

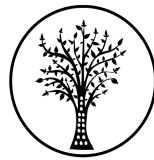
HERITAGE IMPACT ASSESSMENT

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

Proposed development of the San Solar PV Facility and Associated Infrastructure, Northern Cape Province

SAHRIS Ref: 349

Prepared by CTS Heritage

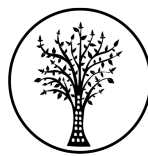


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For

Savannah Environmental (Pty) Ltd

April 2022



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EXECUTIVE SUMMARY

1. Site Name:

San Solar PV Facility

2. Location:

Remainder of Farm 472

3. Locality Plan:

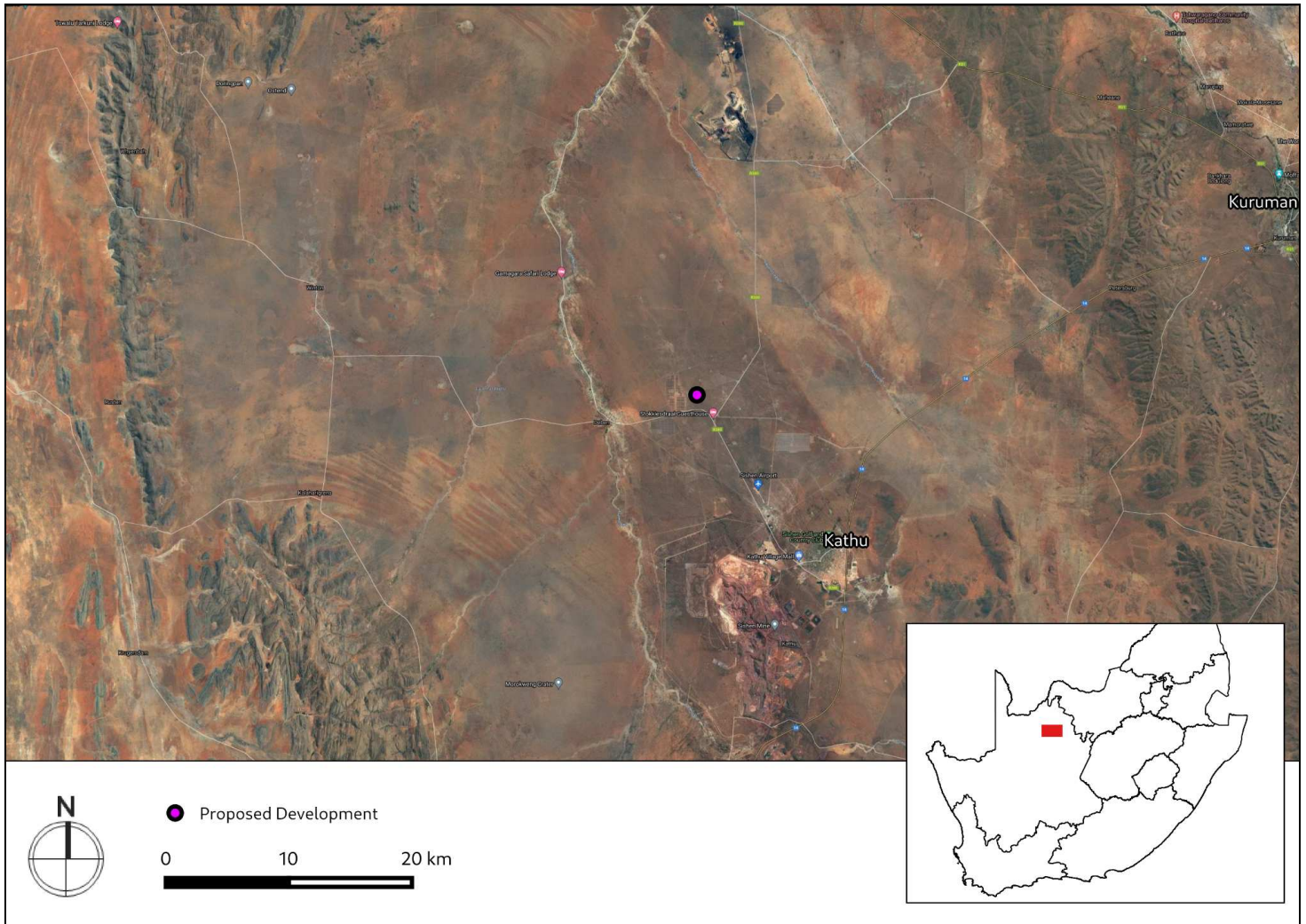
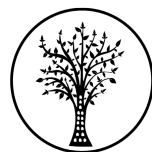


Figure 1: Location of the proposed study area

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4. Description of Proposed Development:

San Solar Energy Facility (Pty) Ltd proposes the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km northwest of Kathu in the Northern Cape Province. The solar PV facility will be developed on the Remaining extent of the Farm Wincanton 472 and comprise several arrays of PV panels and associated infrastructure with a contracted capacity of up to 100MW. The study area¹ falls within the Gamagara Local Municipality within the John Taolo Gaetsewe District Municipality. The site is located east of Deben and is accessible via the R380 provincial route which branches off the N14 National Road, approximately 3km south of Kathu.

5. Heritage Resources Identified in and near the study area:

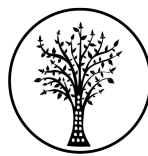
Site No.	Description	Density	Period	Co-ordinates		Grading	Mitigation
002	Ruin of mid-Century structure. In context with farming infrastructure and an abandoned railway siding on the eastern side of the railway line bordering the old farm settlement. Building material mostly vernacular with some modern additions. Karoo cottage style architecture. Building material seems like dolomite blocks.	NA	Modern	27° 34' 39.10" S	22° 56' 20.40" E	NCW	NA
004	Scaper, core and chunk made from CCS and BIF. Located on edge of wetland	3/10m ²	MSA	27° 34' 04.6" S	22° 57' 04.9" E	IIIC	200m Buffer
005	Scaper, chips and chunks made from CCS and BIF. Located on edge of wetland	6/10m ²	MSA	27° 34' 02.3" S	22° 57' 08.9" E	IIIC	200m Buffer
006	Unfinished blade, chunk, scraper, chips and a core made from BIF. Located on edge of wetland	8/50m ²	MSA	27° 34' 06.3" S	22° 57' 06.1" E	IIIC	200m Buffer
008	Memorials to those who died in road accidents on the R380 on the eastern edge of the grid connection corridor	NA	Modern	27° 35' 23.6" S	22° 56' 37.2" E	NCW	NA

6. Anticipated Impacts on Heritage Resources:

The results of the archaeological field assessment conducted largely aligns with the findings of previous archaeological assessments completed within and in the vicinity of the proposed development. The archaeological resources identified within the development area are dominated by low density Middle Stone Age flakes and artefacts associated with a wetland. Due to its ecological sensitivity, the wetland has been excluded from the proposed development layout and as such, no impact to these resources is anticipated. Based on the information available, the proposed development is unlikely to directly impact on any significant archaeological heritage resources.

According to the Desktop PIA (Bamford, 2021), based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the limestones and calcretes of

¹ The study area is defined as the Remaining extent of the Farm Wincanton 472, which has the extent of ~ 1000ha.



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the Tertiary because they are very rare and there are no visible outcrops in the flat landscape.. There is a very small chance that fossils may occur in the Tertiary limestones so a Fossil Chance Find Protocol must be implemented. Mitigation measures for this risk are proposed below.

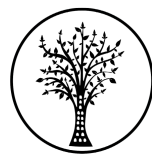
7. Recommendations:

There is no objection to the proposed development of the San Solar Pv Facility and associated grid connection in terms of impacts to heritage resources on condition that:

- A no-go buffer area of 200m must be implemented around the wetland associated with Sites 004, 005 and 006 to ensure that no indirect impact takes place. This site should also be marked as no-go on all development maps and SDPs.
- The attached Chance Fossil Finds Procedure is implemented for the duration of construction activities
- Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

Jenna Lavin

28/04/2022



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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.

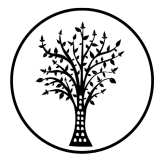
Jenna is on the Executive Committee of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has 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 80 Heritage Impact Assessments throughout South Africa.

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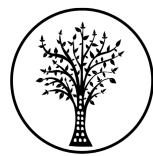
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CONTENTS

1. INTRODUCTION	6
1.1 Background Information on Project	6
1.2 Description of Property and Affected Environment	7
2. METHODOLOGY	11
2.1 Purpose of HIA	11
2.2 Summary of steps followed	11
2.3 Assumptions and uncertainties	11
2.4 Constraints & Limitations	11
2.5 Savannah Impact Assessment Methodology	12
3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT	13
3.1 Desktop Assessment	13
3.2 Palaeontology	19
4. IDENTIFICATION OF HERITAGE RESOURCES	20
4.1 Summary of findings of Specialist Reports	20
4.2 Heritage Resources identified	26
4.3 Mapping and spatialisation of heritage resources	30
5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT	33
5.1 Assessment of impact to Heritage Resources	33
5.2 Sustainable Social and Economic Benefit	35
5.3 Proposed development alternatives	35
5.4 Cumulative Impacts	36
6. RESULTS OF PUBLIC CONSULTATION	38
7. CONCLUSION	38
8. RECOMMENDATIONS	38
APPENDICES	
1	Heritage Screening Assessment
2	Archaeological Impact Assessment (2022)
3	Desktop PIA (2021)
4	Chance Fossil Finds Procedure



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1. INTRODUCTION

1.1 Background Information on Project

San Solar Energy Facility (Pty) Ltd proposes the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km northwest of Kathu in the Northern Cape Province. The solar PV facility will be developed on the Remaining extent of the Farm Wincanton 472 and comprise several arrays of PV panels and associated infrastructure with a contracted capacity of up to 100MW. The study area² falls within the Gamagara Local Municipality within the John Taolo Gaetsewe District Municipality. The site is located east of Deben and is accessible via the R380 provincial route which branches off the N14 National Road, approximately 3km south of Kathu.

A facility development area³, which will include the PV facility, BESS and a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line will be identified within the study area considered in the Scoping phase. The infrastructure associated with this 100MW PV facility includes:

- » PV modules and mounting structures
- » Inverters and transformers
- » Cabling between the panels, to be laid underground where practical.
- » Battery Energy Storage System (BESS)
- » Site and internal access roads (up to 8m wide)
- » Laydown area.
- » Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouse, and workshop areas for maintenance and storage.
- » Grid connection solution including a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line (located ~5km east of the site).

The development area will be larger than the area needed for the construction of a 100MW PV facility and will provide the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint⁴. To avoid areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the development footprint within which the infrastructure of San Solar PV facility and its associated infrastructure will be located will be fully assessed during the EIA Phase.

² The study area is defined as the Remaining extent of the Farm Wincanton 472, which has the extent of ~ 1000ha.

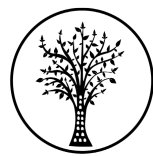
³ The development area is that identified area (located within the study area) where the San Solar PV facility would be located.

⁴ The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for San Solar PV will be planned to be constructed. This will be the actual footprint of the facility, and the area which would be disturbed. The extent of the development footprint will be determined in the EIA Phase.

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Three (3) solar facilities have been constructed in the broader area. These include the Sishen Solar PV and Kathu Solar PV facilities located immediately west of the farm Remaining extent of the Farm Wincanton 472. The Kathu Solar facility is a CSP facility located to the east of the study area

1.2 Description of Property and Affected Environment

The environment is a typical savannah/Kalahari type environment with flat sandy plains, rocky outcrops at certain areas and sloping slightly towards the south of the development site. The terrain and general region had two very good raining seasons the past two years. Almost the entire site is densely overgrown with thick/tall grass. Kameeldoring/Camel Thorn trees (*Acacia eriloba*) are scattered throughout the development site. Swarthaak/Blackthorn and Vaalbos trees are very densely present throughout the development site. Generally the site is rather flat with a slight slope towards the south. The development site is currently used for cattle farming/grazing. The entire terrain is divided into camps by fencing. There are cattle posts in at least 4 places on the site. An existing railway line runs from north to south along the western border of the development site. At least one natural, non-perennial pan/depression is present on the development site.

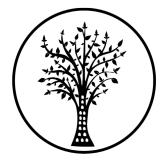
There are three pans or wetland depressions in close proximity to the development site, close to the eastern, north-eastern and northern boundaries of the site.. These water features are non-perennial and will hold or gather water for a period of time during abnormal high rainfalls. No riverine, rivers or dry waterways were observed on the development site.

The development area is surrounded by farmland/agricultural land and the existing Sishen mine towards the southwest. The R380 Secondary road also forms a boundary, but the overhead line corridor section development site stretches beyond the R380 towards the south, linking up with an existing Eskom power line. An existing solar energy facility is located immediately west and south west of the development area.

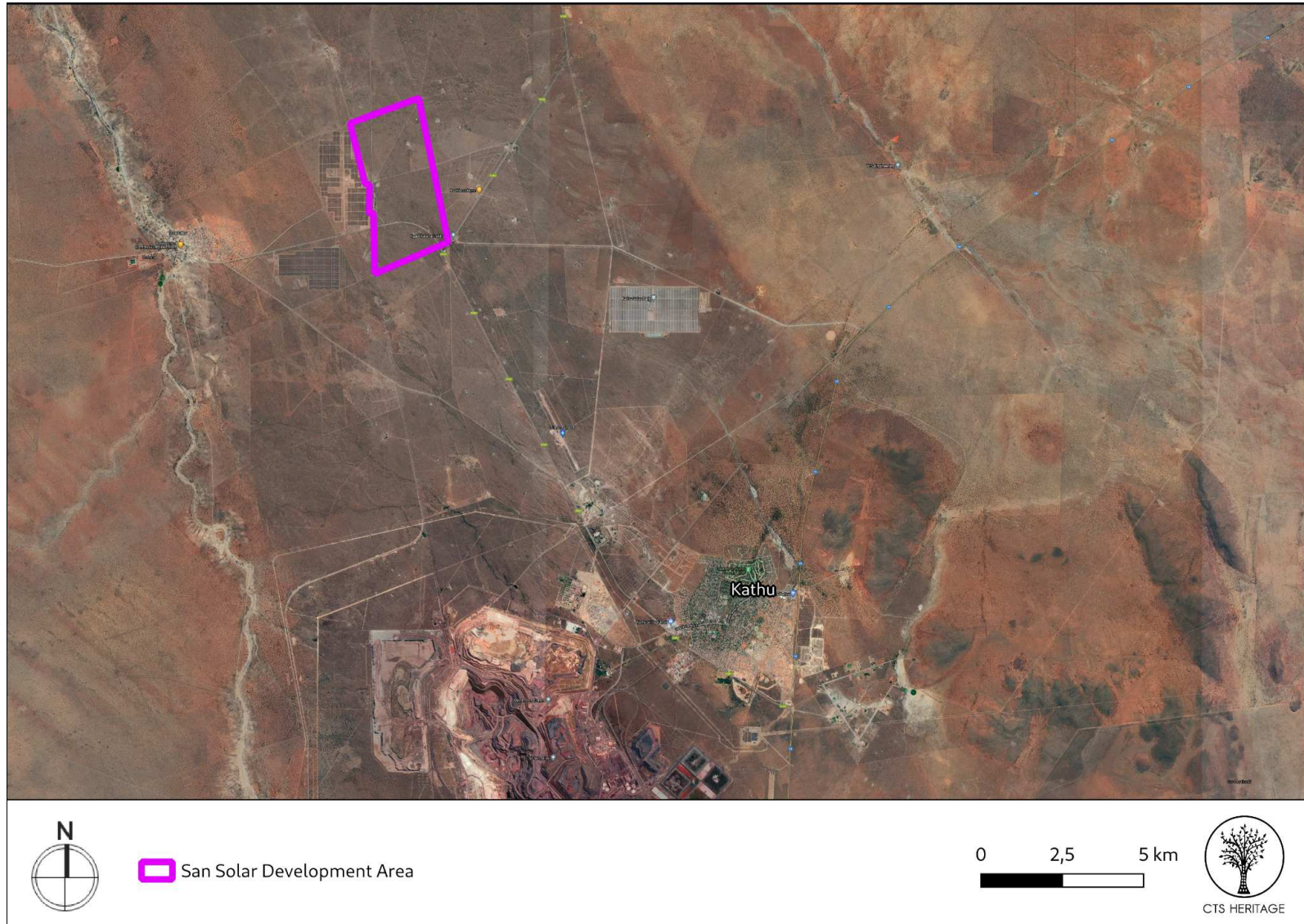
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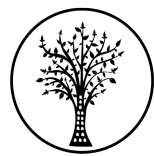
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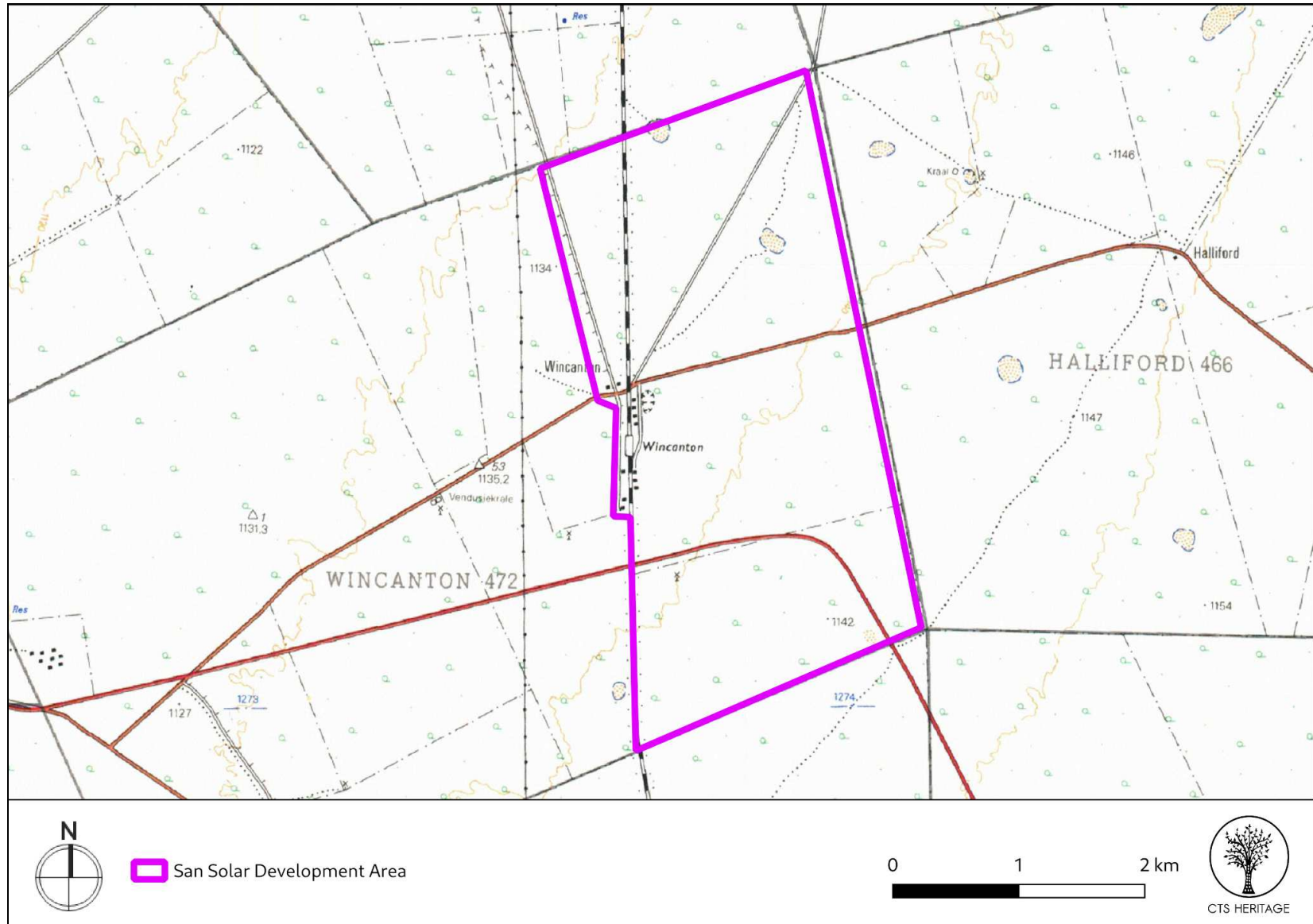
Map 1a: The proposed development relative to Kathu

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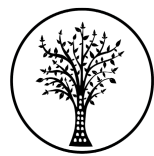


