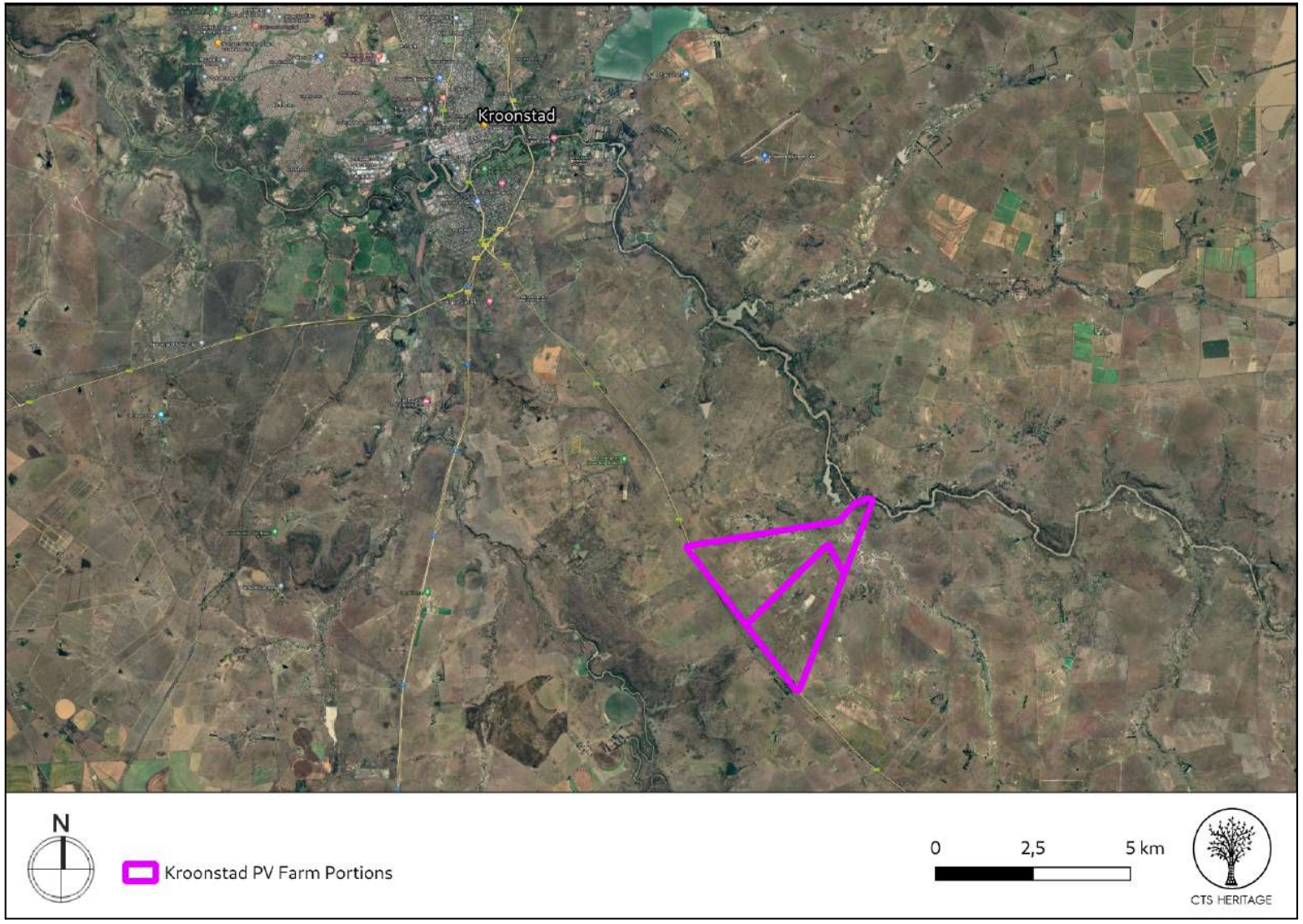

Figure 1b Overview Map. Satellite image (2022) indicating the proposed development area at closer range relative to Kroonstad PV

