

# HERITAGE IMPACT ASSESSMENT

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

**Proposed development of Khunab Solar Grid Connection near Upington in the  
Northern Cape Province.**

**Prepared by CTS Heritage**



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**For**

**Savannah Environmental**

**September 2019**



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## EXECUTIVE SUMMARY

McTaggart PV1 (Pty) Ltd proposes the construction and operation of a grid connection solution for the proposed McTaggart PV1, PV2, PV3 and Klip Punt PV1 solar PV facilities near Upington in the Northern Cape Province. The grid connection solution will connect the four solar PV facilities to the Upington Main Transmission Substation (MTS) and will include the development of a single circuit power line and two collector substations each including switching station components. The collector substations will be known as, the Khunab Collector Sub-station and the Klip Punt Collector Sub-station. Other associated infrastructure will also be required for the grid connection solution, including access roads, feeder bays (inclusive of line bays, busbars, bussection and protection equipment), a fibre and optical ground wire (OPGW) layout, insulation and assembly structures.

A grid connection corridor which is 300m wide (which increases to ~700m at the Upington MTS) and 13km long is being assessed to allow for the optimisation of the grid connection and associated infrastructure to accommodate the identified environmental sensitivities. The grid connection infrastructure will be developed within the 300m wide grid connection corridor. The height of the power line pylons will be up to 32m and will be located within a servitude of up to 36m and the two collector substations, each including switching station components, will evacuate power at 132kV. Only one feasible alternative grid connection corridor exists.

The proposed development will not have a negative impact on the heritage resources situated in the grid connection corridor and powerline servitude footprint. The lithic and historic material identified is of low significance, and even though the resources may be destroyed during the construction, the impact is inconsequential. Based on the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary. There is a very small chance that fossils may occur in the adjacent shales of the early Permian Vryheid Formation so a Chance Find Protocol should be added to the Environmental Management Programme (EMPr). All proposed infrastructure lies on the Gordonia Formation dune and aeolian sands and as far as the palaeontology is concerned there is no likely impact.

In addition, the proposed development is located within a REDZ and Power Corridor. Due to the REDZ, there are a number of similar existing and/or proposed PV facilities in the area, as well as the associated grid connection infrastructure, and as such, there is the potential for the cumulative impact of the proposed grid connection infrastructure for the 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 the impact on the experience of the cultural landscape is not foreseen to be significant.

**Cedar Tower Services (Pty) Ltd t/a CTS Heritage**

16 Edison Way, Century City, Cape Town 7441

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



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Therefore, in the 300m wide grid connection corridor assessed for the Khunab Solar Grid Connection, no significant archaeological or palaeontological resources were identified. Therefore, no further mitigation is required, and from a heritage point of view, there is no objection to the proposed development.

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16 Edison Way, Century City, Cape Town 7441

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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 40 Heritage Impact Assessments throughout South Africa.

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## CONTENTS

<b>1. INTRODUCTION</b>	<b>5</b>
1.1 Background Information on Project	5
1.2 Description of Property and Affected Environment	7
<b>2. METHODOLOGY</b>	<b>8</b>
2.1 Purpose of HIA	8
2.2 Summary of steps followed	8
2.3 Assumptions and uncertainties	8
2.4 Constraints & Limitations	8
2.5 Savannah Impact Assessment Methodology	9
<b>3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT</b>	<b>10</b>
3.1 Previous Heritage Impact Assessments	10
3.2 Geomorphology, climate, vegetation	12
<b>4. IDENTIFICATION OF HERITAGE RESOURCES</b>	<b>16</b>
4.1 Summary of findings of Specialist Reports	16
4.2 Heritage Resources identified	17
4.3 Mapping and spatialisation of heritage resources	19
<b>5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT</b>	<b>20</b>
5.1 Assessment of impact to Heritage Resources	20
5.2 Sustainable Social and Economic Benefit	21
5.3 Proposed development alternatives	21
5.4 Cumulative Impacts	21
<b>6. RESULTS OF PUBLIC CONSULTATION</b>	<b>24</b>
<b>7. CONCLUSION</b>	<b>24</b>
<b>8. RECOMMENDATIONS</b>	<b>25</b>
<b>APPENDICES</b>	
1	Archaeological Impact Assessment 2019
2	Palaeontological Impact Assessment 2019
3	Heritage Screening Assessment
4	CVs of Specialists and Specialist Declaration