Map 1b: The proposed development area reflected on the 1:50 000 Topo Map

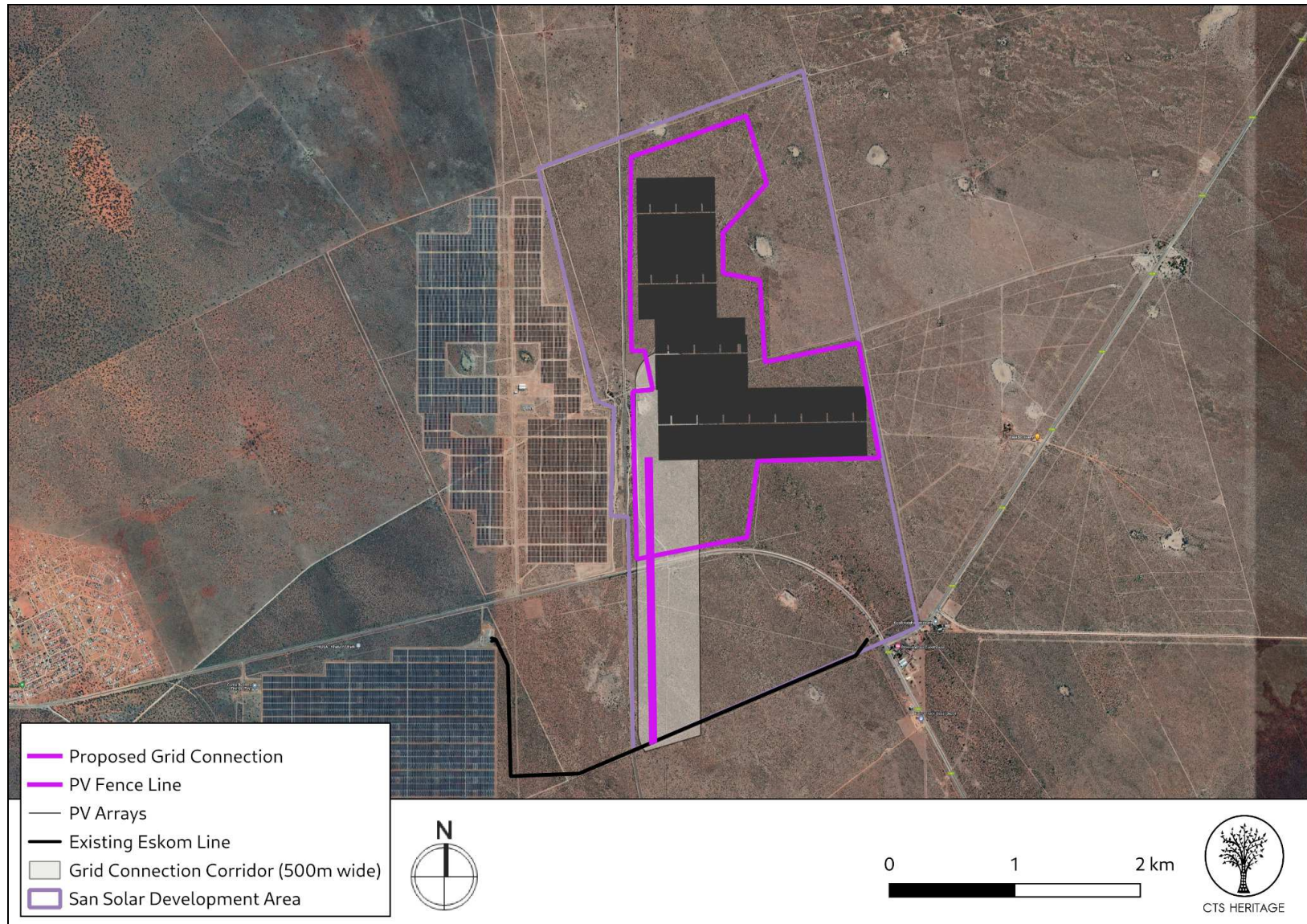
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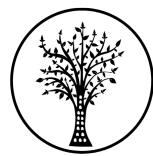


Map 1c: The proposed layout area for the San Solar PV Facility

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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). Furthermore, SAHRA has requested an updated HIA with a field-based component.

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) (Appendix 1)
- An archaeologist conducted an assessment of the broader study area in order to determine the archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit on 21 to 23 April 2022 (Appendix 2)
- A desktop palaeontological assessment was integrated into the HIA (Appendix 3)
- 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.

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

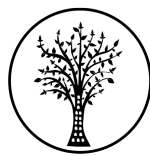
2.4 Constraints & Limitations

The terrain and general region had two very good rainy seasons over the past two years and as such, almost the entire site is densely overgrown with thick/tall grass. The development site is very well conserved by previous owners and is quite pristine. Vegetation cover was a constraint during the survey and movement on the site, both by vehicle and/or pedestrian movement was difficult. Furthermore, site access to certain parts of the site were

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blocked due to locked gates. San Solar could not assist with keys for locked gates to obtain access to these areas of the site.

Despite these challenges, based on the specialist knowledge of the heritage team we are confident that we have been able to determine the overall heritage sensitivity of the area proposed for development.

2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified through the Basic Assessment process were assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).
- The duration, wherein it will be indicated whether:
 - The lifetime of the impact will be of a very short duration (0 – 1 years) – assigned a score of 1.
 - The lifetime of the impact will be of a short duration (2 – 5 years) – assigned a score of 2.
 - Medium-term (5 – 15 years) – assigned a score of 3.
 - Long term (> 15 years) – assigned a score of 4.
 - Permanent – assigned a score of 5.
- The consequences (magnitude), quantified on a scale from 0 – 10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1 – 5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high.
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

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The significance is calculated by combining the criteria in the following formula:

$$S = (E + D + M) \times P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area).
- 30 – 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated).
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

Cultural Landscape

This application is for the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km north west of Kathu in the Northern Cape Province. The previous EA that was undertaken for the project lapsed, hence a new process is being followed.

The town of Kathu was established in the 1960's and 1970's as a result of the iron ore mining taking place at the neighbouring Sishen mine. It is important to note that the Grade I Kathu Pan Archaeological site lies approximately 10km southeast of the proposed development. At Kathu Pan, evidence of early hominin occupation has been observed at multiple sinkhole sites within the pan, and the results of scientific investigation into these sites has been broadly published. These sites are known for their rich collection of Early Stone Age artefacts, and several Archaeological and Heritage Impact Assessments have recorded the area (see Figure 2 Appendix 2). These archaeological resources occur in areas associated with outcrops of banded ironstone, and the localised natural pan, with most coming specifically from sinkholes in the pan itself.

As indicated in Figure 1c, the area proposed for the San Solar PV Facility is located immediately adjacent to an existing PV facility to the west. As such, it is not anticipated that the proposed development will have a negative



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impact on any significant cultural landscape in the area due to the existing similar infrastructure here. Furthermore, it is often preferred to have development such as PV facilities clustered in one area to mitigate the sprawl of this infrastructure across otherwise pristine landscapes. As no impact to the cultural landscape is anticipated, no further assessment of impacts to the cultural landscape is recommended.

Archaeology and Built Environment Heritage

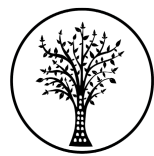
Gaigher (2013) conducted an assessment for the San Solar Energy Facility located north of Kathu on a Portion of the Farm Wincanton 472 - for this exact development proposal (SAHRIS NID 110765). According to Gaigher (2013), "One site for the placement of Solar Array generation plant was investigated. Due to the topographic requirements of Solar Arrays the areas are by nature flat and featureless with limited possibilities of water intrusion. Traditionally people have congregated in areas where shelter is found in some geographic feature or in areas that are elevated above the surrounding landscape. Accesses to water sources are also a deciding factor in the location of occupational sites. None of these factors were present in the areas investigated. Some dry dongas were located in some of the sites; however these are not reliable sources of water. The area could still contain the remains of nomadic hunter/gatherer camps and some areas with suitable substrates could have been used as quarries for material to produce Stone Age tools. No such sites were however identified. We should however in this case apply the rule of Absence of Evidence is not Evidence of Absence." Gaigher (2013) did note the presence of some poorly defined quartz stone artefacts.

No cores or manufacturing amounts of flakes could be identified. It is believed that these tools are the result of alluvial relocation from a more prominent site, possibly within the river valley. The amount and composition of the finds does not warrant the site being described as a tool location site. Gaigher (2013) also noted the presence of railway related structures located outside of the study area to the west, but these were neither described, photographed nor indicated on any map. Based on the information included in Gaigher (2013), it is not anticipated that the proposed development of solar PV facilities in this area will have a negative impact on significant archaeological heritage. Due to the proximity to Kathu Pan site, and the similar geology of the area, there remains the possibility of the Early Stone Age landscape that is renowned from the Kathu Pan sites extending into this development area. Such archaeology may not be visible from the ground surface and may only become evident during the process of excavation.

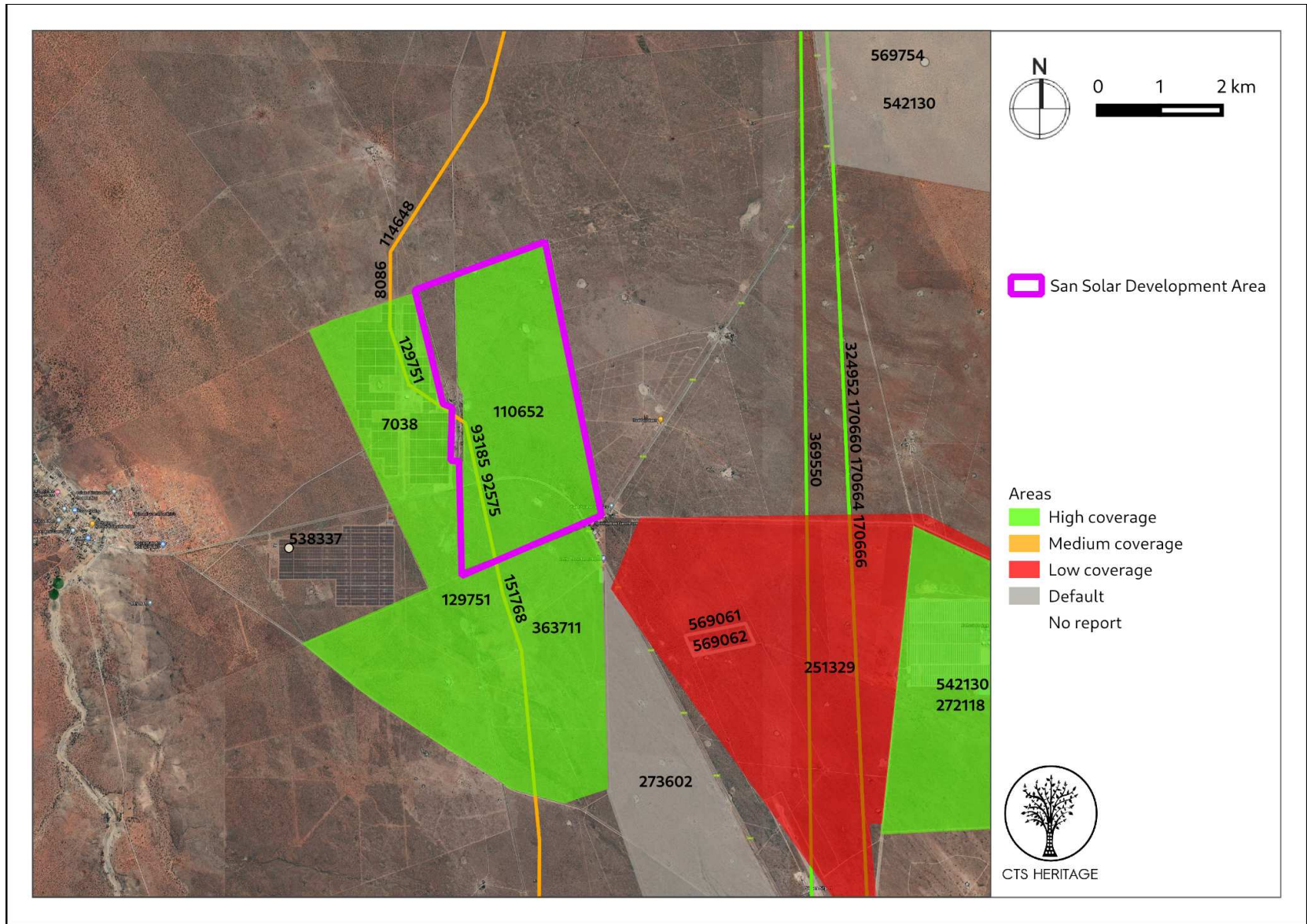
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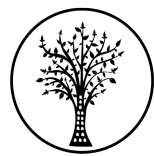


Map 2a: Spatialisation of heritage assessments conducted in proximity to the broader study area

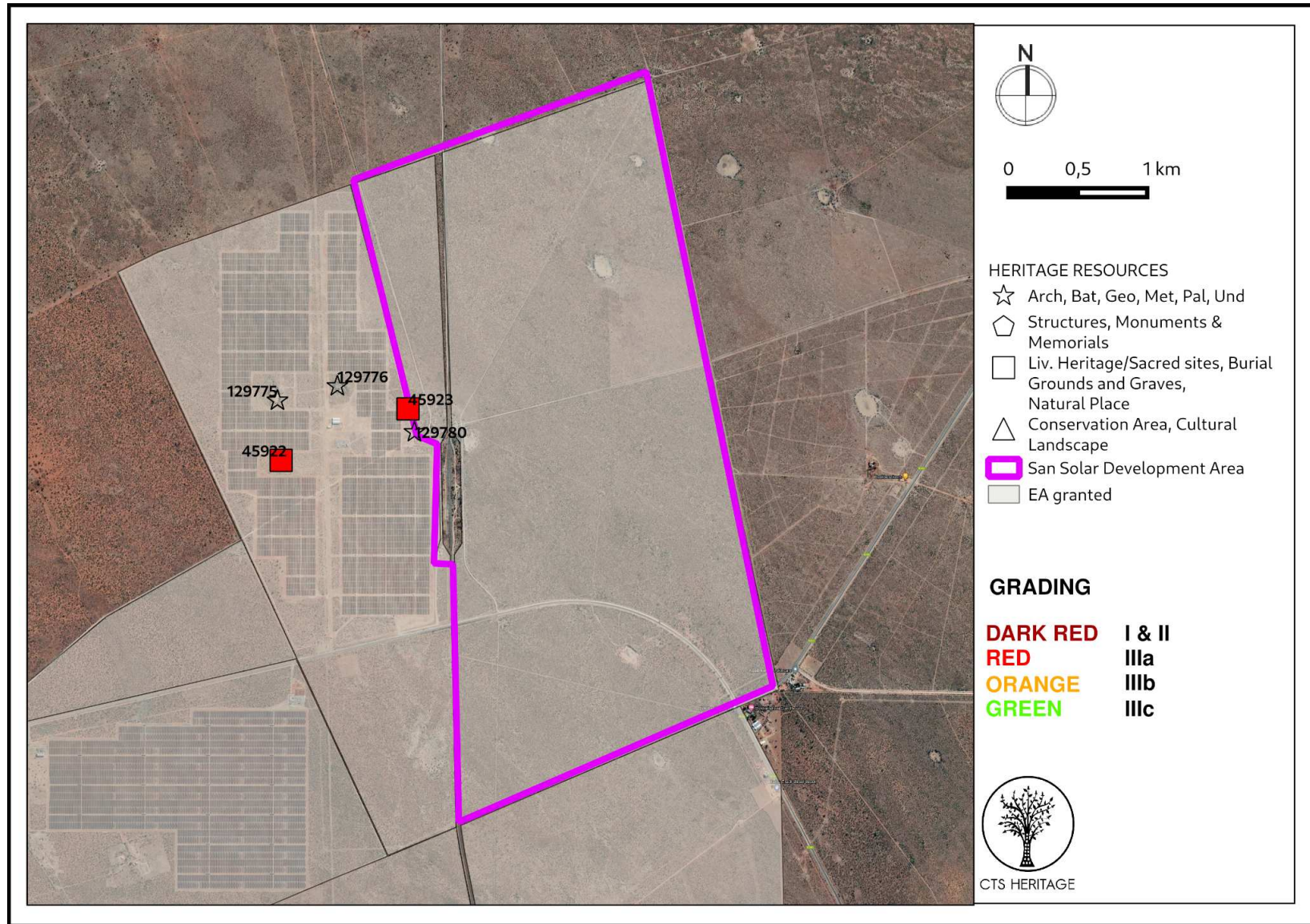
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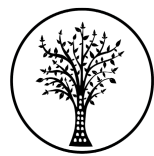
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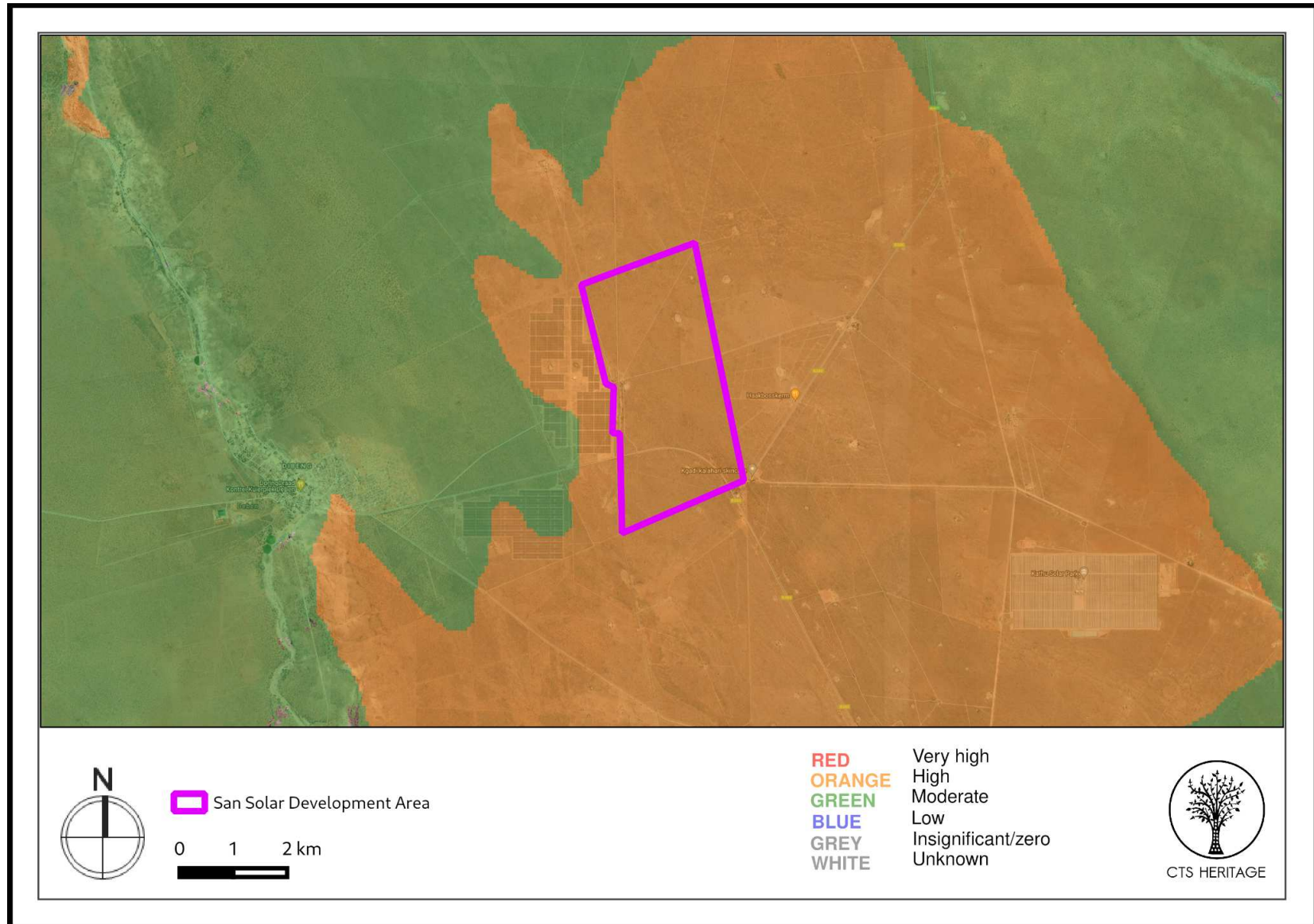
Map 2b: Spatialisation of heritage resources known in proximity to the broader study area

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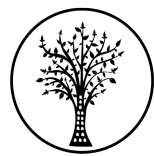


Map 3a: Palaeontological sensitivity of the area surrounding the broader study area

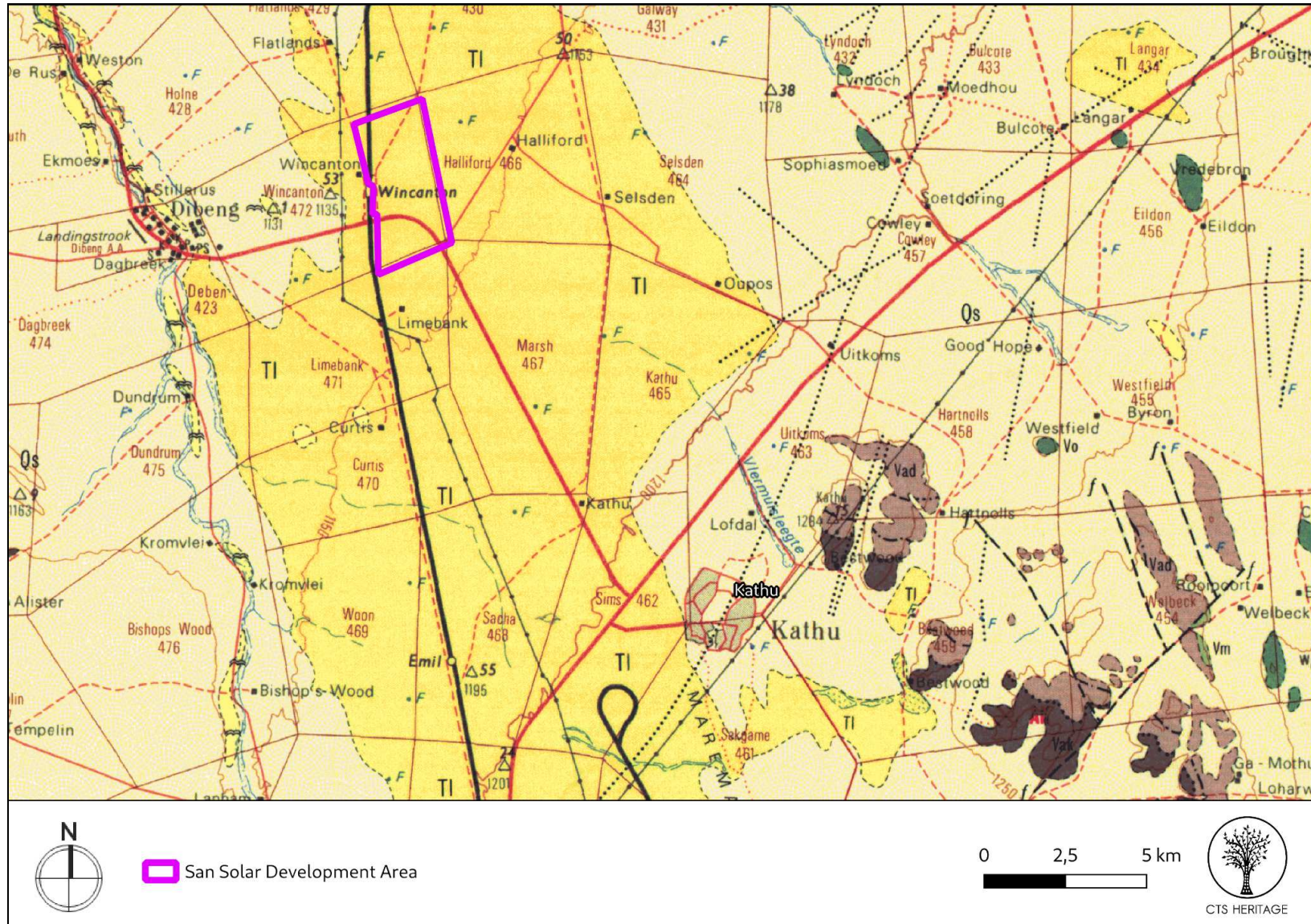
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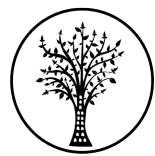
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Map 3b: Geology Map. Extracted from the CGS Map 2722 for Kuruman indicates that the area proposed for development is underlain by TI: surface Limestone dated to the Tertiary Period and Quaternary Sands of the Gordonia Formation

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3.2 Palaeontology

According to the SAHRA Palaeosensitivity map, the area is underlain by formations of high palaeontological sensitivity. According to the Desktop Palaeontology Assessment completed by Bamford (2021) for this project, “The site lies on the northern margin of the Transvaal Basin on the Kaapvaal Craton. The underlying rocks are not exposed here and only the overlying Tertiary Calcretes are of relevance to this project.