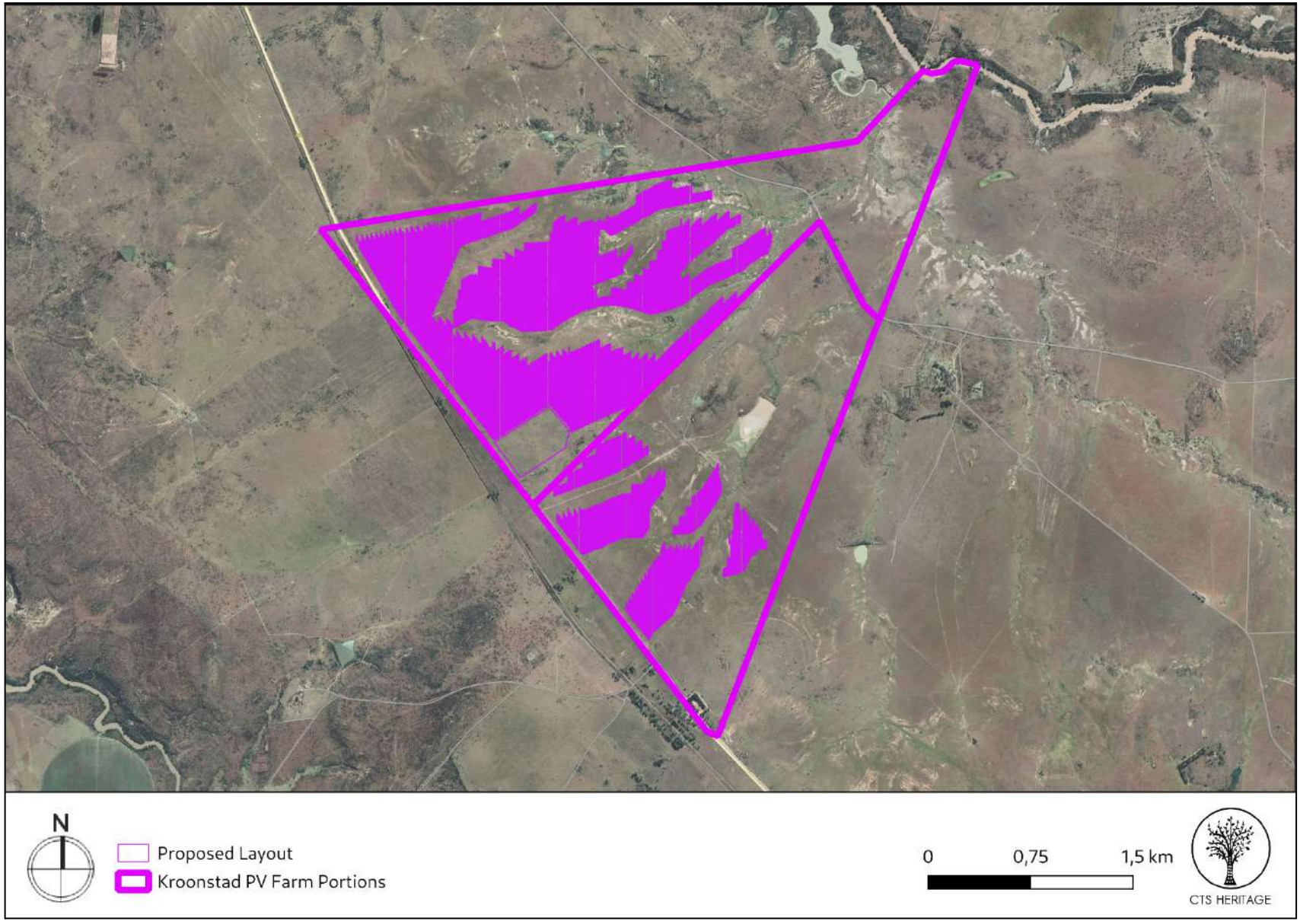

Figure 1c. Overview Map. Satellite image (2022) indicating the proposed development on Remainder and Portion 1 of Farm 636