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## 1. INTRODUCTION

### 1.1 Background Information on Project

McTaggarts PV1 (Pty) Ltd proposes the construction and operation of a grid connection solution for the proposed McTaggarts PV1, PV2, PV3 and Klip Punt PV1 solar PV facilities near Upington in the Northern Cape Province. The grid connection solution will connect the four solar PV facilities to the Upington Main Transmission Substation (MTS) and will include the development of a single circuit power line and two collector substations each including switching station components. The collector substations will be known as, the Khunab Collector Sub-station and the Klip Punt Collector Sub-station. Other associated infrastructure will also be required for the grid connection solution, including access roads, feeder bays (inclusive of line bays, busbars, bussection and protection equipment), a fibre and optical ground wire (OPGW) layout, insulation and assembly structures.

The Khunab Collector Substation will facilitate a connection from McTaggarts PV2 and PV3 to the national grid and will be located on Portion 3 of McTaggarts Camp No. 453. The Klip Punt Collector Substation will facilitate a connection from McTaggarts PV1 and Klip Punt PV1 to the national grid and will be located on Portion 3 of McTaggarts Camp 453 and Portion 12 of Klip Punt 452.

A grid connection corridor which is 300m wide (which increases to ~700m at the Upington MTS) and 13km long is being assessed to allow for the optimisation of the grid connection and associated infrastructure to accommodate the identified environmental sensitivities. The grid connection infrastructure will be developed within the 300m wide grid connection corridor. The height of the power line pylons will be up 32m and will be located within a servitude of up 36m and the two collector substations, each including switching station components, will evacuate power at 132kV. Only one feasible alternative grid connection corridor exists.

The grid connection corridor traverses three affected properties, namely:

- Portion 3 of the Farm McTaggarts Camp No. 453;
- Portion 12 of the Farm Klip Punt 452; and
- Olyvenhouts Drift Settlement Agricultural Holdings 1080