The Quaternary Kalahari sands form an extensive cover of much younger deposits over much of the Northern Cape Province and Botswana. Based on the early works of Leicester King, Partridge and Maud (1987, 2000) developed a model of three African Erosion Surfaces for southern Africa, from the Cretaceous to the Pliocene. During the Cretaceous Africa was very high, averaging about 2500-2000 m above sea level but the rifting apart of Gondwanaland and formation of the Atlantic and Indian Oceans, coastal erosion was rapid and the escarpment rapidly receded about 120 km inland along the east and south coasts, but only 50km along the west coast. The newly exposed surface was called the African Erosion Surface. Their model has been challenged and modified by a number of researchers (Burke, 2011; Braun et al., 2014) who propose that mantle plumes caused uplift of the continent during the late Cretaceous, followed by erosion and further uplift about 30-20 million years ago. The newer interpretations have been followed here.

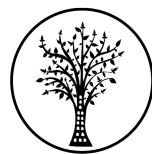
Haddon and McCarthy (2005) proposed that the Kalahari basin formed as a response to down-warp of the interior of the southern Africa, probably in the Late Cretaceous. This, along with possible uplift along epeirogenic axes, back-tilted rivers into the newly formed Kalahari basin and deposition of the Kalahari Group sediments began. Sediments included basal gravels in river channels, sand and finer sediments. A period of relative tectonic stability during the mid-Miocene saw the silcretisation and calcretisation of older Kalahari Group lithologies, and this was followed in the Late Miocene by relatively minor uplift of the eastern side of southern Africa and along certain epeirogenic axes in the interior. More uplift during the Pliocene caused erosion of the sand that was then reworked and redeposited by aeolian processes during drier periods, resulting in the extensive dune fields that are preserved today.

Tertiary calcretes cover large parts of the Northern Cape but they are difficult to date and there are several schools of thought (see Partridge et al., 2006). Nonetheless, it is accepted that calcretes form under alternating cycles of humid and arid climatic conditions in strata that have calcium carbonate (Netterberg, 1969). More recent research using geophysical techniques to measure uplift of the continent during the Cretaceous and Tertiary, combined with the fossil record (Braun et al., 2014) suggest that there were two predominant humid periods during the Tertiary. The whole of the Eocene (56-33 Ma) and a short period during the early Miocene (ca 20-19 Ma) were humid according to their estimations. It is possible that the Northern Cape calcretes formed during one of these periods.

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Overlying many of these rocks are loose sands and sand dunes of the Gordonia Formation, Kalahari Group of Neogene Age. The Gordonia Formation is the youngest of six formations and is the most extensive, stretching from the northern Karoo, Botswana, Namibia to the Congo River (Partridge et al., 2006). It is considered to be the biggest palaeo-erg in the world (ibid). The sands have been derived from local sources with some additional material transported into the basin (Partridge et al., 2006). Much of the Gordonia Formation comprises linear dunes that were reworked a number of times before being stabilised by vegetation (ibid).”

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Palaeontology

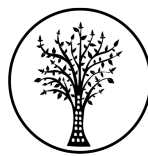
According to the Desktop PIA completed for this project (Bamford, 2021), “The Tertiary calcretes can trap fossils and artefacts when associated with palaeo-pans or palaeo-springs (Partridge et al., 2006). Where deflation has occurred, for example along the west coast of South Africa, any trapped materials in the different levels can be concentrated in the depo-centre of the pan or dune and thus it can be challenging to interpret the deposit (Felix-Henningsen et al., 2003). A well-known example of a limestone tufa deposit is at the Buxton-Norlim Limeworks about 15m southwest of Taung, on the margin of the Ghaap Plateau. Fauna and the Taung child cranium were excavated from here but it should be noted that the topography of this fossiliferous site is very diverse and includes a now roofless cave complex (Hopley et al., 2013). In contrast, the limestones north of Kathu are generally more or less flat.

The Aeolian sands of the Gordonia Formation do not preserve fossils because they have been transported and reworked, but in some regions these too may have covered pan or spring deposits and these can trap fossils, and more frequently archaeological artefacts. Usually these geomorphological features can be detected using satellite imagery. No such features are visible.”

Archaeology

In terms of impacts to archaeological heritage, very few heritage resources of significance were identified during the archaeological field assessment conducted for this project. Three observations of Middle Stone Age scatters of low density noted were all associated with a wetland that is located well-outside of the development footprint. These observations have been graded IIIIC for their contextual scientific significance.

The field assessment also identified a ruin of a mid-Century (1950’s-1970’s) structure located in context with other farming infrastructure and an abandoned railway siding on the eastern side of the railway line bordering the old farm settlement. The building material is mostly vernacular (dolomite) with some modern additions. This observation has no intrinsic heritage significance and has been determined to be not conservation-worthy.



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The field assessment also identified an informal memorial located on the R380 road in remembrance of someone that may have perished in an accident here. Although this memorial may have social significance for specific family members of the deceased, it is hard to argue for broader social significance in terms of the cultural values described in the NHRA. So while this observation is worth noting, this informal memorial has been determined to be not conservation-worthy.



Figure 4a: Contextual Image indicating dense vegetation



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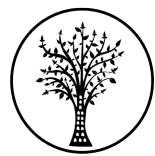


Figure 4b: Contextual Image indicating dense vegetation



Figure 4c: Contextual Image indicating dense vegetation

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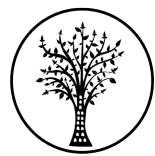


Figure 4d: Contextual Image indicating dense vegetation



Figure 4e: Contextual Image indicating dense vegetation

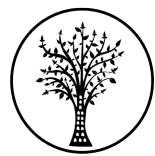
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Figure 4f: Contextual Image indicating dense vegetation



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Figure 4g: Contextual Image indicating dense vegetation



Figure 4h: Contextual Image indicating dense vegetation



4.2 Heritage Resources identified

Table 1: Heritage resources identified in the study area

Site No.	Description	Density	Period	Co-ordinates		Grading	Mitigation
002	Ruin of mid-Century structure. In context with farming infrastructure and an abandoned railway siding on the eastern side of the railway line bordering the old farm settlement. Building material mostly vernacular with some modern additions. Karoo cottage style architecture. Building material seems like dolomite blocks.	NA	Modern	27° 34' 39.10" S	22° 56' 20.40" E	NCW	NA
004	Scaper, core and chunk made from CCS and BIF. Located on edge of wetland	3/10m ²	MSA	27° 34' 04.6" S	22° 57' 04.9" E	IIIC	200m Buffer
005	Scaper, chips and chunks made from CCS and BIF. Located on edge of wetland	6/10m ²	MSA	27° 34' 02.3" S	22° 57' 08.9" E	IIIC	200m Buffer
006	Unfinished blade, chunk, scaper, chips and a core made from BIF. Located on edge of wetland	8/50m ²	MSA	27° 34' 06.3" S	22° 57' 06.1" E	IIIC	200m Buffer
008	Memorials to those who died in road accidents on the R380 on the eastern edge of the grid connection corridor	NA	Modern	27° 35' 23.6" S	22° 56' 37.2" E	NCW	NA



Figure 5a: Observation 004



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Figure 5b: Observation 005



Figure 5c: Observation 006



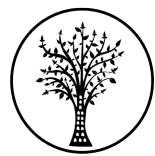
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Figure 5d: Observation 002



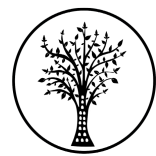
Figure 5e: Observation 002



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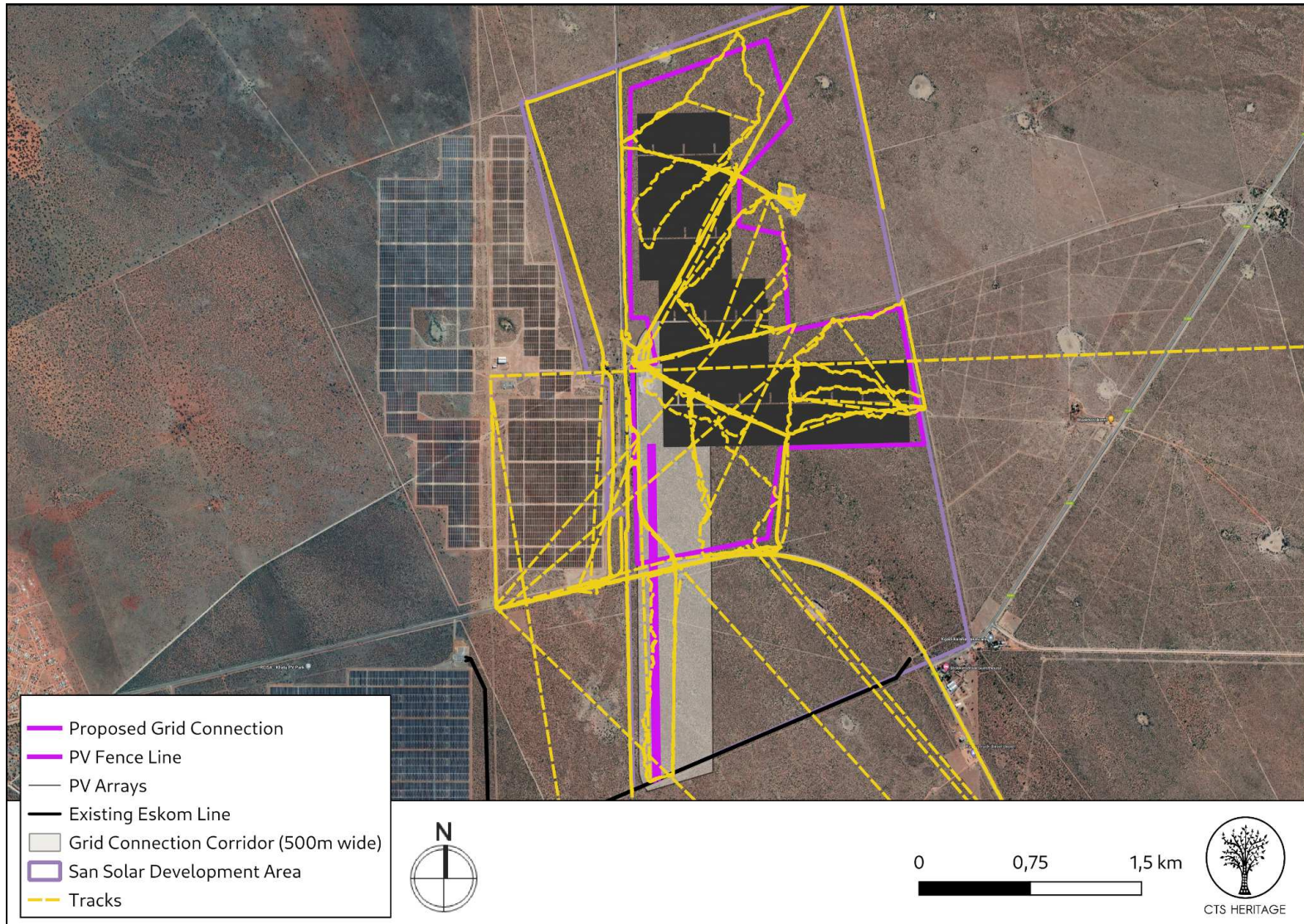


Figure 5f: Observation 008



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4.3 Mapping and spatialisation of heritage resources

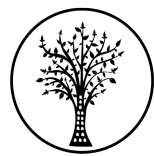


Map 6a: Map of track paths followed in the field assessment of the San Solar PV project

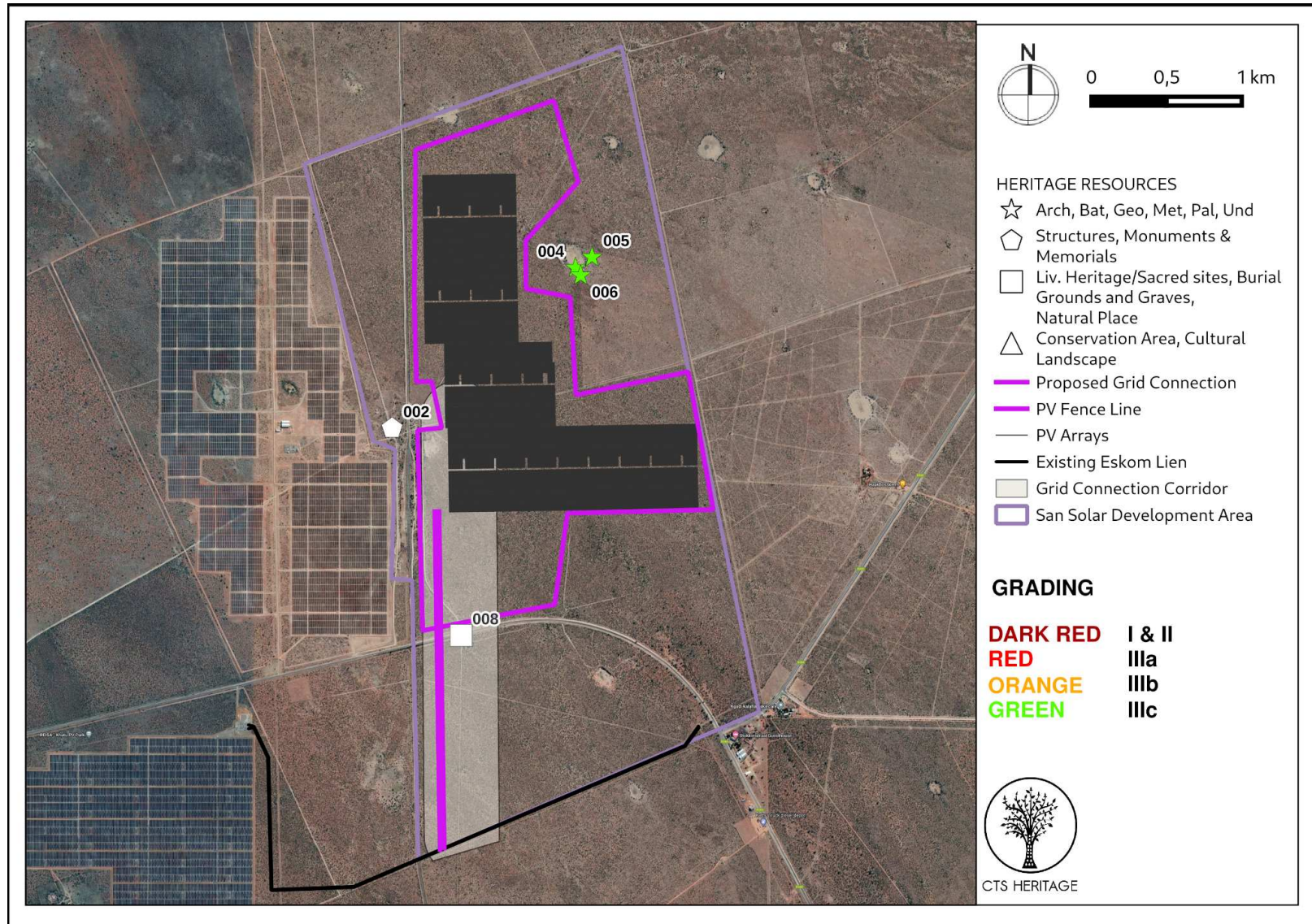
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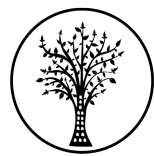
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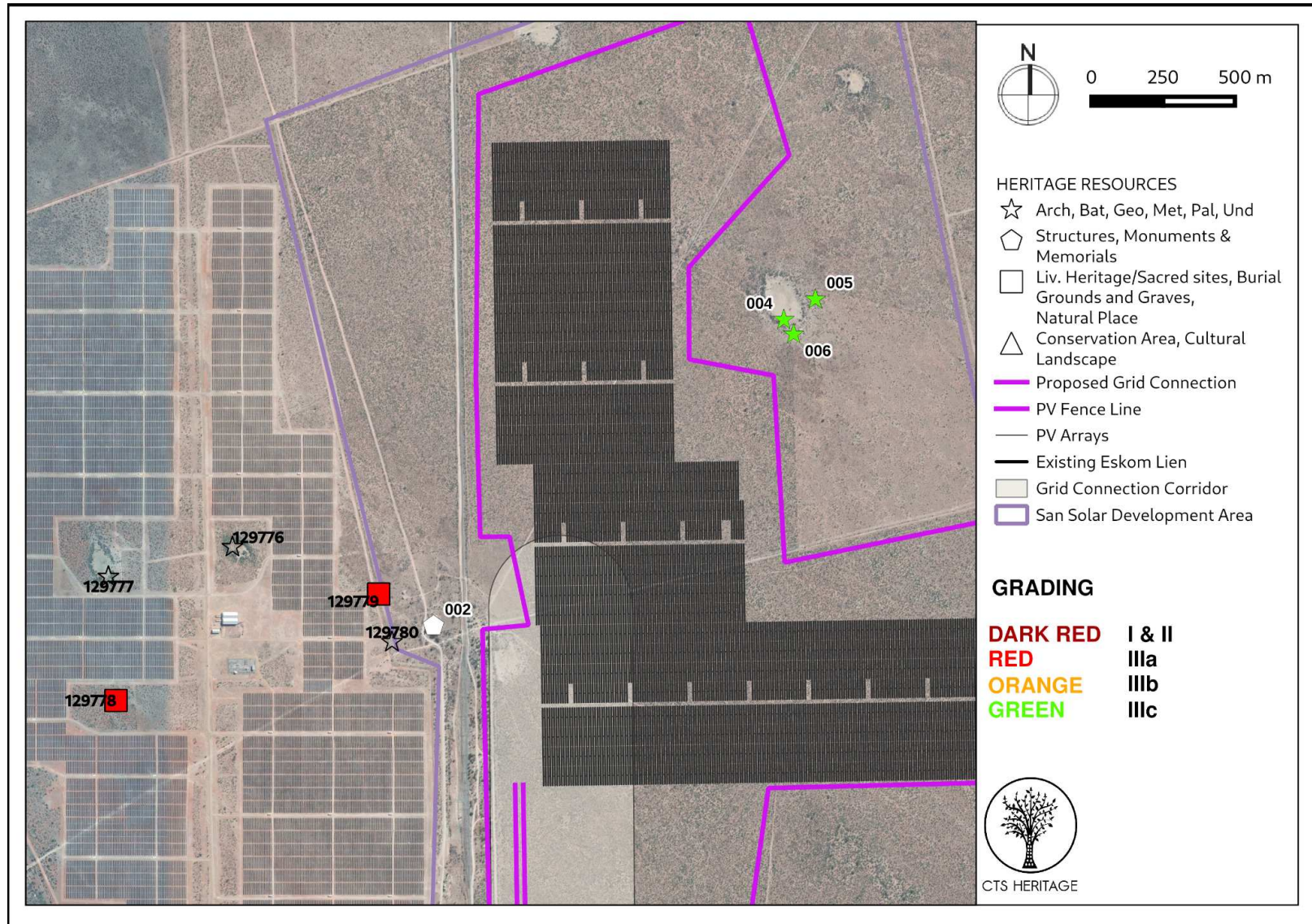
Map 6b: Map of heritage resources identified during the field assessment, relative to the proposed development of San Solar PV

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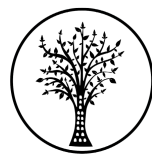
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Map 6c: Map of all known heritage resources located in proximity to the proposed development of San Solar PV

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

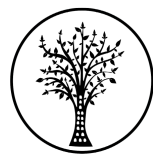
Palaeontology

According to Bamford (2021), “Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils (below ground) or might trap Tertiary fossils in limestones and calcretes. The material to be excavated is flat soils and sands this does not preserve fossils...