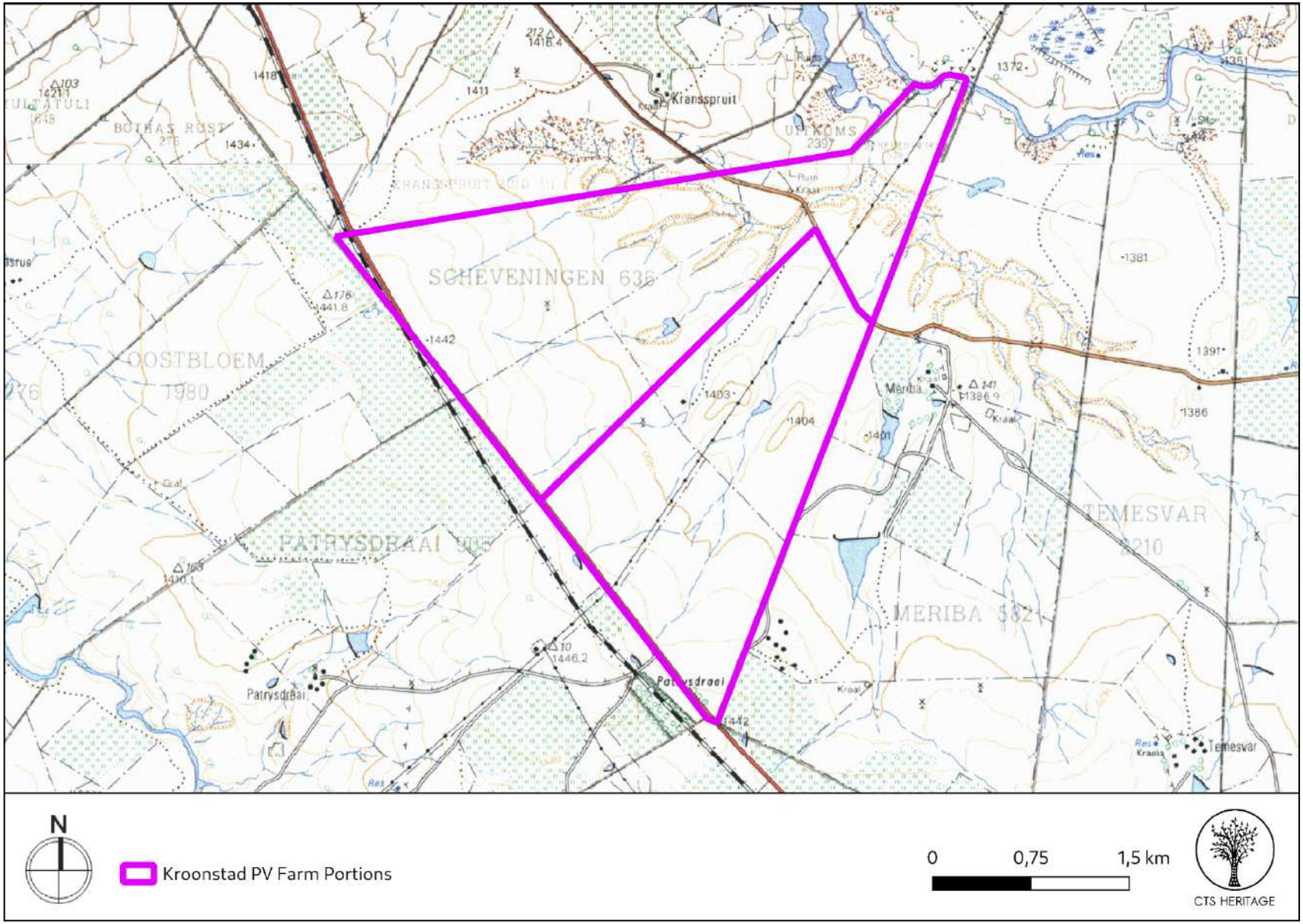

Figure 1d. Overview Map. 1:50 000 Topo Map for the development area

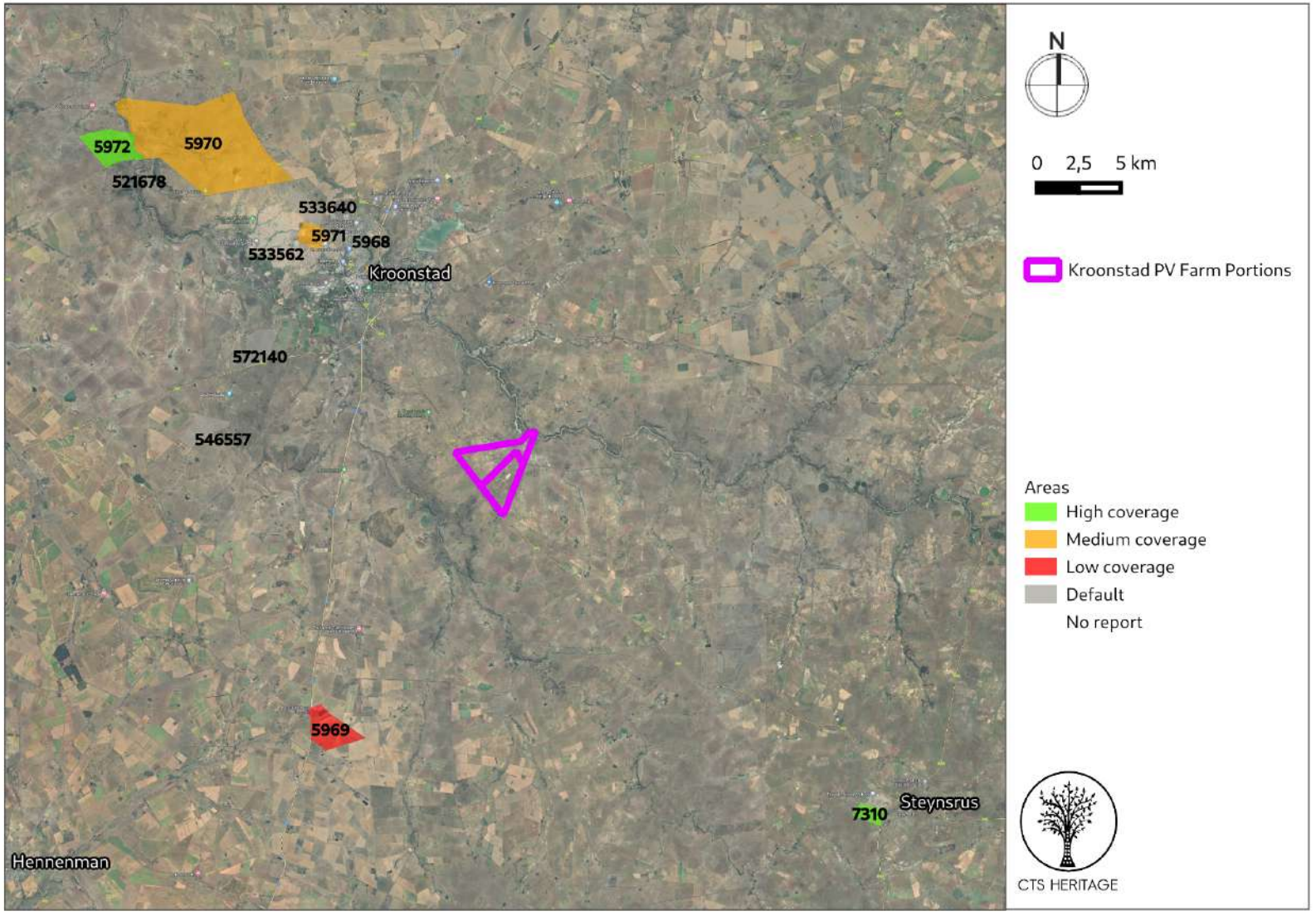

Figure 2. Previous HIAs Map. Previous Heritage Impact Assessments surrounding the proposed development area, with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