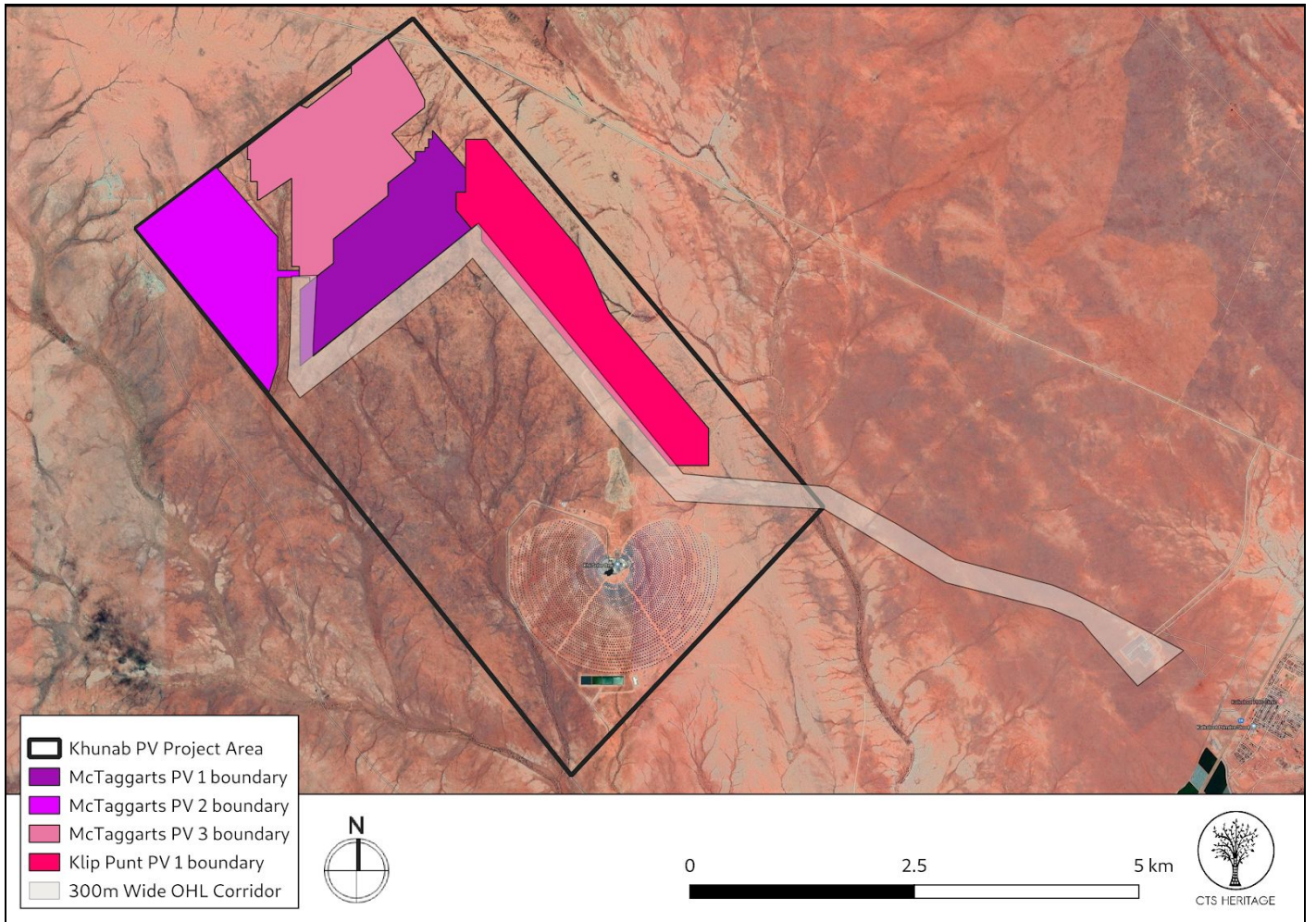
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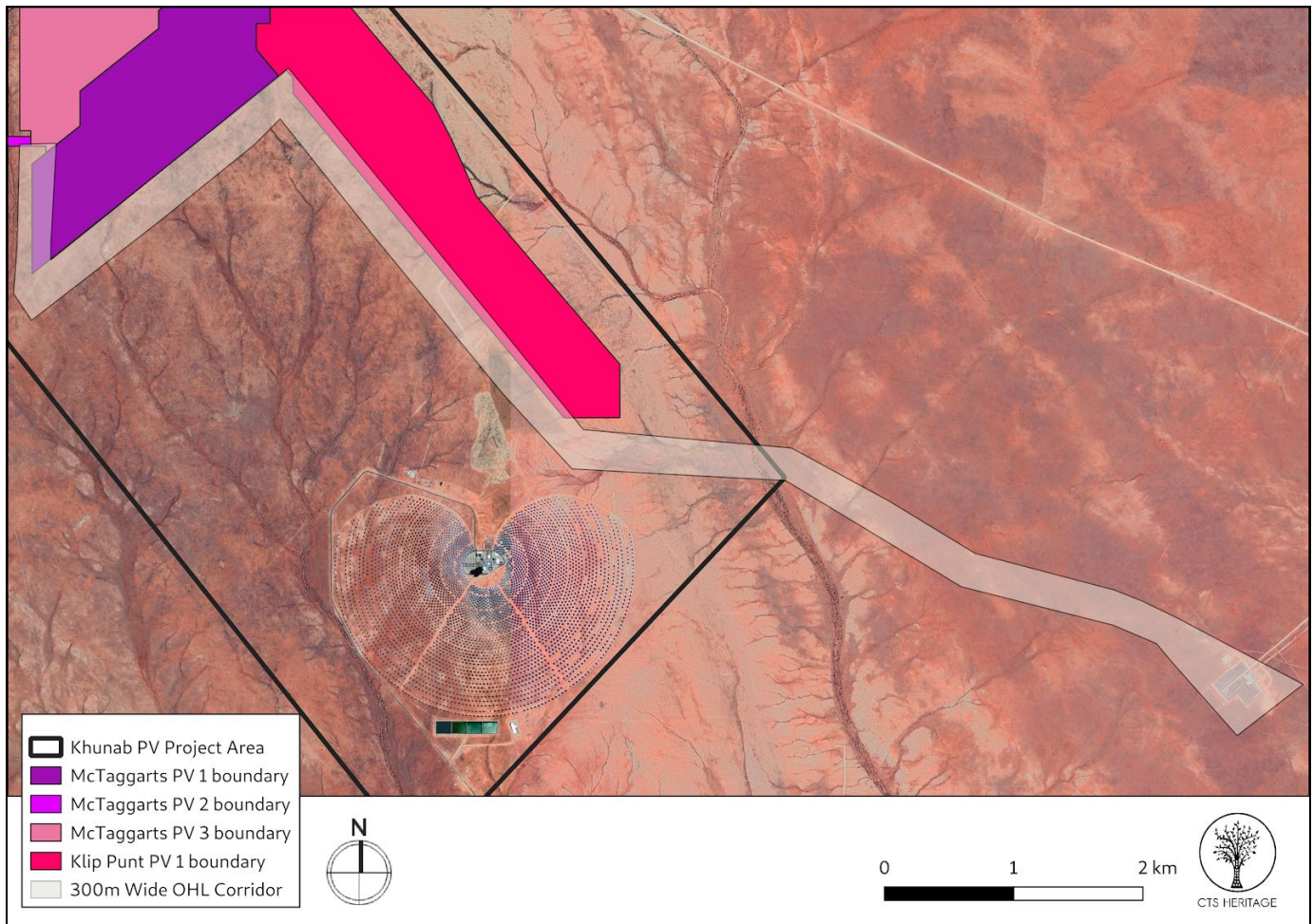