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the limestones and calcretes of the Tertiary because they are very rare and there are no visible outcrops in the flat landscape.. There is a very small chance that fossils may occur in the Tertiary limestones so a Fossil Chance Find Protocol must be implemented.”

Table 2a: Impacts of the proposed development to palaeontological resources

NATURE: It is possible that buried palaeontological resources may be impacted by the proposed development				
		Without Mitigation		With Mitigation
MAGNITUDE	L (4)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that have high palaeontological sensitivity.	L (2)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that have high palaeontological sensitivity.
DURATION	H (5)	Where manifest, the impact will be permanent.	H (5)	Where manifest, the impact will be permanent.
EXTENT	L (1)	Limited to the development footprint	L (1)	Limited to the development footprint
PROBABILITY	L (1)	It is unlikely that significant fossils will be impacted	L (1)	It is unlikely that significant fossils will be impacted
SIGNIFICANCE	H	$(4+5+1) \times 1 = 10$	H	$(2+5+1) \times 1 = 8$
STATUS		Negative		Negative
REVERSIBILITY	L	Any impacts to heritage resources that do occur are irreversible	L	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	P	Possible	L	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION:				
<ul style="list-style-type: none"> The attached Chance Fossil Finds procedure must be implemented during the course of construction activities 				
RESIDUAL RISK:				
None				



Archaeology

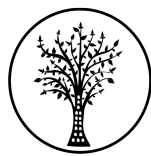
The results of the archaeological field assessment conducted largely align with the findings of previous archaeological assessments completed in the vicinity of the proposed development and within the development area itself. The archaeological resources identified within the development area are dominated by low density scatters of Middle Stone Age artefacts and flakes located in proximity to a wetland. These resources have been graded III C for their contextual significance.

Due to its environmental and ecological sensitivity, this wetland is excluded from the proposed development and there is more than 200m between the boundaries of the wetland and the proposed PV fence line. As such, no impact to these resources is anticipated.

Additional observations were made (ruined structure and memorial) however these observations were determined to be not conservation-worthy in terms of the definitions of cultural significance included in the NHRA and as such, no further recommendations are made in this regard.

Table 2b: Impacts of the proposed development to archaeological resources

NATURE: It is possible that significant archaeological resources may be impacted by the proposed development			
		Without Mitigation	With Mitigation
MAGNITUDE	M (6)	3 archaeological sites of low scientific significance were identified within the area proposed for development	L (2) 3 archaeological sites of low scientific significance were identified within the area proposed for development
DURATION	H (5)	Where manifest, the impact will be permanent.	H (5) Where manifest, the impact will be permanent.
EXTENT	L (1)	Limited to the development footprint	L (1) Limited to the development footprint
PROBABILITY	M (3)	It is possible that significant archaeological resources will be impacted	L (1) It is unlikely that significant archaeological resources will be impacted
SIGNIFICANCE	M	$(6+5+1) \times 5 = 60$	L $(2+5+1) \times 1 = 8$
STATUS		Negative	Neutral
REVERSIBILITY	L	Any impacts to heritage resources that do occur are irreversible	L Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	P	Possible	L Not Likely
CAN IMPACTS BE MITIGATED		Yes	
MITIGATION:			
<ul style="list-style-type: none"> A 200m no-go buffer must be implemented around the wetland associated with these archaeological observations Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward. 			
RESIDUAL RISK:			
None			



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5.2 Sustainable Social and Economic Benefit

Socio-economic Benefits of the Red Sands PVs include the following:

- The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
- The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
- The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
- The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy.
- The water requirement for a wind farm is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
- South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Red Sands PVs will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

5.3 Proposed development alternatives

No alternatives are proposed at this stage. In addition, as no impacts to significant heritage resources are proposed, no alternatives are put forward in this assessment.

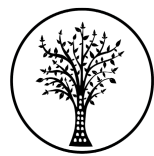


5.4 Cumulative Impacts

The proposed renewable energy facility is located in a cluster of approved renewable energy facilities (Map 7) located around Kathu. In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact due to its location as one of many renewable energy facilities in this area.

Table 3: Cumulative Impact Table

NATURE: Cumulative Impact to the sense of place and known archaeological and palaeontological resources				
		Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects in the area
MAGNITUDE	L (4)	Low	M (5)	Moderate
DURATION	M (3)	Medium-term	H (4)	Long-term
EXTENT	L (1)	Low	L (1)	Low
PROBABILITY	L (2)	Improbable	H (3)	Probable
SIGNIFICANCE	L	$(4+3+1) \times 2 = 16$	L	$(5+4+1) \times 3 = 30$
STATUS		Neutral		Neutral
REVERSIBILITY	H	High	L	Low
IRREPLACEABLE LOSS OF RESOURCES?	L	Unlikely	L	Unlikely
CAN IMPACTS BE MITIGATED		NA		NA
CONFIDENCE IN FINDINGS: High				
MITIGATION: None				



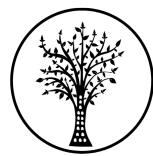
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Map 7: Map indicating the location of authorised renewable energy facilities in proximity to the proposed development

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6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the EAP during the EIA. No heritage-related comments have been received to-date. SAHRA is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation.

7. CONCLUSION

The results of the archaeological field assessment conducted largely aligns with the findings of previous archaeological assessments completed within and in the vicinity of the proposed development. The archaeological resources identified within the development area are dominated by low density Middle Stone Age flakes and artefacts associated with a wetland. Due to its ecological sensitivity, the wetland has been excluded from the proposed development layout and as such, no impact to these resources is anticipated. Based on the information available, the proposed development is unlikely to directly impact on any significant archaeological heritage resources.

According to the Desktop PIA (Bamford, 2021), based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the limestones and calcretes of the Tertiary because they are very rare and there are no visible outcrops in the flat landscape.. There is a very small chance that fossils may occur in the Tertiary limestones so a Fossil Chance Find Protocol must be implemented. Mitigation measures for this risk are proposed below.

8. RECOMMENDATIONS

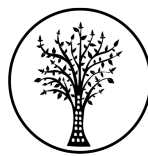
There is no objection to the proposed development of the San Solar Pv Facility and associated grid connection in terms of impacts to heritage resources on condition that:

- A no-go buffer area of 200m must be implemented around the wetland associated with Sites 004, 005 and 006 to ensure that no indirect impact takes place. This site should also be marked as no-go on all development maps and SDPs.
- The attached Chance Fossil Finds Procedure is implemented for the duration of construction activities
- Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

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9. REFERENCES

Heritage Impact Assessments				
NID	Author(s)	Date	Type	Title
109484	Heritage Statement	Stephan Gaigher	09/05/2012	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located south of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province.
110652	HIA Phase 1	Stephan Gaigher	01/02/2013	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located south of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province
110765	HIA Phase 1	Stephan Gaigher	26/02/2013	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located north of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province
114648	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED 16 MTPA EXPANSION OF TRANSNETS EXISTING MANGANESE ORE EXPORT RAILWAY LINE & ASSOCIATED INFRASTRUCTURE BETWEEN HOTAZEL AND THE PORT OF NGQURA, NORTHERN & EASTERN CAPE. Part 1: Hotazel to Kimberley, Northern Cape
129751	HIA Phase 1	Elize Becker	20/02/2013	Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura
153307	Heritage Impact Assessment Specialist Reports	Robert de Jong	22/02/2011	Kalahari Solar Power Project Heritage Impact Assessment Report and Heritage Management Plan developed by Robert De Jong and Associates
157923	Heritage Scoping	R. C. De Jong	10/12/2010	Heritage Scoping Report for the Proposed Kalahari Solar Project on Portions of the Farm Kathu 465, Kuruman Registration Division, Gamagara Local Municipality, Northern Cape Province
159473	AIA Phase 1	Johnny Van Schalkwyk		Archaeological impact survey report for THE PROPOSED DEVELOPMENT OF A SOLAR POWER PLANT ON THE FARM BESTWOOD 459, KATHU REGION, NORTHERN CAPE PROVINCE
160089	AIA Phase 1	Johnny Van Schalkwyk		Archaeological impact survey report for THE PROPOSED KALAHARI SOLAR PARK DEVELOPMENT ON THE FARM KATHU 465, NORTHERN CAPE PROVINCE
251329	Heritage Impact Assessment	Jayson Orton	20/02/2015	Heritage Impact Assessment for a Proposed 132 kV Power Line, Kuruman Magisterial District, Northern Cape



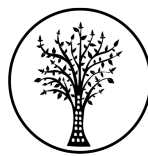
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	Specialist Reports			
272118	Archaeological Specialist Reports	Jayson Orton, Steven Walker	20/04/2015	Archaeological Survey for the Proposed Kalahari Solar Project, Kuruman Magisterial District, NC Province
273602	Heritage Impact Assessment Specialist Reports	Polke Birkholtz	20/04/2015	Heritage Impact Assessment for the Proposed Establishment of a Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape.
363711	Heritage Impact Assessment Specialist Reports	Johann van Schalkwyk	01/03/2016	Cultural heritage impact assessment for THE DEVELOPMENT OF THE PROPOSED BOITSHOKO SOLAR POWER PLANT ON THE REMAINING EXTENT OF PORTION 1 OF THE FARM LIMEBANK NO 471 REGISTRATION DIVISION KURUMAN, NORTHERN CAPE PROVINCE
363712		Lloyd Rossouw	01/03/2016	Phase 1 Palaeontological Assessment of the proposed Boitshoko solar power plant (SPP) facility on the Remaining Extent of Portion 1 of the farm Limebank 471, near Kathu, Northern Cape Province.
7038	AIA Phase 1	David Morris	07/11/2010	PROPOSED KATHU-SISHEN SOLAR ENERGY FACILITIES. SPECIALIST INPUT FOR THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE AND ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED KATHU SISHEN SOLAR ENERGY FACILITIES, NORTHERN CAPE
8944	PIA Phase 1	John Pether	17/01/2011	BRIEF PALAEOLOGICAL IMPACT ASSESSMENT (Desktop Study) PROPOSED KATHU & SISHEN SOLAR ENERGY FACILITIES Portions 4 & 6 of the Farm WINCANTON 472 Kuruman District, Northern Cape
93163	HIA Phase 1	Stephan Gaigher	09/05/2012	Heritage Impact Assessment Report Environmental Impact Assessment Phase: Proposed Establishment of the San Solar Energy Facility, Located North of Kathu on a Portion of Farm Wincanton 472, Northern Cape Province

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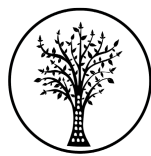
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APPENDICES

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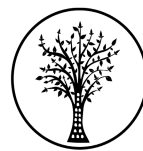
34 Harries Street, Plumstead, Cape Town

Tel: +27 (0)87 073 5739 **Email** info@ctsheritage.com **Web** <http://www.ctsheritage.com>



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APPENDIX 1: Heritage Screening Assessment (2022)



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HERITAGE SCREENER

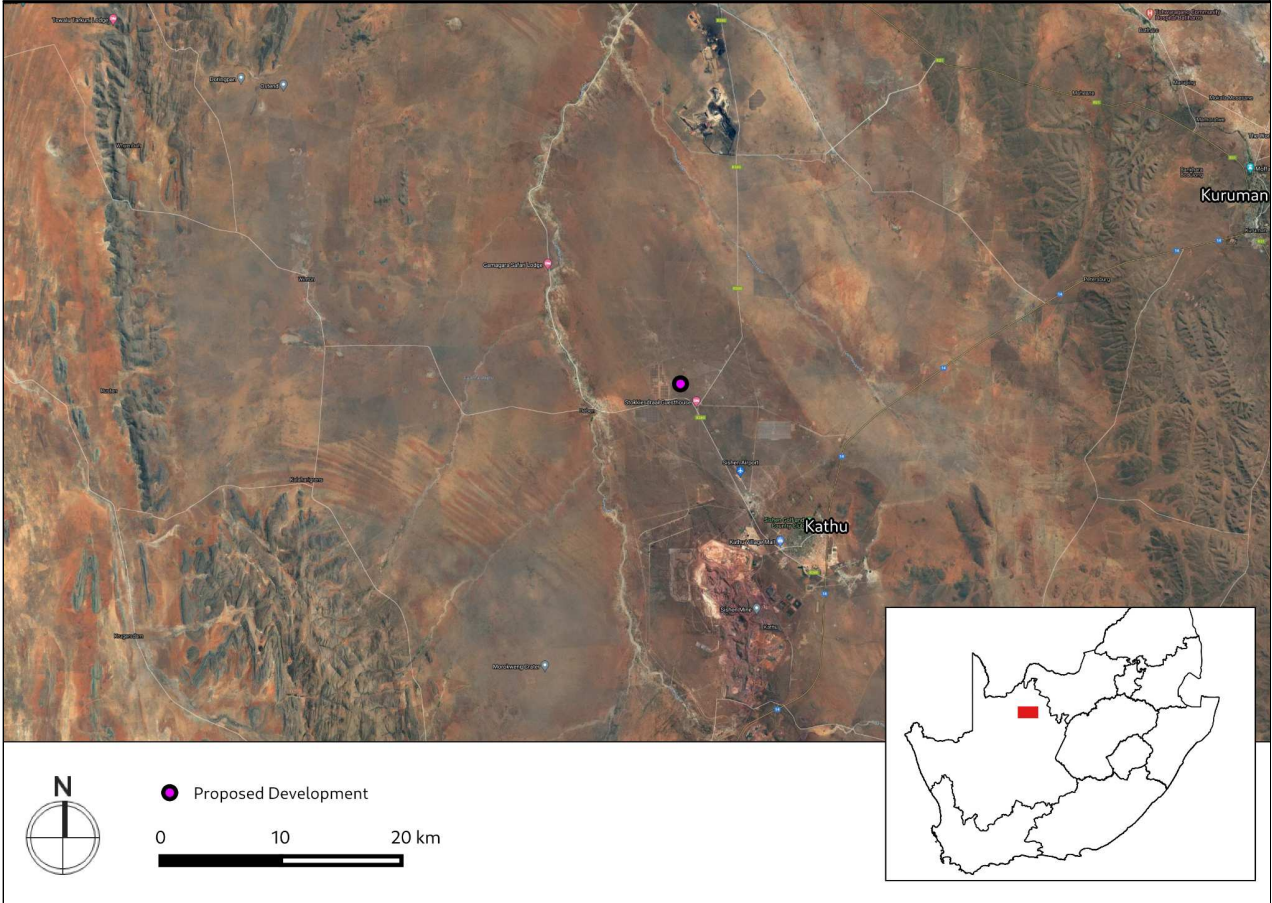
CTS Reference Number:	CTS21_208	
SAHRA Ref Number	349	
Client:	Savannah	
Date:	November 2021	
Title:	San Solar PV Facility and Associated Infrastructure, Northern Cape Province	
Recommendation:	<p>RECOMMENDATION</p> <p>Based on the available information, it is unlikely that the proposed development will impact significant archaeological or palaeontological heritage. However, it is possible that the excavations associated with the development may impact significant archaeological heritage located below the ground surface and as such, it is recommended that:</p> <ul style="list-style-type: none">- Should any sink holes or ESA archaeological artefacts be uncovered during the course of excavation activities, work must cease in that area and SAHRA must be contacted regarding a way forward- The attached Chance Fossil Finds Procedure is implemented for the duration of excavation activities	

Figure 1a. Satellite map indicating the location of the proposed development in the Northern Cape Province



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1. Proposed Development Summary

San Solar Energy Facility (Pty) Ltd proposes the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km north west of Kathu in the Northern Cape Province. The solar PV facility will be developed on the Remaining extent of the Farm Wincanton 472 and comprise several arrays of PV panels and associated infrastructure with a contracted capacity of up to 100MW. The study area¹ falls within the Gamagara Local Municipality within the John Taolo Gaetsewe District Municipality. The site is located east of Deben and is accessible via the R380 provincial route which branches off the N14 National Road, approximately 3km south of Kathu.

A facility development area², which will include the PV facility, BESS and a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line will be identified within the study area considered in the Scoping phase. The infrastructure associated with this 100MW PV facility includes:

- » PV modules and mounting structures
- » Inverters and transformers
- » Cabling between the panels, to be laid underground where practical.
- » Battery Energy Storage System (BESS)
- » Site and internal access roads (up to 8m wide)
- » Laydown area.
- » Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouse, and workshop areas for maintenance and storage.
- » Grid connection solution including a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line (located ~5km east of the site).

The development area will be larger than the area needed for the construction of a 100MW PV facility and will provide the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint³. To avoid areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the development footprint within which the infrastructure of San Solar PV facility and its associated infrastructure will be located will be fully assessed during the EIA Phase.

Three (3) solar facilities have been constructed in the broader area. These include the Sishen Solar PV and Kathu Solar PV facilities located immediately west of the farm Remaining extent of the Farm Wincanton 472. The Kathu Solar facility is a CSP facility located to the east of the study area

¹ The study area is defined as the Remaining extent of the Farm Wincanton 472, which has the extent of ~ 1000ha.

² The development area is that identified area (located within the study area) where the San Solar PV facility would be located.

³ The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for San Solar PV will be planned to be constructed. This will be the actual footprint of the facility, and the area which would be disturbed. The extent of the development footprint will be determined in the EIA Phase.



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2. Application References

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

3. Property Information

Latitude / Longitude	27°34'47.09"S 22°56'54.25"E
Erf number / Farm number	Remainder of Farm 472
Local Municipality	Gamagara
District Municipality	John Taolo Gaetsewe
Province	Northern Cape
Current Use	Agriculture
Current Zoning	Agriculture

4. Nature of the Proposed Development

Total Surface Area	~ 1000ha
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
	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.

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	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):

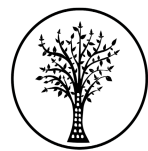
6. Additional Infrastructure Required for this Development

See project description above.