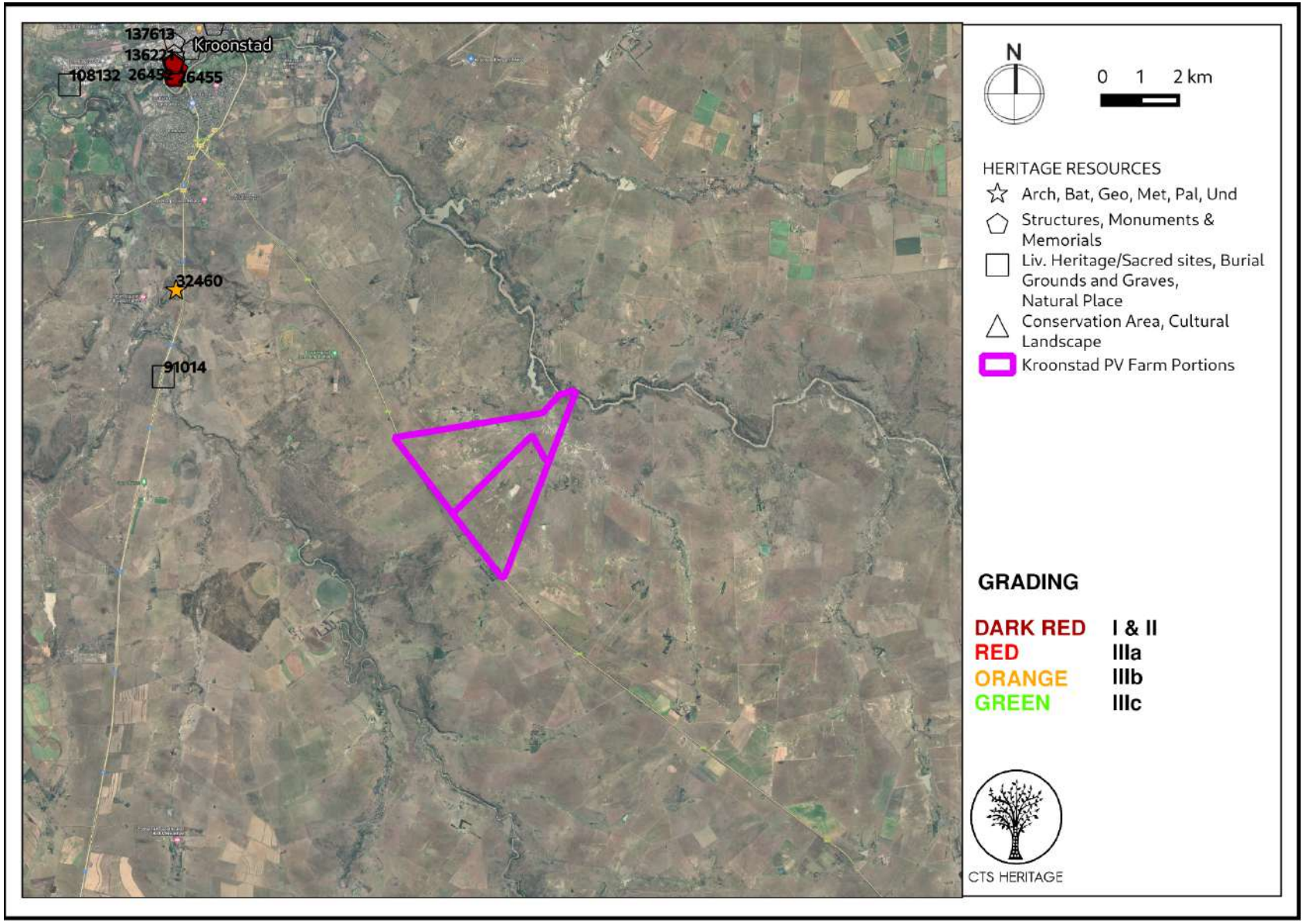

Figure 3a. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated. Please See Appendix 4 for a full description of heritage resource types.