**Map 1a: The proposed development areas of all four proposed PV Facilities as part of the Khunab Solar Development and the grid connection corridor for the development of the Khunab Solar Grid Connection assessed as part of this HIA**





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Map 1b: The proposed grid connection corridor for the Khunab Solar Grid Connection

## 1.2 Description of Property and Affected Environment

The area proposed for development is rather flat and sandy with some vegetation cover. It has a slight slope from south to north. The grid connection corridor is still utilised for agricultural purposes (livestock farming) and several internal fences cross over the grid connection corridor. The grid connection corridor is covered by various types of vegetation including Camel Thorn trees (*Acacia erioloba*), Black Thorn trees (*Acacia mellifera*), Three Thorn/Driedoring (*Rhigozum trichotomum*), Skaapbossie (*Aizoon schellenbergii*), Shepherd tree (*Boscia albitrunca*), Suurgras (*Enneapogon desvauxii*), Pencil Milkbush (*Euphorbia lignose*), Helichrysum tomentosulum (*Prosopis glandilosa*), Tall Bushman grass (*Stipagrostis hirtigluma*), Silky Bushman grass (*Stipagrostis uniplumis*) and Kortbeen Boesmangras. There are several dry riverbeds that are present in the grid connection corridor flowing from north to south and from west to east.

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16 Edison Way, Century City, Cape Town 7441

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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).

### 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)
- An archaeologist and palaeontologist were contracted to conduct an assessment of archaeological and palaeontological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit from 10 to 14, and 21 to 22 June 2019.
- The palaeontologist conducted a desktop assessment.
- 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 within the grid connection corridor during construction, such activities should be halted, and it would be required that 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

No constraints were experienced. The knowledge of the heritage practitioner, and observations made during the study therefore allow us to predict with some accuracy the archaeological sensitivity of the receiving environment.



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The layout of the proposed development was amended slightly after the Palaeontological Impact Assessment (PIA) was completed. As such, the maps in the Desktop PIA are slightly different to the final layout maps. The relevant palaeontology maps have been updated in this report. Importantly, this difference in layout does not impact on the findings or conclusions of the PIA report.

## 2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified 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.

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- The degree to which the impact can be mitigated.

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 Previous Heritage Impact Assessments**

##### **Cultural Landscape**

According to Van Schalkwyk (2014 SAHRIS NID 170520), “The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (stone age) component and a later colonial (farmer) component. This rural landscape has always been sparsely populated. The second component is an urban one, consisting of a number of smaller towns, most of which developed during the last 150 years or less.” According to Von Vollenhoven (2012 SAHRIS NID 117902), “the environment of the area is mostly undisturbed although it is being used for sheep farming... The natural topography... is reasonably flat, but in the north-west a hill dominates the area resulting in an even slope up to the crest. This area also is very rocky. The stones here are dark in colour and may be of a basaltic origin. However in the flat areas adjacent to the hill the rocks are white coloured and most likely are soft calcrete, which would not have been suitable for the manufacture of stone tools. Different non-perennial streams run through the area...” According to Fourie’s assessment of the impacts of similar infrastructure in this area (2014), due to the landscape’s topography the grid connection infrastructure will be prominent in the landscape and alter the rural appearance.

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16 Edison Way, Century City, Cape Town 7441

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However, due to the remoteness of the area, the impact on the experience of the cultural landscape is not foreseen to be significant.