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

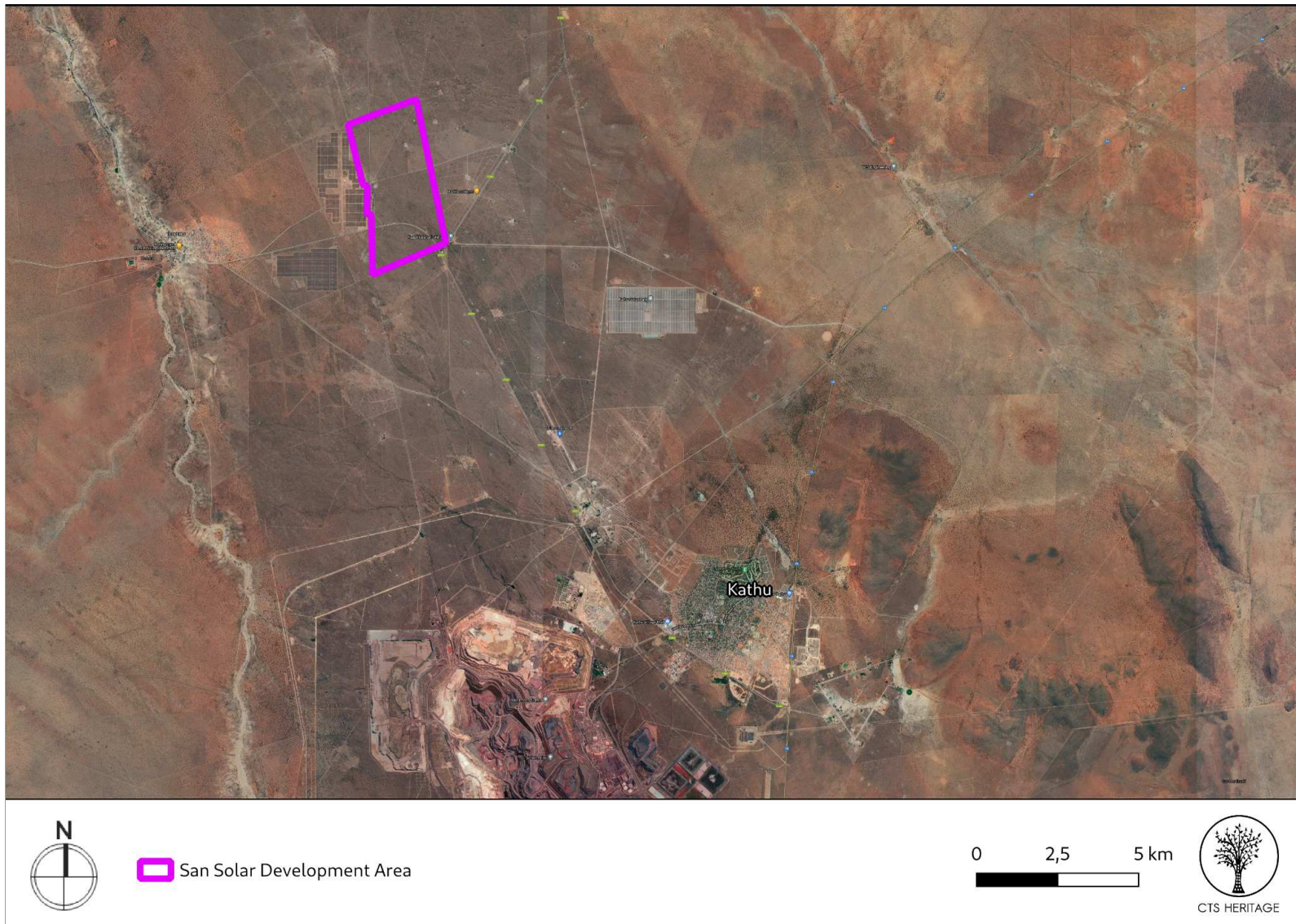


Figure 1b Overview Map. Satellite image (2019) indicating the proposed development area

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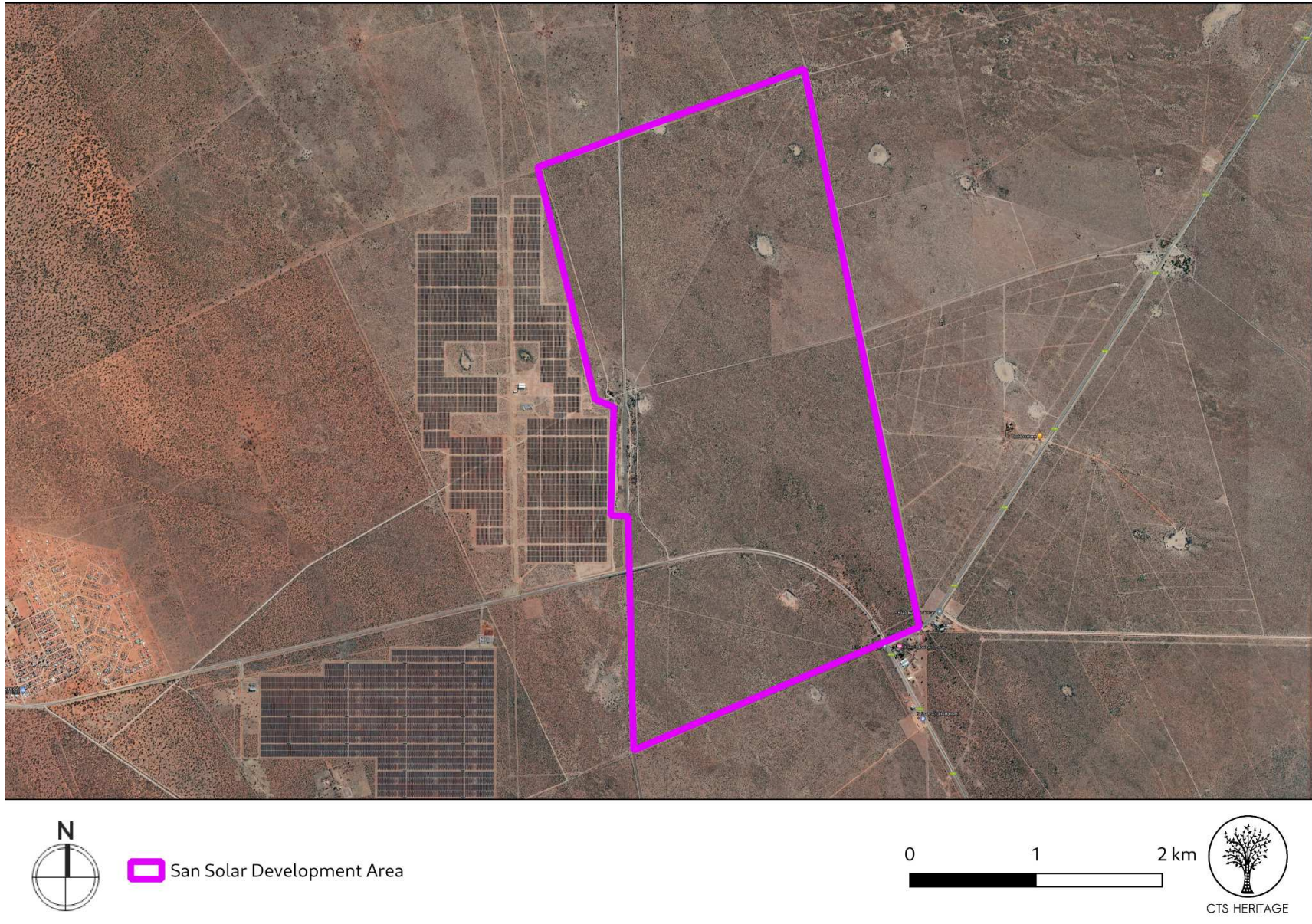
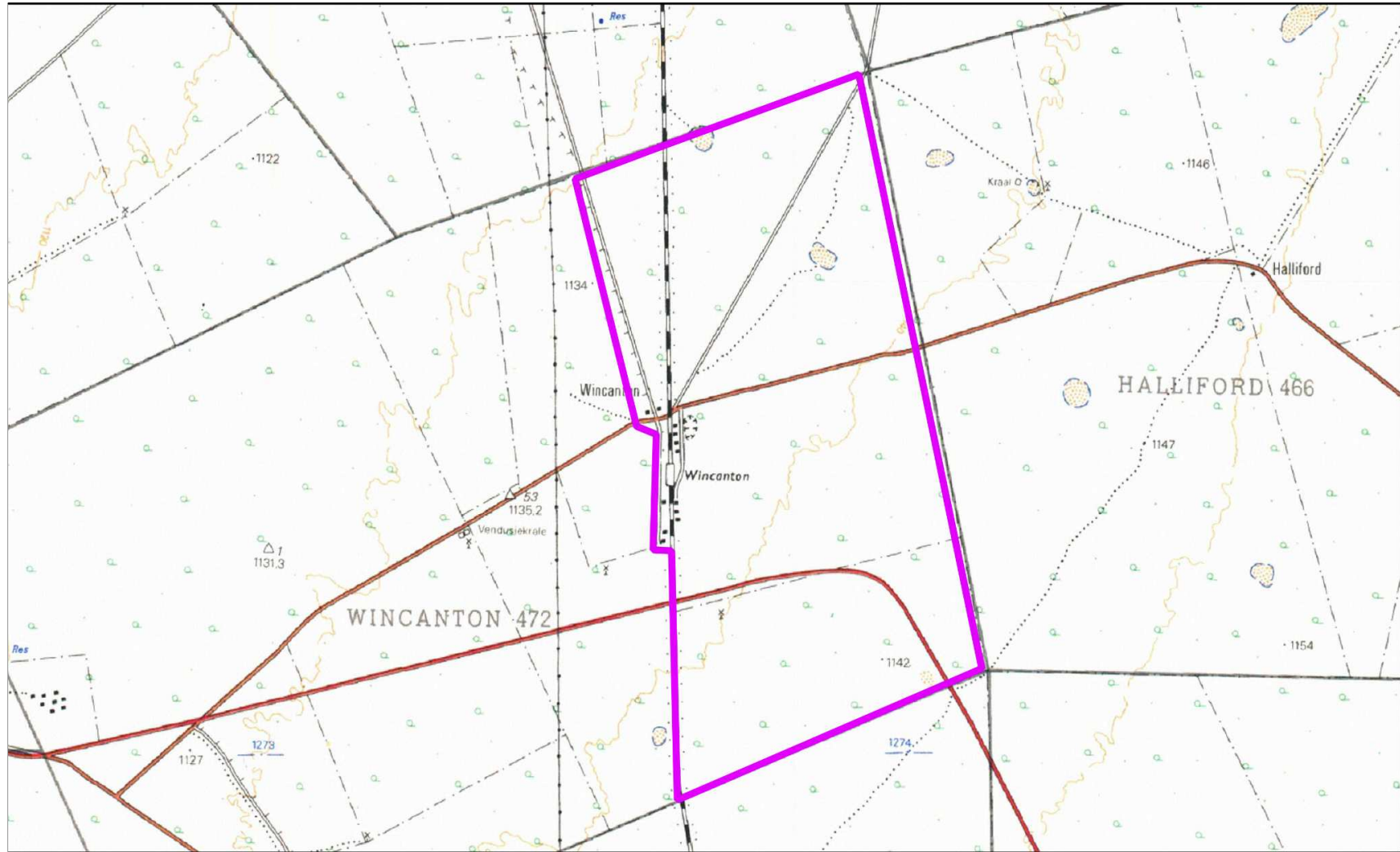


Figure 1c. Overview Map. Satellite image (2019) indicating the proposed development area at closer range.



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 San Solar Development Area

0 1 2 km



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Figure 1d. Overview Map. Extract from the 1:50 000 Topo Map indicating the proposed development area

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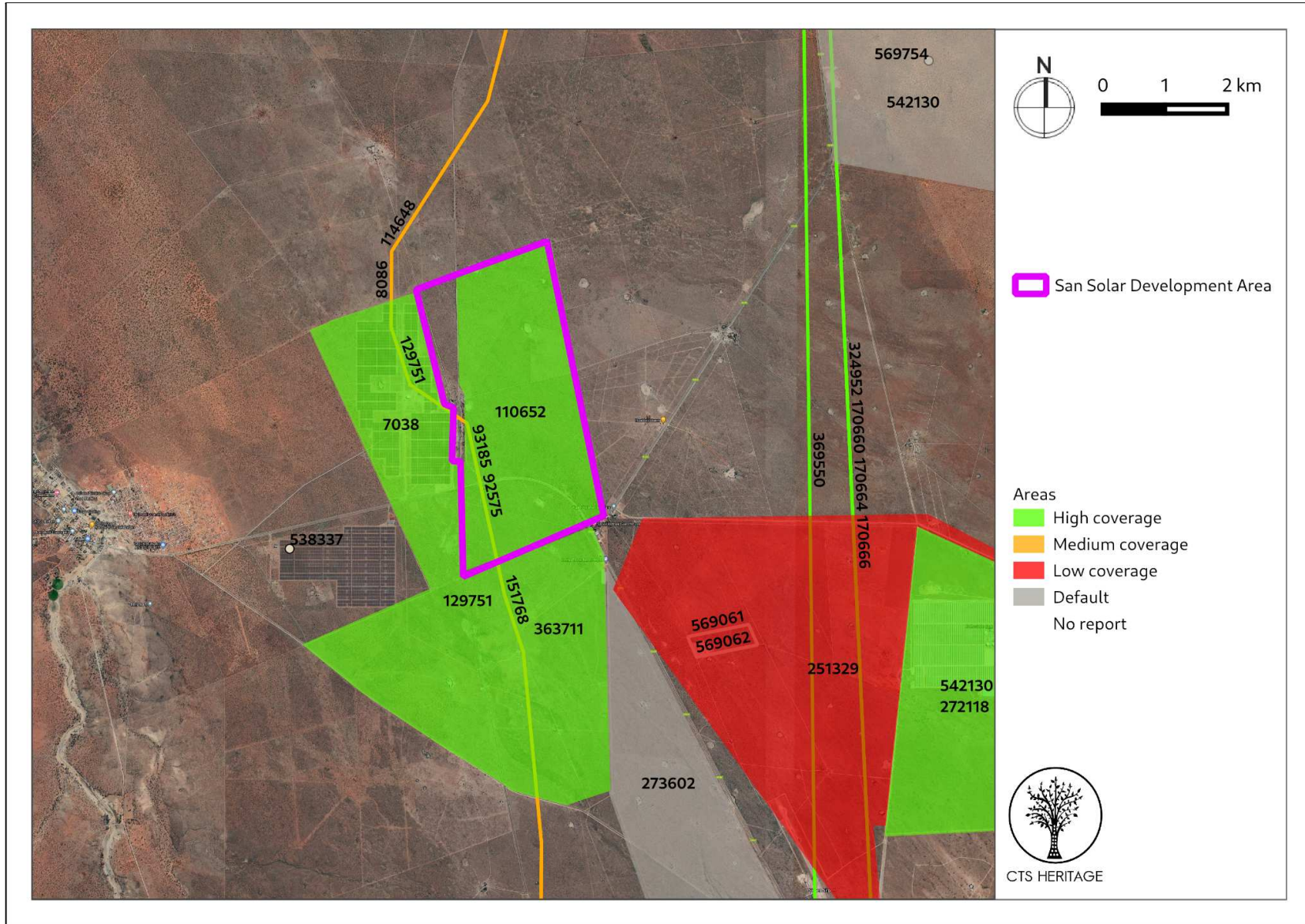
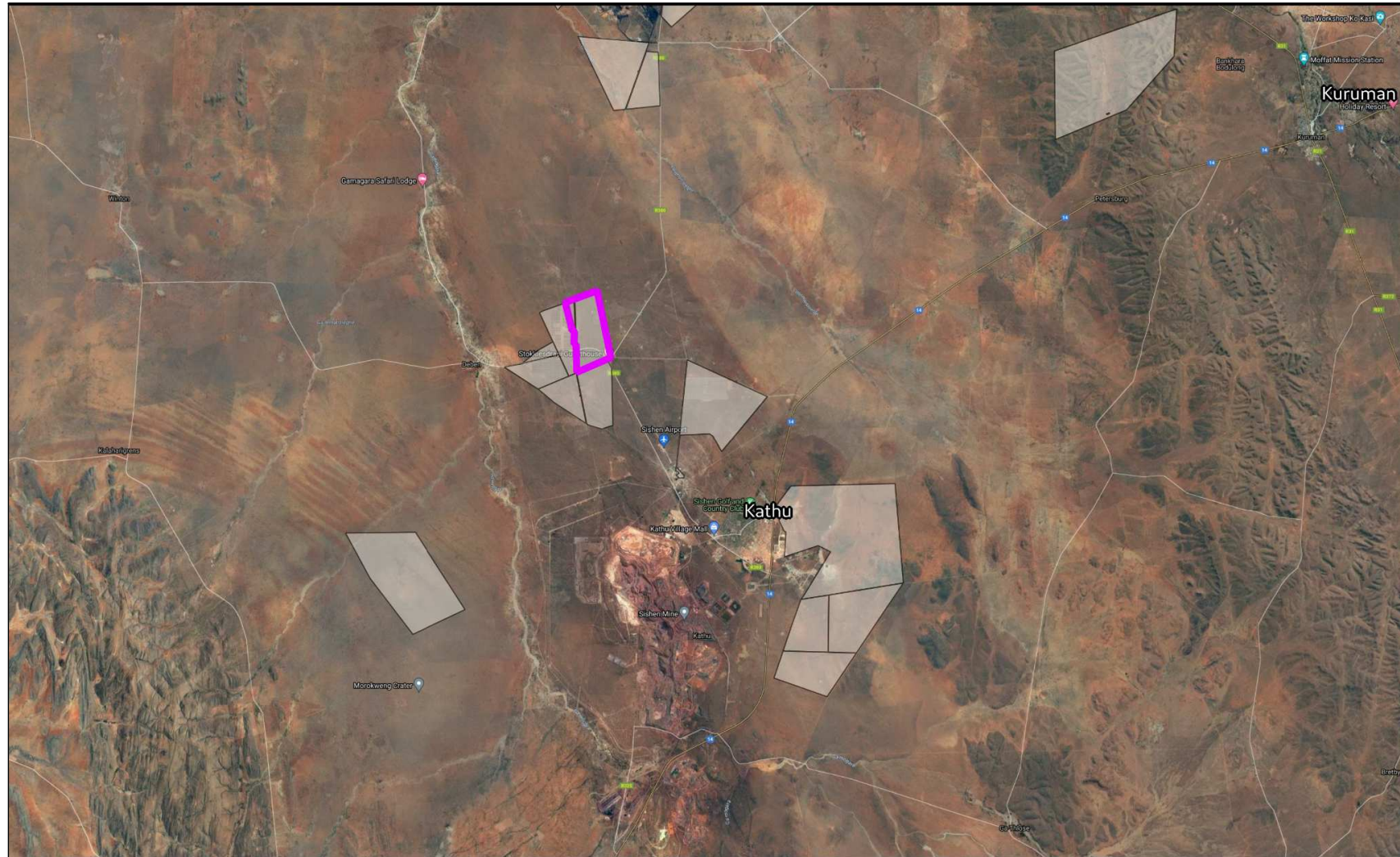


Figure 2. Previous HIAs Map. Previous Heritage Impact Assessments surrounding the proposed development area within 5km, with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.



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 San Solar Development Area
 RE Environmental Authorisation

0 7,5 15 km



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Figure 2a. Renewable Energy EA Map. Renewable energy projects with Environmental Authorisation (EA)

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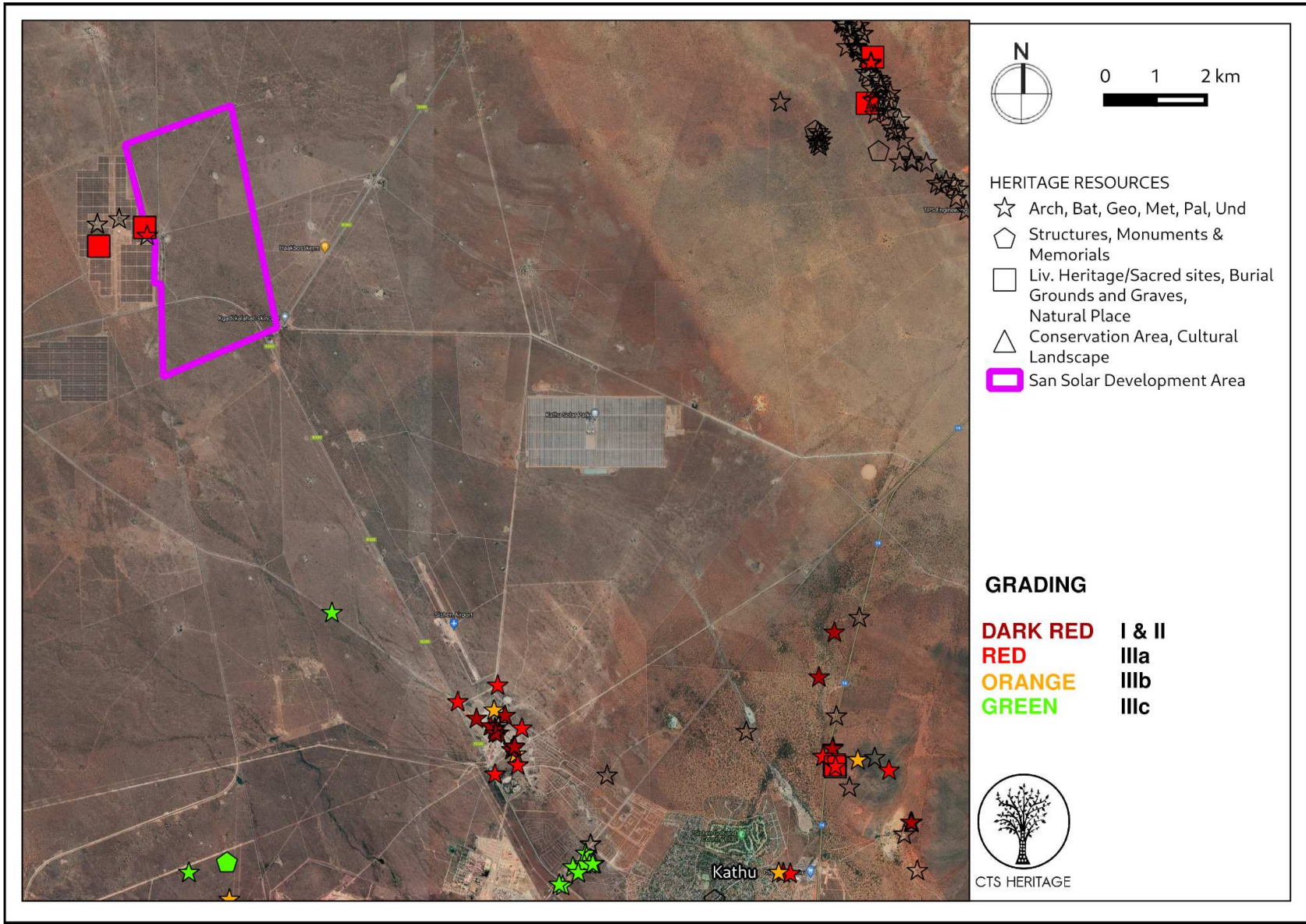


Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area



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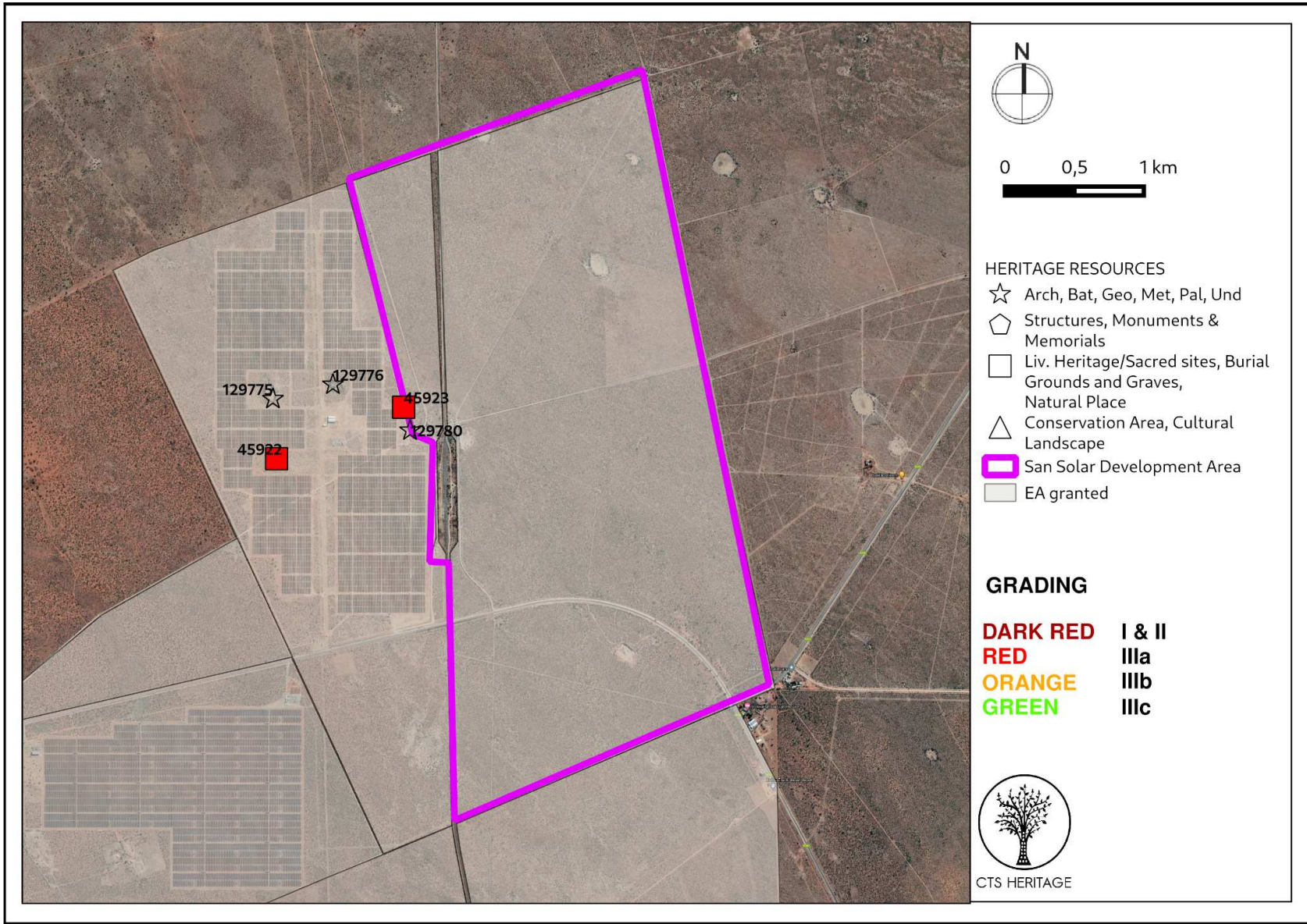


Figure 3a. Heritage Resources Map. Inset A , with SAHRIS Site IDs indicated. Please See Appendix 4 for full description of heritage resource types.

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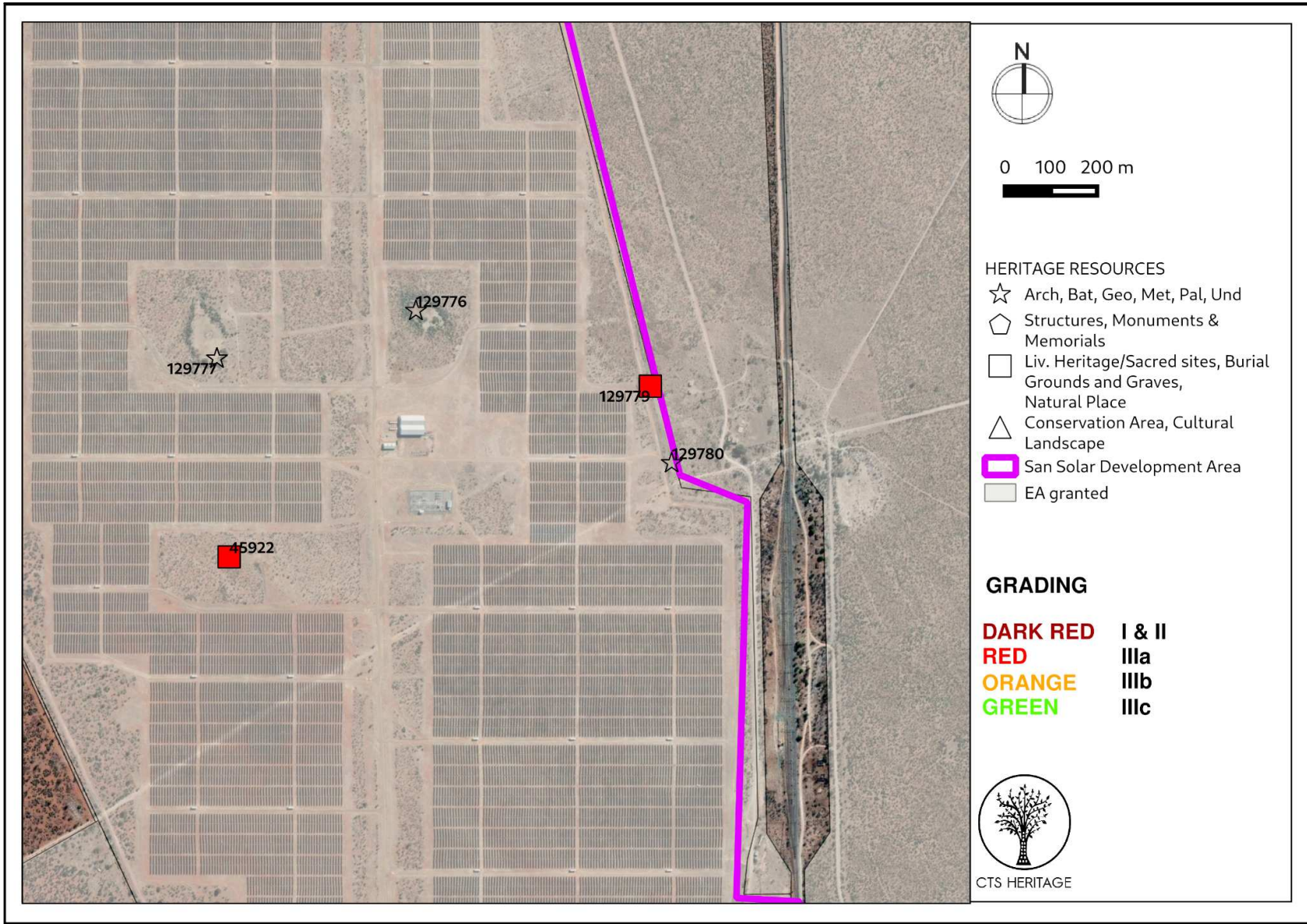
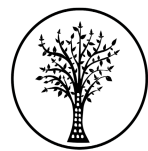


Figure 3b. Heritage Resources Map. Inset B

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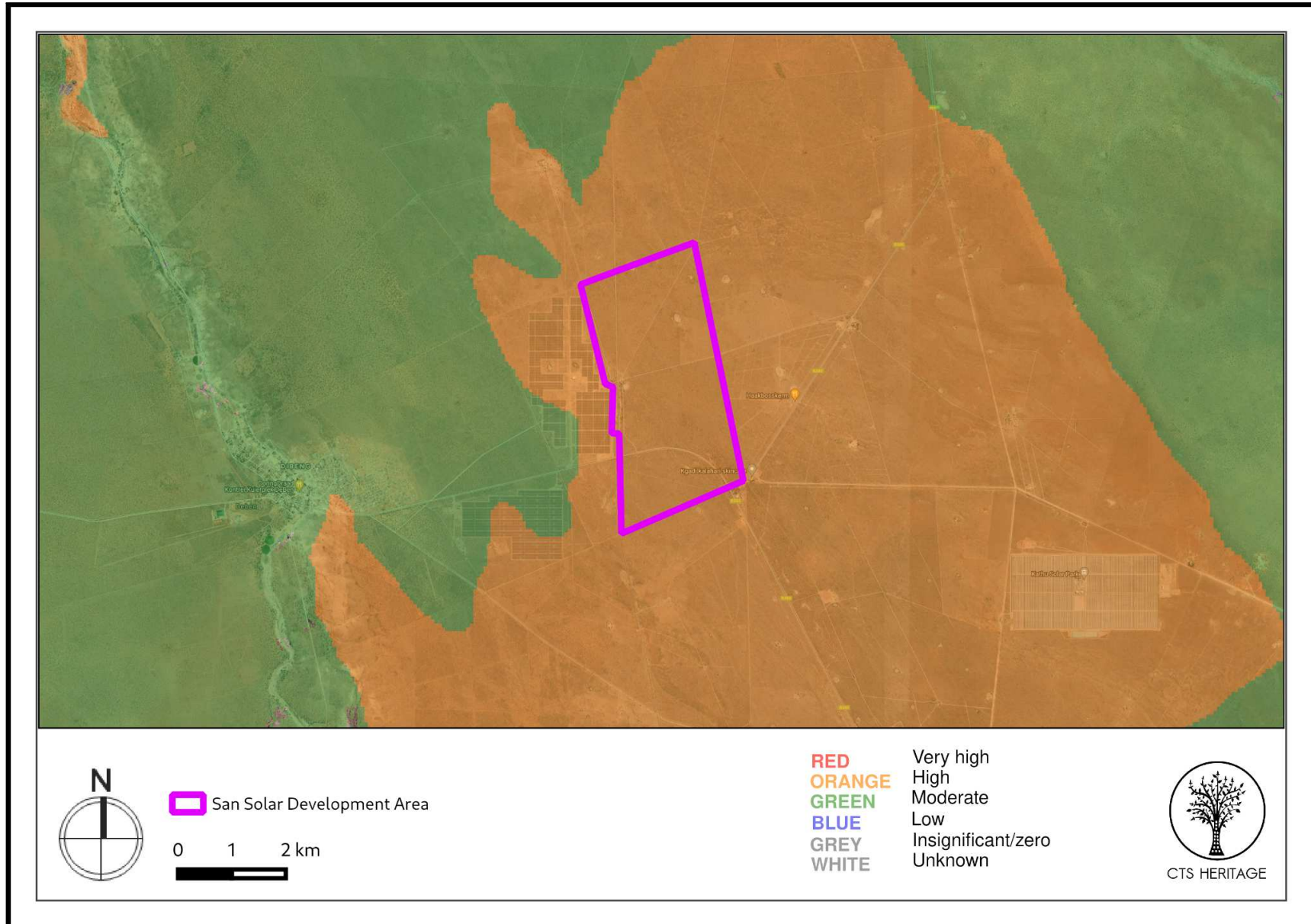


Figure 4a. Palaeosensitivity Map. Indicating moderate and high fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

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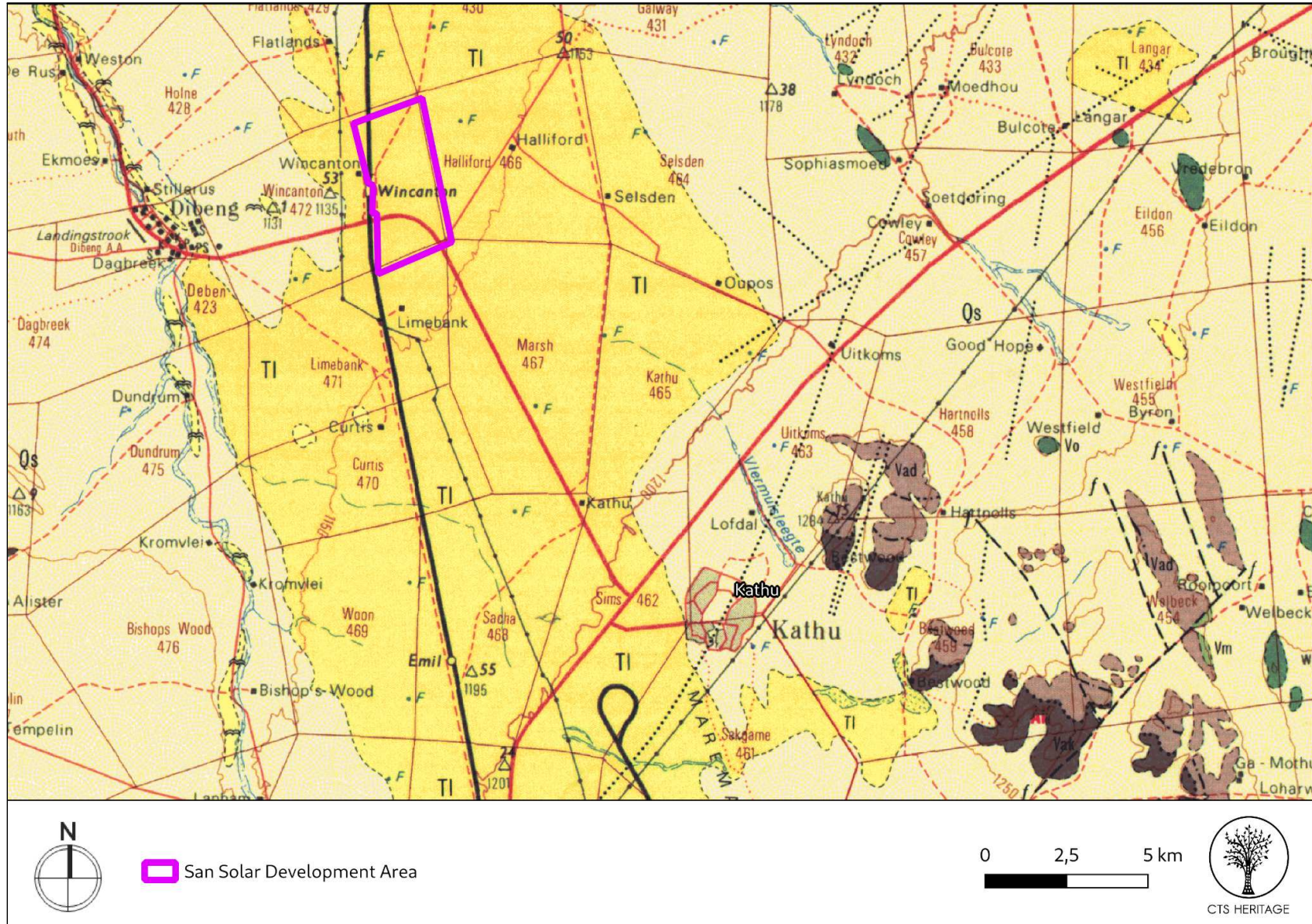


Figure 4b. Geology Map. Extracted from the CGS Map 2722 for Kuruman indicates that the area proposed for development is underlain by TI: surface Limestone dated to the Tertiary Period

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8. Heritage statement and character of the area

This application is for the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km north west of Kathu in the Northern Cape Province. The previous EA that was undertaken for the project lapsed, hence a new process is being followed.

The town of Kathu was established in the 1960's and 1970's as a result of the iron ore mining taking place at the neighbouring Sishen mine. It is important to note that the Grade I Kathu Pan Archaeological site lies approximately 10km southeast of the proposed development. At Kathu Pan, evidence of early hominin occupation has been observed at multiple sinkhole sites within the pan, and the results of scientific investigation into these sites has been broadly published. These sites are known for their rich collection of Early Stone Age artefacts, and several Archaeological and Heritage Impact Assessments have recorded the area (see Figure 2 Appendix 2). These archaeological resources occur in areas associated with outcrops of banded ironstone, and the localised natural pan, with most coming specifically from sinkholes in the pan itself.

As indicated in Figure 1c, the area proposed for the San Solar PV Facility is located immediately adjacent to an existing PV facility to the west. As such, it is not anticipated that the proposed development will have a negative impact on any significant cultural landscape in the area due to the existing similar infrastructure here. Furthermore, it is often preferred to have development such as PV facilities clustered in one area to mitigate the sprawl of this infrastructure across otherwise pristine landscapes. As no impact to the cultural landscape is anticipated, no further assessment of impacts to the cultural landscape is recommended.

Gaigher (2013) conducted an assessment for the San Solar Energy Facility located north of Kathu on a Portion of the Farm Wincanton 472 - for this exact development proposal (SAHRIS NID 110765). According to Gaigher (2013), "One site for the placement of Solar Array generation plant was investigated. Due to the topographic requirements of Solar Arrays the areas are by nature flat and featureless with limited possibilities of water intrusion. Traditionally people have congregated in areas where shelter is found in some geographic feature or in areas that are elevated above the surrounding landscape. Accesses to water sources are also a deciding factor in the location of occupational sites. None of these factors were present in the areas investigated. Some dry dongas were located in some of the sites; however these are not reliable sources of water. The area could still contain the remains of nomadic hunter/gatherer camps and some areas with suitable substrates could have been used as quarries for material to produce Stone Age tools. No such sites were however identified. We should however in this case apply the rule of Absence of Evidence is not Evidence of Absence." Gaigher (2013) did note the presence of some poorly defined quartz stone artifacts. No cores or manufacturing amounts of flakes could be identified. It is believed that these tools are the result of alluvial relocation from a more prominent site, possibly within the river valley. The amount and composition of the finds does not warrant the site being described as a tool location site. Gaigher (2013) also noted the presence of railway related structures located outside of the study area to the west, but these were neither described, photographed nor indicated on any map. Based on the information included in Gaigher (2013), it is not anticipated that the proposed development of solar PV facilities in this area will have a negative impact on significant archaeological heritage. Due to the proximity to Kathu Pan site, and the similar geology of the area, there remains the possibility of the Early Stone Age landscape that is renowned from the Kathu Pan sites extending into this development area. Such archaeology may not be visible from the ground surface and may only become evident during the process of excavation.

According to the SAHRA Palaeosensitivity map, the area is underlain by formations of high palaeontological sensitivity. However Almond and Pether (2009) describe these specific formations as having a low sensitivity for fossils. The Gordonian Formation of the Kalahari Group consists of aeolian sands and fossils (bones, teeth, petrified wood, palynomorphs) mainly associated with ancient pans, lakes and river systems, however in a Palaeontological Impact Assessment by Almond (2012, NID 114648), it is stated that "*while a wide spectrum of vertebrate remains, invertebrates, trace fossils, plant fossils and microfossils have been recorded from these Kalahari Group sediments, in general they are of low palaeontological sensitivity and of considerable lateral extent so impacts on fossil heritage here are likely to be of low significance*". Considering these factors, and the fact that no deep excavation is anticipated to occur, it is unlikely that palaeontologically sensitive sediments will be impacted by the proposed development. However, a Desktop Palaeontology Assessment will be completed to further interrogate this.

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RECOMMENDATION

Based on the available information, it is unlikely that the proposed development will impact significant cultural landscape, archaeological or palaeontological heritage and as such, the assessment of archaeology and palaeontology will not be necessary during the EIA phase.