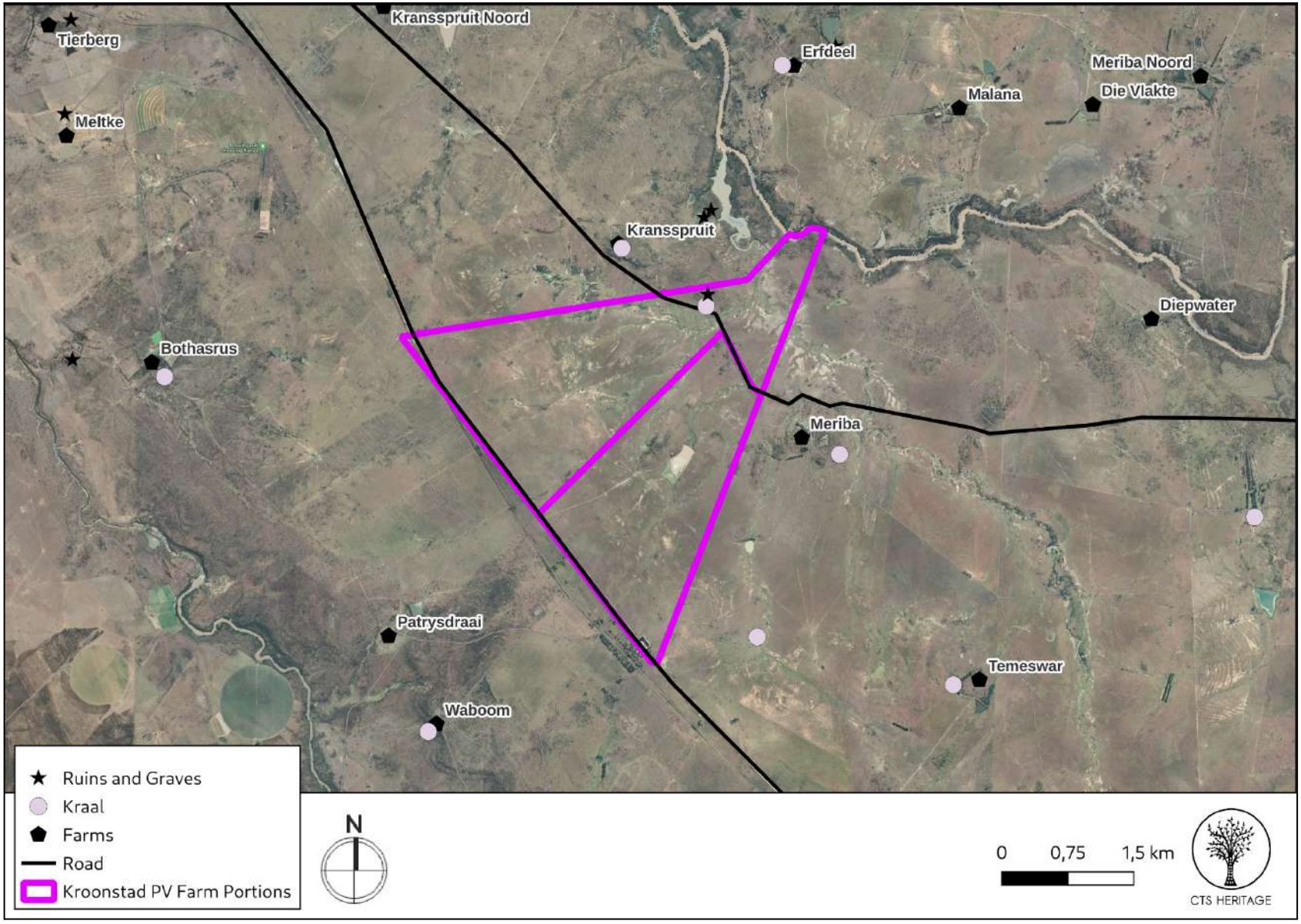

Figure 3b. Heritage Resources Map. Cultural Landscape elements identified from the Topo map