### **Archaeology and the Built Environment**

Many farm portions in the immediate vicinity of the area proposed for development have been assessed in terms of impacts to heritage resources (Map 4). It has been found that the area surrounding Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335). Based on the outcomes of these assessments, it is noted that most of the heritage resources identified are stone age artefact scatters of varying significance. In Fourie's assessment (2014), the field work identified numerous areas where low density scatters of Middle and Later Stone Age lithics were found. As no context and *in situ* preservation were identified these sites were graded as having low heritage significance. In addition, one possible herder site was identified during the Fourie's (2014) survey, also of low heritage significance. No other material or deposits were identified but does not exclude the possibility of subsurface material. The ruins of old mining infrastructure were also identified. In Von Vollenhoven's assessment (2012 SAHRIS NID 117902), he identified a number of very interesting and significant rock art engravings depicting various animals including giraffes and an aardvark. In addition, he identified a significant historical site known as the "Rebellion Tree" as well as graves associated with farmers in this area.

Five sites of moderate local significance are located just beyond the border of the proposed grid connection corridor. These sites are highlighted in orange in Appendix 1. Site 24972 is linked to Von Vollenhoven's (2012) report and may well be the location of the rock art engravings described above. Site 45523 is described as consisting of ostrich egg shell fragments and stone flakes scattered around the base of a hill in low densities. Flakes are micro lithic supporting an ascription to the Later Stone Age (LSA) utilising quartzite as raw material. A lead sealed bully beef can was also found here dated to the late 1800's or early 1900's. Sites 19977 to 19979 describe Middle Stone Age (MSA) artefact scatter sites.

### **Palaeontology**

According to the SAHRIS Palaeosensitivity Map (Map 2), the extract from the CGS Sheet 2820 Map 3a and 3b), this area (including the grid connection corridor) is underlain by the Gordonia Formation (Quaternary coversands of moderate palaeontological sensitivity), the Bethesda Formation, the Jannelsepan Formation, the Keimoes Formation and the Straussburg Granite, of zero palaeontological sensitivity. The primary risk associated with impacts to palaeontological heritage is related to impacting fossils preserved within the Quaternary coversands of the Gordonia Formation.

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16 Edison Way, Century City, Cape Town 7441

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According to Almond's assessment for similar solar PV infrastructure development in this area (2011 SAHRIS NID 174335), "overall impact significance of the proposed solar park development is likely to be LOW because: Most of the study area is underlain by unfossiliferous igneous and metamorphic basement rocks (granites, gneisses etc.) or mantled by superficial sediments (wind-blown sands, alluvium etc.) of low palaeontological sensitivity; Extensive, deep excavations are unlikely to be involved in this sort of solar park project. Significant negative impacts on local fossil heritage are therefore unlikely to result from the proposed solar park development and in the author's opinion no further specialist palaeontological studies for this project are necessary." The same assessment can apply to the proposed grid connection infrastructure.

### **3.2 Geomorphology, climate, vegetation**

The Namaqua sector of the Namaqua-Natal Province is the geological setting of the region around Upington. These are igneous and metamorphic rocks that were formed or metamorphosed during the Namaqua Orogeny approximately 1200 – 1000 million years ago. The Namaqua-Natal Province has been divided into a number of tectonostratigraphic terranes based on common rock types and bounded by shear zones. There have also been some mafic or ultramafic intrusions into the terranes. Upington falls in the Areachap terrane and is bounded to the northeast by the Brakbosch-Trooilaspan Shear Zone and to the southwest by the Boven Rugzeer Shear Zone (Cornell et al., 2006).

There are scattered outcrops of the intrusive Louisvale Granites, Bethesda Formation gneisses and Toeslaan Formation Gneisses (Map 3a). Apart from the age of these rocks pre-dating body fossils, these are all volcanic rocks and have been metamorphosed, so they do not preserve any fossils. They will not be considered any further.

Overlying these complex ancient rocks are much younger sediments of the Tertiary and Quaternary, in particular calcretes that indicate drying out of the surface, and alluvial and aeolian sands of the Gordonia Formation.

The palaeontological sensitivity of the area under consideration is presented in Map 2. The proposed grid connection corridor for the Khunab Solar Grid Connection development lies on the alluvial and aeolian sands of the Gordonia Formation that is Quaternary in age.