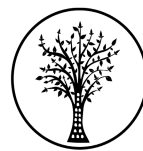
However, it is possible that the excavations associated with the development may impact significant archaeological heritage located below the ground surface and as such, it is recommended that:

- **Should any sink holes or ESA archaeological artefacts be uncovered during the course of excavation activities, work must cease in that area and SAHRA must be contacted regarding a way forward**
- **The attached Chance Fossil Finds Procedure is implemented for the duration of excavation activities**

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9. Scoping Assessment Impact Table

Impact

- Impact to archaeological and built environment 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 unlikely.
- Impacts to palaeontological resources are unlikely.
- There is the potential for the cumulative impact of proposed solar energy facilities to negatively impact the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial, however, due to the remoteness of the area, and the presence of existing PV infrastructure adjacent to the site, the impact on the experience of the cultural landscape is not foreseen to be significant. As no impact to the cultural landscape is anticipated, no further assessment of impacts to the cultural landscape is recommended.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impact to significant heritage resources through destruction during the development phase and disturbance during the operational 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

A Desktop Palaeontological Assessment is recommended to provide further insight into the palaeontological sensitivity of the development area

No impacts to significant heritage resources are likely based on the information available, however, due to the possibility of impact to archaeological and palaeontological resources located below the ground surface, it is recommended that:

- Should any sink holes or ESA archaeological artefacts be uncovered during the course of excavation activities, work must cease in that area and SAHRA must be contacted regarding a way forward
- The attached Chance Fossil Finds Procedure is implemented for the duration of excavation activities

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APPENDIX 1: List of heritage resources within close proximity to the development area

Site ID	Site no	Full Site Name	Site Type	Grading
45922	KAT-SIS05	Kathu-Sishen 05	Burial Grounds & Graves	Grade IIIa
45923	KAT-SIS06	Kathu-Sishen 06	Burial Grounds & Graves	Grade IIIa
129775	2722DD/Solar/Farm Wincanton 472/Site 1	Stone artefacts	Artefacts	Ungraded
129776	2722DD/Solar/Farm Wincanton 472/Site 2	Dolines	Archaeological	Ungraded
129777	2722DD/Solar/Farm Wincanton 472/Site 3	Stone artefacts	Artefacts	Ungraded
129778	2722DD/Solar/Farm Wincanton 472/Site 4	Grave	Burial Grounds & Graves	Ungraded
129779	2722DD/Solar/Farm Wincanton 472/Site 5	Grave	Burial Grounds & Graves	Ungraded
129780	2722DD/Solar/Farm Wincanton 472/Site 6	Ash-heap	Archaeological	Ungraded

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APPENDIX 2: Reference List

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
109484	Heritage Statement	Stephan Gaigher	09/05/2012	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located south of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province.
110652	HIA Phase 1	Stephan Gaigher	01/02/2013	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located south of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province
110765	HIA Phase 1	Stephan Gaigher	26/02/2013	HERITAGE IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT PHASE Proposed establishment of the San Solar Energy Facility located north of Kathu on a Portion of the Farm Wincanton 472, Northern Cape Province
114648	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED 16 MTPA EXPANSION OF TRANSNETS EXISTING MANGANESE ORE EXPORT RAILWAY LINE & ASSOCIATED INFRASTRUCTURE BETWEEN HOTAZEL AND THE PORT OF NGQURA, NORTHERN & EASTERN CAPE. Part 1: Hotazel to Kimberley, Northern Cape
129751	HIA Phase 1	Elize Becker	20/02/2013	Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura
153307	Heritage Impact Assessment Specialist Reports	Robert de Jong	22/02/2011	Kalahari Solar Power Project Heritage Impact Assessment Report and Heritage Management Plan developed by Robert De Jong and Associates
157923	Heritage Scoping	R. C. De Jong	10/12/2010	Heritage Scoping Report for the Proposed Kalahari Solar Project on Portions of the Farm Kathu 465, Kuruman Registration Division, Gamagara Local Municipality, Northern Cape Province
159473	AIA Phase 1	Johnny Van Schalkwyk		Archaeological impact survey report for THE PROPOSED DEVELOPMENT OF A SOLAR POWER PLANT ON THE FARM BESTWOOD 459, KATHU REGION, NORTHERN CAPE PROVINCE
160089	AIA Phase 1	Johnny Van		Archaeological impact survey report for THE PROPOSED KALAHARI SOLAR PARK DEVELOPMENT ON

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		Schalkwyk		THE FARM KATHU 465, NORTHERN CAPE PROVINCE
251329	Heritage Impact Assessment Specialist Reports	Jayson Orton	20/02/2015	Heritage Impact Assessment for a Proposed 132 kV Power Line, Kuruman Magisterial District, Northern Cape
272118	Archaeological Specialist Reports	Jayson Orton, Steven Walker	20/04/2015	Archaeological Survey for the Proposed Kalahari Solar Project, Kuruman Magisterial District, NC Province
273602	Heritage Impact Assessment Specialist Reports	Polke Birkholtz	20/04/2015	Heritage Impact Assessment for the Proposed Establishment of a Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape.
363711	Heritage Impact Assessment Specialist Reports	Johann van Schalkwyk	01/03/2016	Cultural heritage impact assessment for THE DEVELOPMENT OF THE PROPOSED BOITSHOKO SOLAR POWER PLANT ON THE REMAINING EXTENT OF PORTION 1 OF THE FARM LIMEBANK NO 471 REGISTRATION DIVISION KURUMAN, NORTHERN CAPE PROVINCE
363712		Lloyd Rossouw	01/03/2016	Phase 1 Palaeontological Assessment of the proposed Boitshoko solar power plant (SPP) facility on the Remaining Extent of Portion 1 of the farm Limebank 471, near Kathu, Northern Cape Province.
7038	AIA Phase 1	David Morris	07/11/2010	PROPOSED KATHU-SISHEN SOLAR ENERGY FACILITIES. SPECIALIST INPUT FOR THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE AND ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED KATHU SISHEN SOLAR ENERGY FACILITIES, NORTHERN CAPE
8944	PIA Phase 1	John Pether	17/01/2011	BRIEF PALAEOLOGICAL IMPACT ASSESSMENT (Desktop Study) PROPOSED KATHU & SISHEN SOLAR ENERGY FACILITIES Portions 4 & 6 of the Farm WINCANTON 472 Kuruman District, Northern Cape
93163	HIA Phase 1	Stephan Gaigher	09/05/2012	Heritage Impact Assessment Report Environmental Impact Assessment Phase: Proposed Establishment of the San Solar Energy Facility, Located North of Kathu on a Portion of Farm Wincanton 472, Northern Cape Province

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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)
DEFF	Department of Environment, Forest and Fisheries (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 PALAEOLOGICAL 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.

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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.

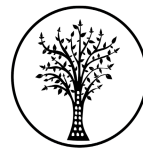
This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- 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

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- 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.

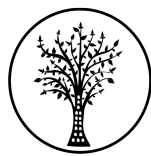
Note:

The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

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APPENDIX 2: Archaeological Assessment (2022)

FIELD NOTES

Phase 1 Archaeological Impact Assessment

Site ID: **Proposed San Solar Development on Wincanton Farm 472 near Kathu**

Phase 1 survey conducted			
CRM Archaeologist	Jan Engelbrecht	Date/s	2022-04-20 – 2022-04-23
Additional surveyors	None		
Type of survey	Pedestrian/Vehicular	Transects	Where accessible
Technical equipment	GPS	Garmin Etrex 10 and Locus Maps	Camera Canon Ixus

PROJECT PARTICULARS

Technical information

Project description	
Project name	The proposed development of a PV Solar Facility with infrastructure, by San Solar as part of the Sishen solar facility near Kathu in the Northern Cape Province.
Description	<p>San Solar Energy Facility (Pty) Ltd proposes the development of the San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, on a site located approximately 16km north west of Kathu in the Northern Cape Province. The solar PV facility will be developed on the Remaining extent of the Farm Wincanton 472 and comprise several arrays of PV panels and associated infrastructure with a contracted capacity of up to 100MW. The study area falls within the Gamagara Local Municipality 1 within the John Taolo Gaetsewe District Municipality. The site is located east of Deben and is accessible via the R380 provincial route which branches off the N14 National Road, approximately 3km south of Kathu. A facility development area², which will include the PV facility, BESS and a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line will be identified within the study area considered in the Scoping phase. The infrastructure associated with this 100MW PV facility includes:</p> <ul style="list-style-type: none"> » PV modules and mounting structures » Inverters and transformers » Cabling between the panels, to be laid underground where practical. » Battery Energy Storage System (BESS) » Site and internal access roads (up to 8m wide) » Laydown area. » Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouse, and workshop areas for maintenance and storage. » Grid connection solution including a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line (located ~5km east of the site). <p>The development area will be larger than the area needed for the construction of a</p>

	100MW PV facility and will provide the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint ³ . To avoid areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the development footprint within which the infrastructure of San Solar PV facility and its associated infrastructure will be located will be fully assessed during the EIA Phase. Three (3) solar facilities have been constructed in the broader area. These include the Sishen Solar PV and Kathu Solar PV facilities located immediately west of the farm Remaining extent of the Farm Wincanton 472. The Kathu Solar facility is a CSP facility located to the east of the study area. (Lavine, J.2022. <i>HIA Heritage Screener Summary Ref CTS 21_208</i> . CTS Heritage: Cape Town)	
Developer		
San Solar Energy Facility (Pty) Ltd		
Contact information	Cel: 084 852 9500	
Development type	Solar/Industrial	
Landowner		
San Solar Energy Facility (Pty) Ltd		
Contact information	Contact Person: Shabeer Cell: 084 852 9500	
Consultants		
Environmental	Savannah Environmental	
Heritage and archaeological	UBIQUE Heritage Consultants and CTS Heritage	
Paleontological	Unknown	
Property details		
Province	Northern Cape	
District municipality	John Taolo Gaetsewe	
Local municipality	Gamagara	
Topo-cadastral map	1:50 000	
Farm name	Remaining extent of the Farm Wincanton 472	
Closest town	Kathu and Deben	
GPS Co-ordinates	27°34'47.09"S 22°56'54.25"E	
Property size	1000 ha	
Development footprint size	Approximately 400ha	
Land use		
Previous	Agriculture	
Current	Agricultural	
Rezoning required	No	
Sub-division of land	No	
Development criteria in terms of Section 38(1) NHRA		Yes/No
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.		Yes
Construction of bridge or similar structure exceeding 50m in length.		No
Construction exceeding 5000m ² .		Yes
Development involving three or more existing erven or subdivisions.		No
Development involving three or more erven or divisions that have been consolidated within the past five years.		No
Rezoning of site exceeding 10 000m ² .		No
Any other development category, public open space, squares, parks, recreation grounds.		No

GENERAL ENVIRONMENT, INFRASTRUCTURE AND LANDSCAPE

Site description

Description of the general area affected by development
Type of environment
The environment is a typical savannah/Kalahari type environment with flat sandy plains, rocky outcrops at certain areas and sloping slightly towards the south of the development site.
Terrain description
The terrain and general region had two very good raining seasons the past two years. Almost the entire site is densely overgrown with thick/tall grass. Kameeldoring/Camel Thorn trees (<i>Acacia erioloba</i>) are scattered throughout the development site. Swarthaak/Blackthorn and Vaalbos trees are very densely present throughout the development site. Generally the site is rather flat with a slight slope towards the south. The development site is currently used for cattle farming/grazing. The entire terrain is divided into camps by fencing. There are cattle posts on at least 4 places on the site. An existing railway line runs from north to south along the western border of the development site. At least one natural, non-perennial pan/depression is present on the development site.
Geology
The geology observed on the ground surface throughout the survey was as follows: <ul style="list-style-type: none"> • Calcrete/Lime stone • Banded Ironstone Formation (BIF) • A few Dolomite outcrops • Crypto-crystalline silicates (CCS) • Quartz (minimal) • Jaspis • Tormaline
Vegetation
Dominant (Prime) vegetation: <ul style="list-style-type: none"> • Black Thorn Acacia/Swarthaak (<i>Acacia mellifera</i>) • Campher Bush (<i>Tarchonanthus camphorates</i>) • Camelthorn/Kameeldoring (<i>Acacia erioloba</i>) • Tumble weed/Gifbol (<i>Ammocharis coronica</i>) • Feathertop chloris/Vingergras (<i>Chloris virgata</i>) • Bluestem/Vleivingergras (<i>Dichanthium annulatum</i>) • Tall Bushmangrass/Lanbeen Boesmangras (<i>Stipagrostis ciliate</i>) • Silky Bushmangrass/Blinkblaar Boesmangras (<i>Stipagrostis uniplumis</i>) • Branched needlegrass/Berggras (<i>Triraphis ramosissima</i>) • Pearly love grass/Reengras (<i>Eragrostis rotifer</i>) • Ringed lovegrass/Blougras (<i>Eragrostis annulata</i>)
Waterways/sources
There are three pans or wetland depression in close proximity to the development site, close to the eastern, north-eastern and northern boundaries of the site.. These water features are non-perennial and will hold or gather water for a period of time during abnormal high rainfalls. No riverine, rivers or dry waterways were observed on the development site.
Site boundaries
<p>North: Neighbouring farmland/agricultural land.</p> <p>South: Neighbouring farmland/agricultural land and existing Sishen mine towards the southwest. The R380 Secondary road also form a boundary, but the overhead line corridor section development site stretches beyond the R380 towards the south, linking up with an existing Eskom power line.</p> <p>East: Neighbouring farmland/agricultural land</p> <p>West: Transnet railway line and existing San Solar/Sishen Solar facility</p>

Site access	GPS Co-ordinates
The development site was entered from the southeast through a prior arranged farm gate. Keys were obtained from the San Solar offices. Site access to certain parts of the site were blocked due to locked gates. San Solar could not assist with keys for locked gates to obtain access to these areas of the site.	27° 35' 18.12"S 22° 57' 03.30"E
Disturbances	
Natural erosion	
Very limited natural erosion. Some places along the roads have been eroded away slightly due to heavy rains. No abnormal major natural erosion was detected or observed on the development site. Slight overgrazing detected around cattle posts, but nothing significant.	
Human-made	
<ul style="list-style-type: none"> • Two main two-track roads lends accessibility to the site • The presense of a burrow pit/quarry along the western boundary of the development site. Approximately 2ha in size and 5-10m deep (Waypoint 007) 	
Notes	
The development site is very well conserved by previous owners and is quite pristine. Vegetation cover was a constraint during the survey and movement on the site, both by vehicle and/or pedestrian was difficult.	

Environmental recording

Way point	Photo number	Description	Location
Site-specific points of interest/ natural significance			
001	N/A	Point of access	27° 35' 18.12" S 22° 57' 03.30" E
N/A	01 – 17	Contextual images of the eastern section of the development site. Taken towards various directions.	N/A
003	25-28	Non-perranial pan or wetland depression.	27° 34' 03.1 S 22° 57' 05.9" E
007	42-47	Existing burrow pit/quarry previously constructed. Disturbed area.	26° 41' 55.77 S 20° 06' 41.35" E
N/A	48-54	Contextual images of the southern section of the development footprint taken towards various directions.	N/A
N/A	57-58	Contextual images of the grid connection corridor taken from the R380 Secondary road towards the south.	N/A
009	59-60	Existing Eskom powerline (overhead) running from east to west. This will be the grid connection link-up power line from the proposed solar development.	27° 36' 08.7" S 22° 56' 34.9" E
N/A	61-65	Contextual images of development site: northwestern section and west sentral towards southwestern section.	N/A

HERITAGE RESOURCES RECORDING

Stone Age Resources Identified

Point ID & Site #	Photo #	Description	Period	Location	Field rating/ Significance/ Recommended Mitigation	
004	29-31	Type lithic/s	MSA/ Early LSA	27° 34' 04.6" S 22° 57' 04.9" E	Field Rating Iii B Medium significance Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	
		Raw material				Scraper, core and chunk CCS and BIF
		N in m ² .				3/10m ²
		Context				Scattered
		Additional				Located on edge of wetland area
005	32-36	Type lithic/s	MSA/ Early LSA	27° 34' 02.3" S 22° 57' 08.9" E	Field Rating Iii B Medium significance Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	
		Raw material				Scraper, chips and chunks CCS and BIF
		N in m ² .				6/10m ²
		Context				Scattered
		Additional				Located on edge of wetland area
006	37-41	Type lithic/s	MSA/ Early LSA	27° 34' 06.3" S 22° 57' 06.1" E	Field Rating Iii B Medium significance Resource must be retained where possible where not possible it must be fully investigated	
		Raw material				Unfinished blade, chunk, scraper, chips and a core BIF
		N in m ² .				8/50m ²
		Context				Scattered
		Additional				Located on edge of wetland area
		Additional				

						and/or mitigated.
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HERITAGE RESOURCES RECORDING

Historical Period Resources Identified

Way Point ID & Site #	Photo #	Description	Period	Location	Field rating/ Significance/ Recommended Mitigation	
Way-Point 002	18-24	Type of feature	Old building ruin	Modern ca 1950s-1970s	27° 34' 39.10" S 22° 56' 20.40" E	Field Rating III C Low significance. Building outside the development site. No Mitigation Required
		Material	N/A			
		N in m ² .	N/A			
		Context	In context with farming infrastructure and an abandoned railway siding on the eastern side of the railway line bordering the old farm settlement.			
		Additional	Building material mostly vernacular with some modern additions. Karoo cottage style architecture. Building material seems like dolomite blocks.			

Iron Age Resources Identified

Point ID & Site #	Photo #	Period	Location	Field rating/ Significance/ Recommended Mitigation
None	None	None	None	None

Graves Identified

Point ID & Site #	Photo #	Period	Location	Field rating/ Significance/ Recommended Mitigation

No graves located or identified

HERITAGE RESOURCES RECORDING

Intangible Heritage Resources/ Cultural Landscape Identified

Point ID & Site #	Photo #	Description	Period	Location	Field rating/ Significance/ Recommended Mitigation										
008	55-56	<table border="1"> <tr> <td>Nature</td> <td>Road crosses</td> </tr> <tr> <td>Cultural evidence</td> <td>Memorials to those who died in road accidents on the R380 on the eastern edge of the grid connection corridor</td> </tr> <tr> <td>Access</td> <td>Open. Within the servitude of the R380 Secondary road</td> </tr> <tr> <td>Affected community</td> <td>Families of deceased and possibly local community</td> </tr> <tr> <td>Additional</td> <td>None</td> </tr> </table>	Nature	Road crosses	Cultural evidence	Memorials to those who died in road accidents on the R380 on the eastern edge of the grid connection corridor	Access	Open. Within the servitude of the R380 Secondary road	Affected community	Families of deceased and possibly local community	Additional	None		27° 35' 23.6" S 22° 56' 37.2" E	Field Rating Iii B Medium significance Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.
Nature	Road crosses														
Cultural evidence	Memorials to those who died in road accidents on the R380 on the eastern edge of the grid connection corridor														
Access	Open. Within the servitude of the R380 Secondary road														
Affected community	Families of deceased and possibly local community														
Additional	None														

IDENTIFIED HERITAGE RESOURCES DISCUSSION

Specialist comments

Stone Age finds Stone age artefacts located and recorded are in context with a wetland area. It was located on the edge of a non-perennial pan or wetland calcrete depression or a hollow in the ground appeared with the passing of time. The MSA /LSA material found at the various locations, suggests a possible temporary settlement of Stone Age people beside a possibly more perennial body of water.
Iron Age/ Agri-pastoralist Early Farming communities finds No Iron Age heritage was located or recorded on the development site.
Historical finds An old house ruin with vernacular building style was located and recorded as part of the regional archaeology. This building is not located on the development site, but it should be noted that this structure is older than 60 years and is to be considered if any further developments are intended which might affect this ruin.
Identified graves No graves were identified on the development footprint. It is imperative that it should be brought under the client's attention, that the vegetation growth was very dense. The grass and brush covered not less than 90% of the ground's surface and only about 10% of the surface of the ground was visible to the naked eye. Trees, such as Campher bush and Black thorn acacia were very dominant throughout the entire site and in conjunction with the grass cover, certain heritage could be hidden from the naked eye.

Intangible Heritage/ Cultural Landscape
A number of memorial crosses were located and recorded within the servitude of the R380 Secondary road. The crosses are located on the eastern edge of the grid connection corridor. The client should take note of these crosses which might be very significant to the local community and the families of the deceased in memoriam.
Other
None

IDENTIFIED HERITAGE RESOURCES MITIGATION

Specialist recommendations

Stone Age finds
We recommend the following mitigation: The identified wetland should be a no-go zone with a conservation bufferzone around the wetland of not less than 200m. This feature is archaeologically sensitive.
Iron Age/ Agri-pastoralist Early Farming communities finds
No mitigation. Project can proceed.
Historical finds
No mitigation, but developers should take cognisance of the sensitivity of the old ruin for possible future developments. Project can proceed.
Identified graves
No graves identified, located or recorded. Take note of above specialist comments on graves.
Intangible Heritage/ Cultural Landscape
We recommend the following mitigation: A 20m concervation bufferzone should be implemented around the crosses until such time it is removed by either the family or road authorities.
Other
Due to the dense vegetation, we rccommend that an additional Heritage survey should be done after ground clearance, to ensure an accurate heritage survey and recording.

ADDITIONAL NOTES AND RESOURCES

Attached Field Data

Filename	File type	Description
AIA SAN SOLAR FIELD DATA	Folder	Tracks, waypoints and Images of survey and AIA.

Additional Notes

Please take note that this survey was not a "one-day" survey. The entire development site is 1000ha and the development footprint consist of approximately 400ha. This is at least a 4 day survey, especially under the difficult conditions as experienced during the survey period.



JAN ENGELBRECHT
ARCHAEOLOGIST
HERITAGE SPECIALIST

082 845 6276
jan@ubiquecrm.com
@ubiquecrm
ubiqueheritage

www.ubiquecrm.com

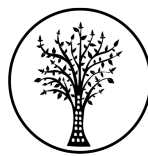
Declaration of independence:

I, Jan Engelbrecht, hereby confirm my independence as a heritage specialist and declare that:

- I am suitably qualified and accredited to act as an independent specialist in this application;
- I do not have any vested interests (either business, financial, personal or other) in the proposed development project other than remuneration for the heritage assessment and heritage management services performed;
- The work was conducted objectively and ethically, in accordance with a professional code of conduct and within the framework of South African heritage legislation.


Signed:
JAC. Engelbrecht
Heritage Consultants

Date: 2022-04-26
UBIQUE



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APPENDIX 3: Palaeontological Assessment (2021)

**Palaeontological Impact Assessment
for the proposed development of the
San Solar PV Facility
near Kathu in the Northern Cape
Province**

Desktop Study (Phase 1)

For

**CTS Heritage
Project No: CTS21_208**

04 December 2021

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa

Marion.bamford@wits.ac.za


Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 32 years research; 24 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by CTS Heritage, Cape Town, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A Palaeontological Impact Assessment was requested for the proposed development of the San Solar PV Facility near Kathu in the Northern Cape. The proposed site is about 10 km northwest of Kathu on the Remainder of Farm Wincanton 472 in the Gamagara Local Municipality.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies on the Tertiary limestones and calcretes that might have preserved fossil plants and bones. The topography of the site is more or less flat and there are no exposures of caves or pans so it is unlikely that any fossils would be found. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the developer/ environmental officer/ other designated responsible person once excavations or drilling activities have commenced. As far as the palaeontology is concerned, the project should be authorised.