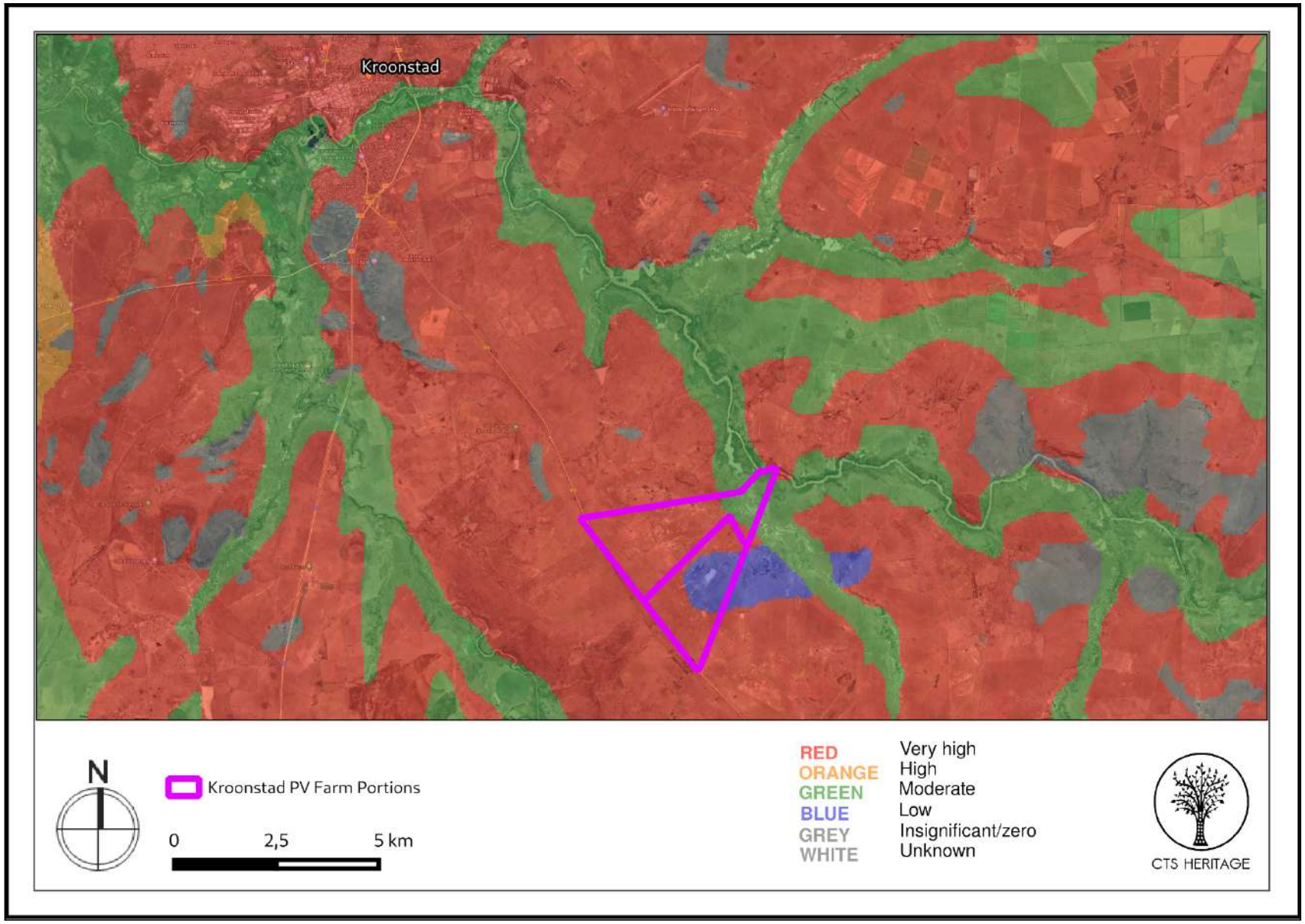

Figure 4. Palaeosensitivity Map. Indicating Low to Very High fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

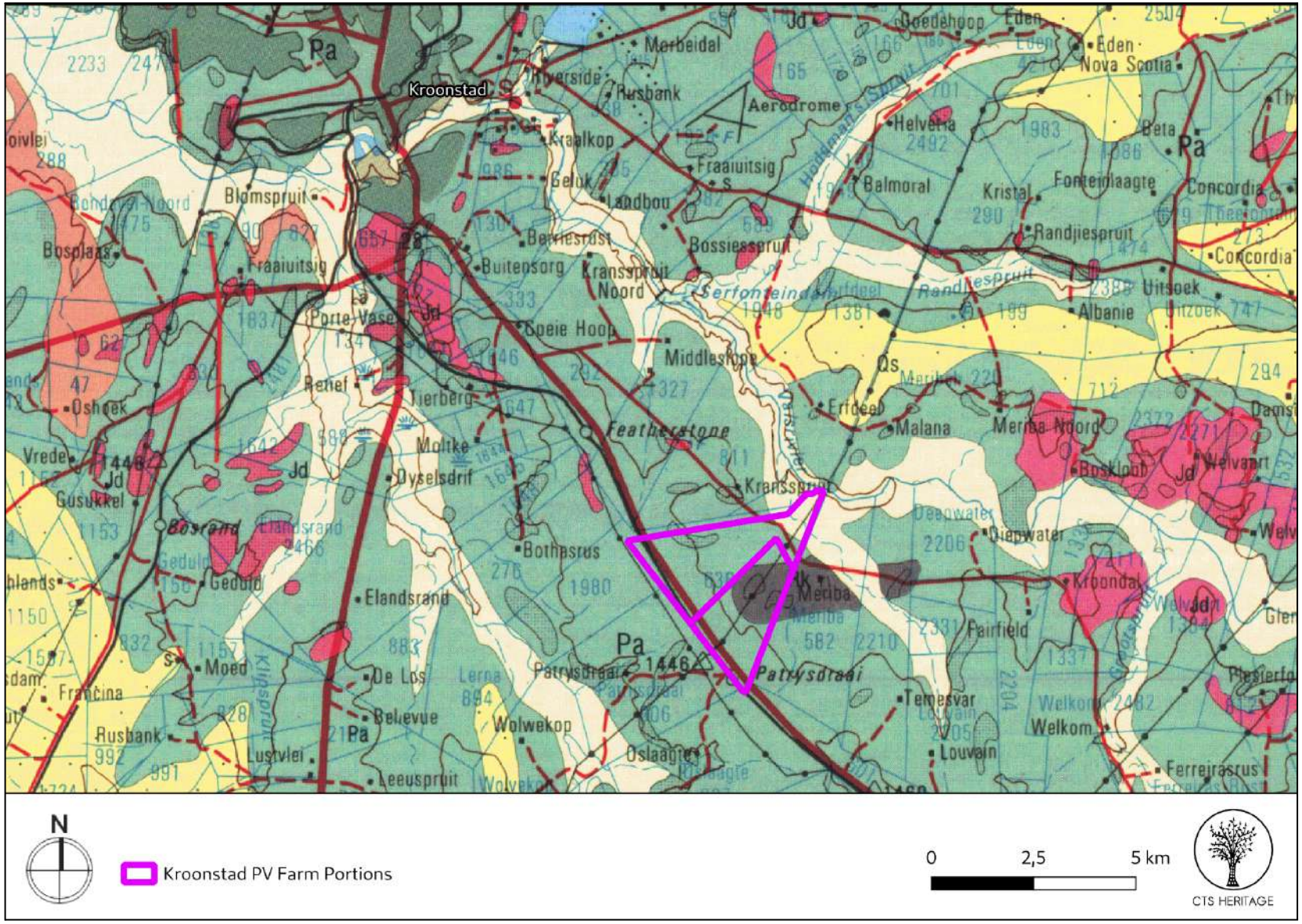

Figure 5. Geology Map. Extract from the CGS 2726 Kroonstad Geology Map indicating that the development area is underlain by sediments of the Adelaide Subgroup of the Beaufort Group (Pa), Klipriviersberg (Rk) and Quaternary Sands