Table of Contents

Expertise of Specialist.....	1
Declaration of Independence.....	1
1. Background.....	4
2. Methods and Terms of Reference.....	6
3i. Project location and geological context.....	7
3ii. Palaeontological context.....	9
4. Impact assessment.....	10
5. Assumptions and uncertainties.....	11
6. Recommendation.....	11
7. References.....	11
8. Chance Find Protocol	13
Appendix A (examples of fossils)	14
Appendix B (short CV of specialist)	15

i. Background

A Palaeontological Impact Assessment was requested for the proposed development of the San Solar PV Facility near Kathu in the Northern Cape. This is immediately to the east of and existing solar facility. The proposed site is about 10 km northwest of Kathu on the Remainder of Farm Wincanton 472 in the Gamagara Local Municipality, John Taolo Gaetsewe District (Figures 1 and 2).

Since this facility will be adjacent to an existing one, it is not anticipated that the proposed development will have a negative impact on any significant cultural landscape. Furthermore, it is often preferred to have development such as PV facilities clustered in one area to mitigate the sprawl of this infrastructure across otherwise pristine landscapes.

A Palaeontological Impact Assessment was requested for the San Solar project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
ai	Details of the specialist who prepared the report	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section i.
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section ii.

f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
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;	Section vii.
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 vi.
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity 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	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A



Figure 1: Google Earth map of the proposed development of the San Solar Facility northwest of Kathu with the site shown by the yellow outline.

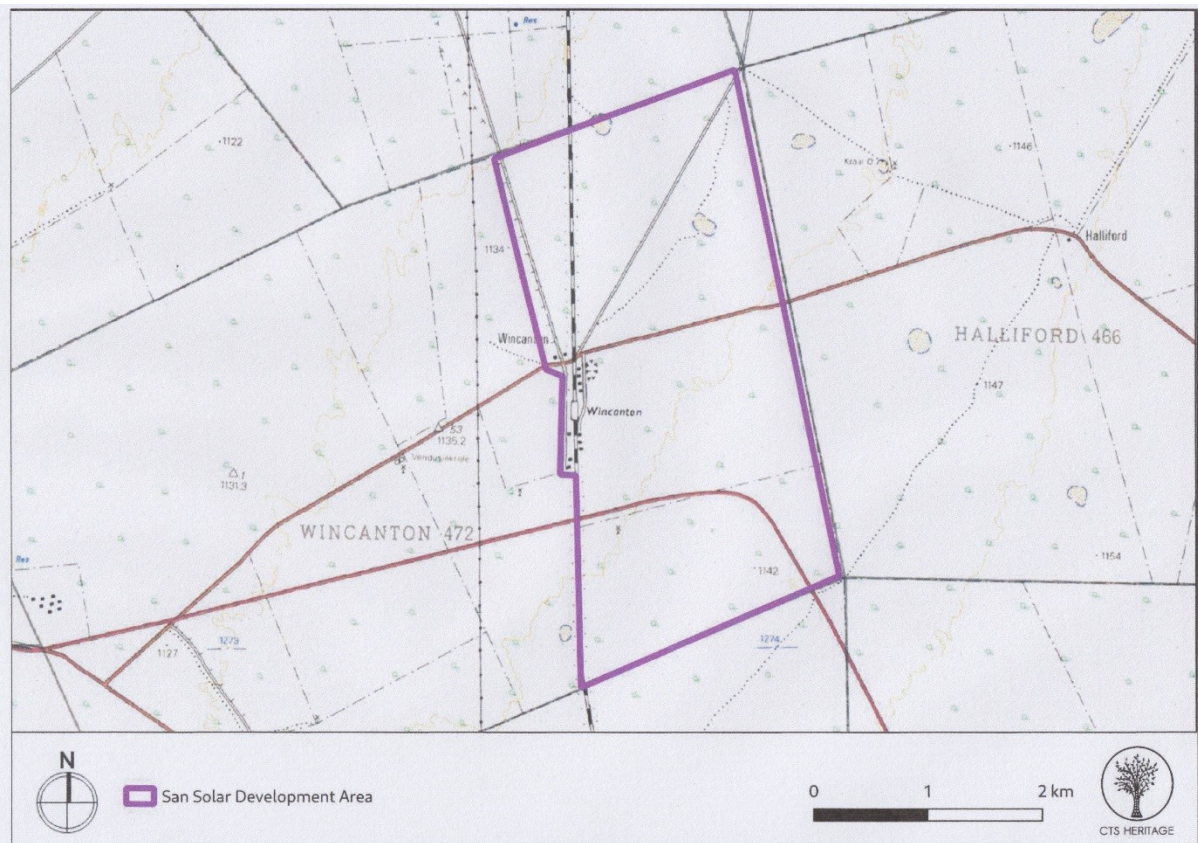


Figure 2: Topographic map to show the boundary of the proposed San Solar facility on the remainder of Farm Wincanton 472, northeast of Kathu.

ii. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

iii. Geology and Palaeontology

iv. Project location and geological context

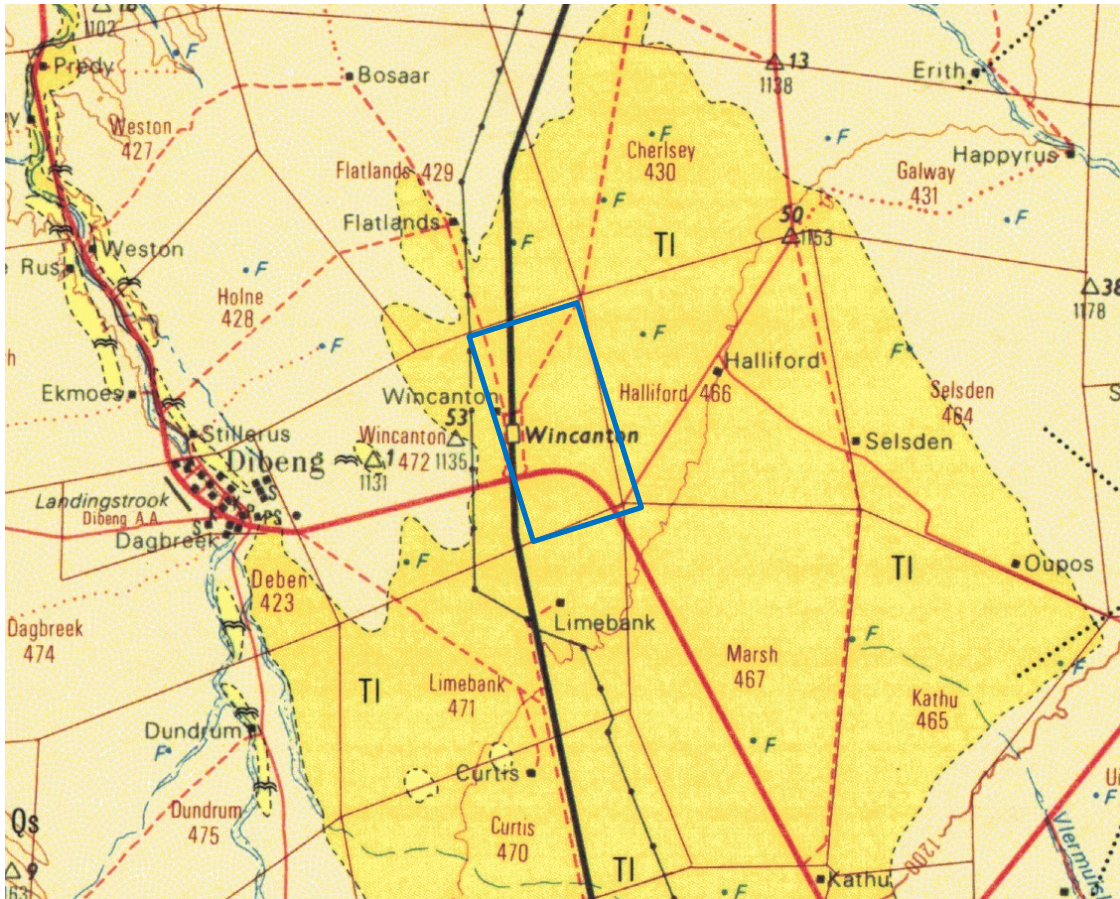


Figure 3: Geological map of the area around the Farm Wincanton 472 and the proposed San Solar Facility as indicated within the blue rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2722 Kuruman.

Table 2: Explanation of symbols for the geological map and approximate ages (Matmon et al., 2015; Partridge et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary Kalahari sands	Alluvium, sand, calcrete	Late Quaternary, Neogene, ca 2.5 Ma to present
Tl	Tertiary limestone	Sand, limestone	Tertiary

The site lies on the northern margin of the Transvaal Basin on the Kaapvaal Craton. The underlying rocks are not exposed here and only the overlying Tertiary Calcretes are of relevance to this project (Figure 3).

The Quaternary Kalahari sands form an extensive cover of much younger deposits over much of the Northern Cape Province and Botswana. Based on the early works of Leicester King, Partridge and Maud (1987, 2000) developed a model of three African Erosion Surfaces for southern Africa, from the Cretaceous to the Pliocene. During the Cretaceous Africa was

very high, averaging about 2500-2000 m above sea level but the rifting apart of Gondwanaland and formation of the Atlantic and Indian Oceans, coastal erosion was rapid and the escarpment rapidly receded about 120 km inland along the east and south coasts, but only 50km along the west coast. The newly exposed surface was called the African Erosion Surface. Their model has been challenged and modified by a number of researchers (Burke, 2011; Braun et al., 2014) who propose that mantle plumes caused uplift of the continent during the late Cretaceous, followed by erosion and further uplift about 30-20 million years ago, The newer interpretations have been followed here.

Haddon and McCarthy (2005) proposed that the Kalahari basin formed as a response to down-warp of the interior of the southern Africa, probably in the Late Cretaceous. This, along with possible uplift along epeirogenic axes, back-tilted rivers into the newly formed Kalahari basin and deposition of the Kalahari Group sediments began. Sediments included basal gravels in river channels, sand and finer sediments. A period of relative tectonic stability during the mid-Miocene saw the silcretisation and calcretisation of older Kalahari Group lithologies, and this was followed in the Late Miocene by relatively minor uplift of the eastern side of southern Africa and along certain epeirogenic axes in the interior. More uplift during the Pliocene caused erosion of the sand that was then reworked and redeposited by aeolian processes during drier periods, resulting in the extensive dune fields that are preserved today.

Tertiary calcretes cover large parts of the Northern Cape but they are difficult to date and there are several schools of thought (see Partridge et al., 2006). Nonetheless, it is accepted that calcretes form under alternating cycles of humid and arid climatic conditions in strata that have calcium carbonate (Netterberg, 1969). More recent research using geophysical techniques to measure uplift of the continent during the Cretaceous and Tertiary, combined with the fossil record (Braun et al., 2014) suggest that there were two predominant humid periods during the Tertiary. The whole of the Eocene (56-33 Ma) and a short period during the early Miocene (ca 20-19 Ma) were humid according to their estimations. It is possible that the Northern Cape calcretes formed during one of these periods.

Overlying many of these rocks are loose sands and sand dunes of the Gordonia Formation, Kalahari Group of Neogene Age. The Gordonia Formation is the youngest of six formations and is the most extensive, stretching from the northern Karoo, Botswana, Namibia to the Congo River (Partridge et al., 2006). It is considered to be the biggest palaeo-erg in the world (ibid). The sands have been derived from local sources with some additional material transported into the basin (Partridge et al., 2006). Much of the Gordonia Formation comprises linear dunes that were reworked a number of times before being stabilised by vegetation (ibid).

v. Palaeontological context



Figure 4: SAHRIS palaeosensitivity map for the site for the proposed San Solar Facility on the Remainder of Farm Wincanton 472 shown within the purple rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

The Tertiary calcretes can trap fossils and artefacts when associated with palaeo-pans or palaeo-springs (Partridge et al., 2006). Where deflation has occurred, for example along the west coast of South Africa, any trapped materials in the different levels can be concentrated in the depo-centre of the pan or dune and thus it can be challenging to interpret the deposit (Felix-Henningsen et al., 2003). A well-known example of a limestone tufa deposit is at the Buxton-Norlim Limeworks about 15m southwest of Taung, on the margin of the Ghaap Plateau. Fauna and the Taung child cranium were excavated from here but it should be noted that the topography of this fossiliferous site is very diverse and includes a now roofless cave complex (Hopley et al., 2013). In contrast, the limestones north of Kathu are generally more or less flat.

The Aeolian sands of the Gordonia Formation do not preserve fossils because they have been transported and reworked, but in some regions these too may have covered pan or spring deposits and these can trap

fossils, and more frequently archaeological artefacts. Usually these geomorphological features can be detected using satellite imagery. No such features are visible

From the SAHRIS map above (Figure 4) the area is indicated as highly sensitive (orange) for the Tertiary Calcretes.

vi. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

TABLE 3A: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

TABLE 3B: IMPACT ASSESSMENT

PART B: ASSESSMENT		
SEVERITY/NATURE	H	-
	M	-
	L	Sands do not preserve fossils but limestones and tufas do; so far there are no records of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.

PART B: ASSESSMENT		
SPATIAL SCALE	L	Since the only possible fossils within the area would be Tertiary-aged fossil plants or bones in the limestones and tufas, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the flat topography of the Tertiary Limestones loose sand that will be excavated. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils (below ground) or might trap Tertiary fossils in limestones and calcretes. The material to be excavated is flat soils and sands this does not preserve fossils. Since there is a small chance that fossils from the Tertiary limestones may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is very low.

vii. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the limestones, calcretes, sandstones, shales and sands are typical for the country and might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils. The topography of the site, flat, is not conducive to the preservation of or finding of fossils. From the satellite imagery there are no visible outcrops where fossils could be found.

viii. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the limestones and calcretes of the Tertiary because they are very rare and there are no visible outcrops in the flat landscape.. There is a very small chance that fossils may occur in the Tertiary limestones so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations and amenities have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample (Dee Section 8 and Appendix A). As far as the palaeontology is concerned, the project should be authorised.

ix. References

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x. Chance Find Protocol

Monitoring Programme for Palaeontology - to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, wood) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 5, 6). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix A - Examples of fossils from the Tertiary and Quaternary.



Figure 5: Fragmented and robust fossils from fluvial and pan deposits.

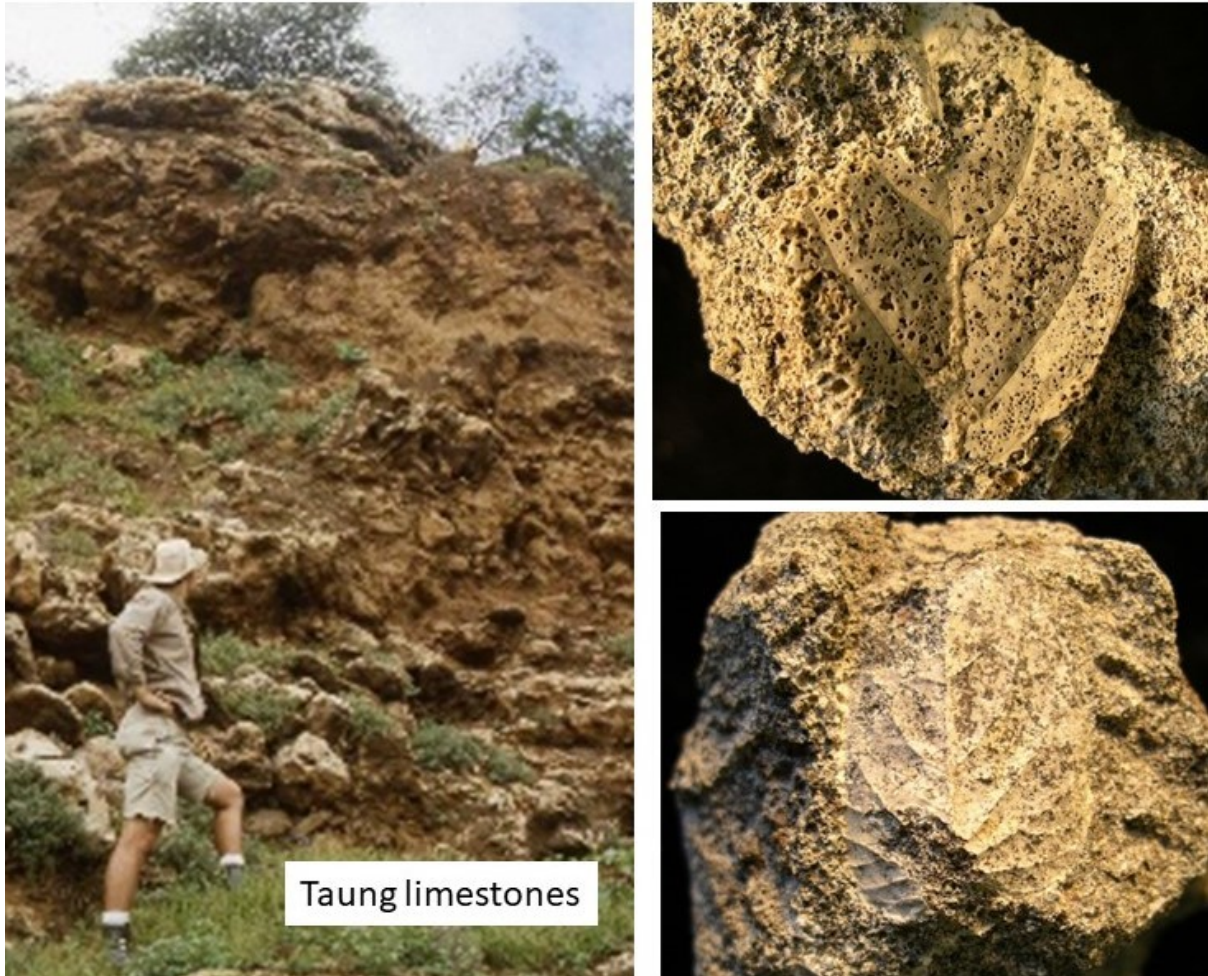


Figure 6: Photographs of the rugged topography at the Taung fossil site limestones and impressions of leaves that formed in tufa (limestone).

Appendix B - Details of specialist

Curriculum vitae (short) - Marion Bamford PhD July 2021

I) Personal details

Surname : **Bamford**
 First names : **Marion Kathleen**
 Present employment : Professor; Director of the Evolutionary Studies Institute.
 Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-
 Telephone : +27 11 717 6690

Fax : +27 11 717 6694
 Cell : 082 555 6937
 E-mail : marion.bamford@wits.ac.za ;
marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
 1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
 1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
 1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
 1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):

1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
 1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
 1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
 Royal Society of Southern Africa - Fellow: 2006 onwards
 Academy of Sciences of South Africa - Member: Oct 2014 onwards
 International Association of Wood Anatomists - First enrolled: January 1991
 International Organization of Palaeobotany - 1993+
 Botanical Society of South Africa
 South African Committee on Stratigraphy - Biostratigraphy - 1997 - 2016
 SASQUA (South African Society for Quaternary Research) - 1997+
 PAGES - 2008 -onwards: South African representative
 ROCEEH / WAVE - 2008+
 INQUA - PALCOMM - 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/ completed	Current
Honours	11	0
Masters	10	4
PhD	11	4
Postdoctoral fellows	10	5

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene
Palaeoecology; Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor
Guest Editor: *Quaternary International*: 2005 volume
Member of Board of Review: *Review of Palaeobotany and Palynology*:
2010 –

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers

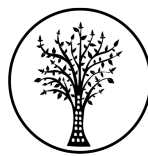
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe

xi) Research Output

Publications by M K Bamford up to July 2021 peer-reviewed journals or scholarly books: over 150 articles published; 5 submitted/in press; 10 book chapters.

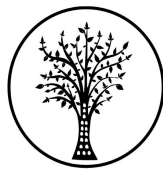
Scopus h-index = 29; Google scholar h-index = 35; -i10-index = 92

Conferences: numerous presentations at local and international conferences.



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APPENDIX 4: Chance Fossil Finds Procedure



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CHANCE FINDS OF PALAEOLOGICAL MATERIAL

(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO. It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

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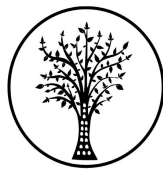
Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent. Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
 - The date
 - A description of the discovery
 - A description of the fossil and its context (e.g. position and depth of find)
 - Where and how the find has been stored
 - Photographs to accompany the preliminary report (the more the better):
 - A scale must be used
 - Photos of location from several angles
 - Photos of vertical section should be provided
 - Digital images of hole showing vertical section (side);
 - Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.



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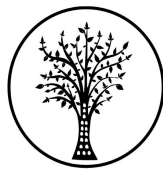
- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

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FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	<i>Lat:</i>	<i>Long:</i>
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	<i>Digital image of vertical section (side)</i>	
	<i>Fossil from different angles</i>	
	<i>Wider context of the find</i>	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		
Recorder Name:		
Contact:		
Photographer Name:		
Contact:		

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