8. Heritage statement and character of the area

This application is for the proposed development of a PV facility and associated grid infrastructure located approximately southeast of Kroonstad along the R76 in the Free State Province. Kroonstad was established as a town in 1855. During the Second Boer War, from 13 March to 11 May 1900, the city became the capital of the Orange Free State, and subsequently the site of a British concentration camp to contain Boer women and children. Kroonstad still boasts much of the inherent rugged beauty which led the Voortrekkers to establish the town where they did and it is situated in an area characterised by open spaces and an abundant variety of vegetation that makes it particularly beautiful. According to Van Schalkwyk (2013), “Most farmsteads were burned down during the Anglo-Boer War, with the result that very little of the built environment dates to the 19th century.” According to Matenga (2019), the Black and Coloured townships are significant as landscapes of segregation occupying the north-western fringe of the CBD, while the exclusive white suburbs were located northeast of the town and south of the Valsch River.

According to Van Schalkwyk (2013), “The cultural landscape qualities of the region essentially consist of a rural setup. In this the human occupation is made up of a pre-colonial element consisting of limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component. This was soon followed by the development of a number of urban centres or towns. Originally these mostly served the surrounding farming communities, but with the discovery of the Free State Gold Fields, they expanded rapidly in order to serve this industry as well.” The proposed Solar Energy Facility and its associated grid connections are located some distance from the historic core of Kroonstad town. Furthermore, the areas proposed for development are located more than 10km away from the site of the Boer War concentration camps and associated burial grounds.

Prior to colonial settlement in 1855, the area proposed for development formed part of a landscape that was occupied by indigenous Khoe herders and San hunter-gatherers. These indigenous communities were displaced by Bantu-speaking people who began to occupy the area in the Iron Age. According to Van Schalkwyk (2013), “Sites dating to the Late Iron Age are known to occur in the region, especially... in the vicinity of the Sandrivier, whereas some are known to occur to the northwest of Ventersburg, These are typical stone walled sites that are linked with Sothospeakers and date to the period after 1600.” As such, it is possible that Early, Middle or Later Stone Age artefacts may be located within the proposed development footprint. Furthermore, it is possible that evidence of Iron Age settlement may also be located within the proposed development areas. Recent archaeological field assessment conducted for the Vrede and Rondawel PV Facilities located approximately 10km from the proposed development area identified some cultural remains but with varied value and preservation. The isolated and scattered lithic artefacts identified are typical of a deflated landscape and have very limited cultural value given that they have been accumulated and modified by various natural processes to their current *ex situ* state. The stone piles found in the south west of the property are more noteworthy (Grade IIIA) and require sensitive treatment. It is likely that similar heritage resources may be present within this development area. As such, it is recommended that an archaeological assessment of the areas proposed for development is completed and anticipated impacts to such resources assessed.

According to the SAHRIS Palaeosensitivity Map (Figure 4), the areas proposed for development are underlain by sediments of moderate to very high palaeontological sensitivity. According to the Council of GeoScience 2726 Kroonstad Map (Figure 5), the development area is underlain by sediments of the Karoo Supergroup including the Adelaide Subgroup (Pa) which have very high palaeontological sensitivity. This formation forms part of the Dicynodon and Lystrosaurus assemblage zones and is known to include fossils of fish, amphibians, reptiles, therapsids and vertebrate burrows. Diverse terrestrial and freshwater tetrapods of *Pristerognathus* to *Dicynodon* Assemblage Zones (amphibians, true reptiles, synapsids – especially therapsids) have been found in this formation, as well as, palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways), sparse to rich assemblages of vascular plants (*Glossopteris* Flora, including spectacular petrified logs) and insects. Based on the known palaeontological sensitivities of the Adelaide Subgroup, it is recommended that a palaeontological assessment of the areas proposed for development is completed and anticipated impacts to such resources assessed.

RECOMMENDATIONS

As it is likely that significant heritage resources will be impacted by the proposed development, it is recommended that a Heritage Impact Assessment is completed that satisfies section 38(3) of the NHRA and assesses likely impacts to archaeological and palaeontological heritage.

9. Scoping Assessment Impact Table

Impact

- Impact to archaeological resources
- Impact to palaeontological resources
- Impact to Cultural Landscape
- Cumulative Impact

Desktop Sensitivity Analysis of the Site

- Impact to significant archaeological resources such as Stone Age artefact scatters, burial grounds and graves, historical artefacts, historical structures and rock art engravings through destruction during the development phase and disturbance during the operational phase is possible.
- Impacts to palaeontological resources are possible.
- Due to the nature of the development and its context, cumulative impact and negative impact to the cultural landscape is possible

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impact to significant heritage resources through destruction during the development phase.	Destruction of significant heritage resources	Local scale with broader impacts to scientific knowledge	None known at present

Gaps in knowledge & recommendations for further study

- It is likely that the proposed development will impact significant archaeological and palaeontological heritage and as such, it is recommended that a heritage impact assessment be completed that assesses these impacts as per section 38(3) of the NHRA.

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APPENDIX 1

List of heritage resources within close proximity to the development area from SAHRIS

Site ID	Site no	Full Site Name	Site Type	Grading
26453	9/2/324/0005	Old Market Square Post Office and prison-cells, 66 Murray Street, Kroonstad	Building	Grade II
26455	9/2/324/0008	Town Hall and Leaping Fountain, Church Street, Kroonstad	Building	Grade II
26451	9/2/324/0014	Old Magistrate's Office, Murray Street, Kroonstad	Building	Grade II
26454	9/2/324/0006	Old market building, Market and Murray Streets, Kroonstad	Building	Grade II
32460	Kroonstad Quarry	Kroonstad Quarry Q42.5	Palaeontological	Grade IIIb
91014	Kroonstad N1	Kroonstad National Road 1 Widening	Burial Grounds & Graves	
138258	RSE-003	Rondavel Solar Energy	Artefacts	
138256	RSE-001	Rondavel Solar Energy	Artefacts	Grade IIIc
138259	RSE-004	Rondavel Solar Energy	Artefacts	Grade IIIc
138257	RSE-002	Rondavel Solar Energy	Burial Grounds & Graves	Grade IIIa
108132	Kroonstad Concentration Camp Cemetery	Kroonstad Concentration Camp Cemetery	Burial Grounds & Graves	
26452	9/2/324/0016	Nederduitse Gereformeerde Mother Church and Sarel Cilliers Statue, Church Square, Kroonstad	Building	Grade II
136204	Kroonstad	Kroonstad	Monuments & Memorials	
136206	DC20/NAMM/0012	World War Memorials, Moqhaka Local Municipality Office, Kroonstad	Monuments & Memorials	
136221	DC20/NAMM/0003	Anglo-Boer War Memorial, NG Moedergemeente, Kroonstad	Monuments & Memorials	

136222	DC20/NAMM/0004	Sarel Cilliers Monument, NG Moedergemeente, Kroonstad	Monuments & Memorials	
137613	Kroonstad	Kroonstad	Monuments & Memorials	
137776	Kroonstad old Market	Kroonstad old Market	Monuments & Memorials	

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APPENDIX 2

Reference List from SAHRIS

NID	Author(s)	Date	Type	Title
5968	Cobus Dreyer	20/06/2005	AIA Phase 1	Archaeological and Historical Investigation of the Proposed New Filling Station at Kroonstad, Free State
5969	Cobus Dreyer	25/08/2005	AIA Phase 1	Historical Investigation of the Existing Outbuildings at the Farm Smaldeel 202, Kroonstad, Free State
5970	Cobus Dreyer	29/05/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Middenspruit 151, Kroonstad, Free State
5971	Cobus Dreyer	12/07/2006	AIA Phase 1	Archaeological and Historical Investigation of the Proposed Township Developments at Maokeng, Kroonstad, Free State
5972	Cobus Dreyer	26/10/2006	AIA Phase 1	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Boschpunt 2218 Kroonstad, Free State

Lavin and Wiltshire. November 2020. ARCHAEOLOGICAL SPECIALIST STUDY In terms of Section 38(8) of the NHRA for a Proposed development of the Vrede and Rondavel Solar Energy Facilities near Kroonstad, Free State Province. Unpublished. Section 38(8) Heritage Impact assessment process.

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APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

AIA	Archaeological Impact Assessment
DARD	Department of Agriculture and Rural Development (KwaZulu-Natal)
DEA	Department of Environmental Affairs (National)
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape)
DEDECT	Department of Economic Development, Environment, Conservation and Tourism (North West)
DEDT	Department of Economic Development and Tourism (Mpumalanga)
DEDTEA	Department of economic Development, Tourism and Environmental Affairs (Free State)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DMR	Department of Mineral Resources (National)
GDARD	Gauteng Department of Agriculture and Rural Development (Gauteng)
HIA	Heritage Impact Assessment
LEDET	Department of Economic Development, Environment and Tourism (Limpopo)
MPRDA	Mineral and Petroleum Resources Development Act, no 28 of 2002
NEMA	National Environmental Management Act, no 107 of 1998
NHRA	National Heritage Resources Act, no 25 of 1999
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VIA	Visual Impact Assessment

Full guide to Palaeosensitivity Map legend

	RED:	VERY HIGH - field assessment and protocol for finds is required
	ORANGE/YELLOW:	HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	GREEN:	MODERATE - desktop study is required
	BLUE/PURPLE:	LOW - no palaeontological studies are required however a protocol for chance finds is required
	GREY:	INSIGNIFICANT/ZERO - no palaeontological studies are required
	WHITE/CLEAR:	UNKNOWN - these areas will require a minimum of a desktop study.

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APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields
- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

DETERMINATION OF THE PALAEONTOLOGICAL SENSITIVITY

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON

Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

Low coverage will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;
- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

Medium coverage will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

High coverage will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

(1) The heritage resources in the area proposed for development are sufficiently recorded - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

(2) The heritage resources and the area proposed for development are only partially recorded - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.

This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area
- undertaking mitigation measures requested in previous assessments/records of decision.

(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.