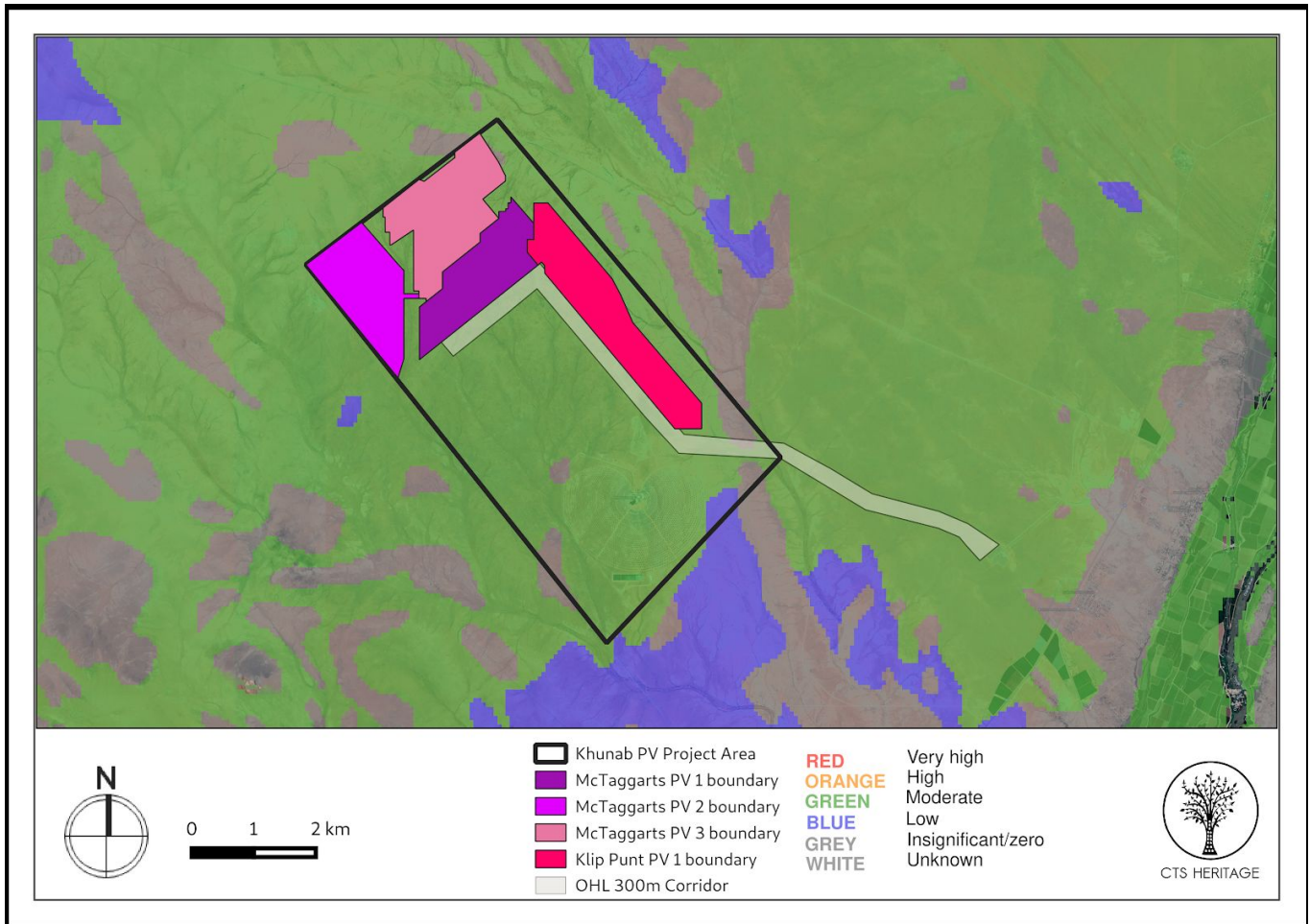
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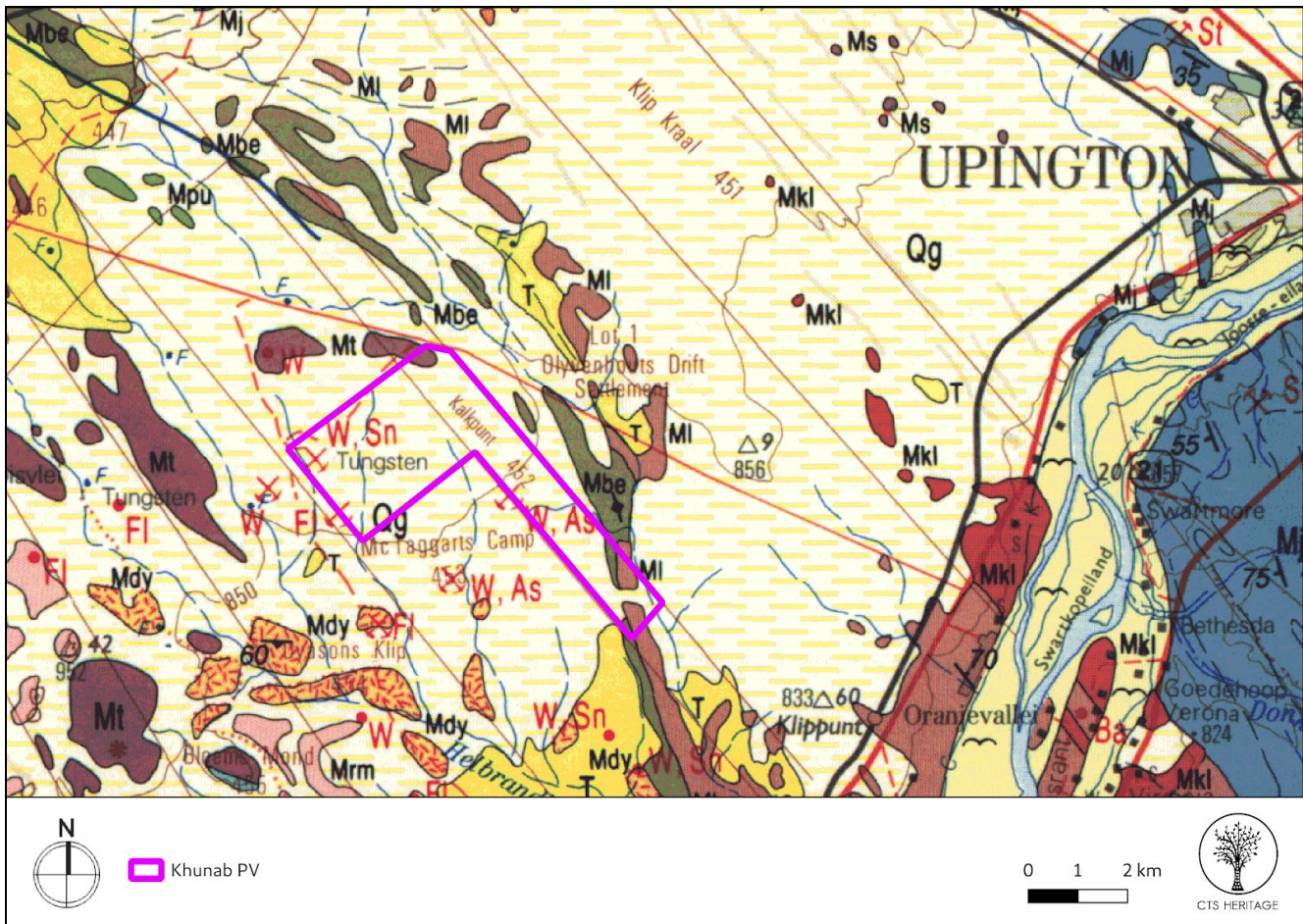
Map 2: Palaeontological sensitivity of the proposed grid connection corridor for the Khunab Solar Grid Connection

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Map 3a: Geology underlying the proposed Khunab Solar Development and Khunab Solar Grid Connection extracted from the Council of Geoscience Map (1:250 000) 2820 Upington

Table 1: Explanation of symbols for the geological map and approximate ages

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Gordonia Formation	Red brown wind blown sand and dunes	Last 2.5 Ma
T	Tertiary	Calcrete	Last 65 Ma
MI	Louisvale Granite, Keimos Suite, Natal-Namaqua Province	Light-grey moderately to well foliated granite	Ca 1000 Ma
Mbe	Bethesda Fm, Areachap Sequence, Natal-Namaqua Province	Migmatitic biotite-rich and aluminous gneisses	1200 – 1000 Ma
Mt	Toeslaan Fm, Biesjpoort Group, Korannaland Sequence, Natal -Namaqua Province	Kinzigite, politic gneisses, biotite gneiss, leucocratic paragneisses	1200 – 1000 Ma

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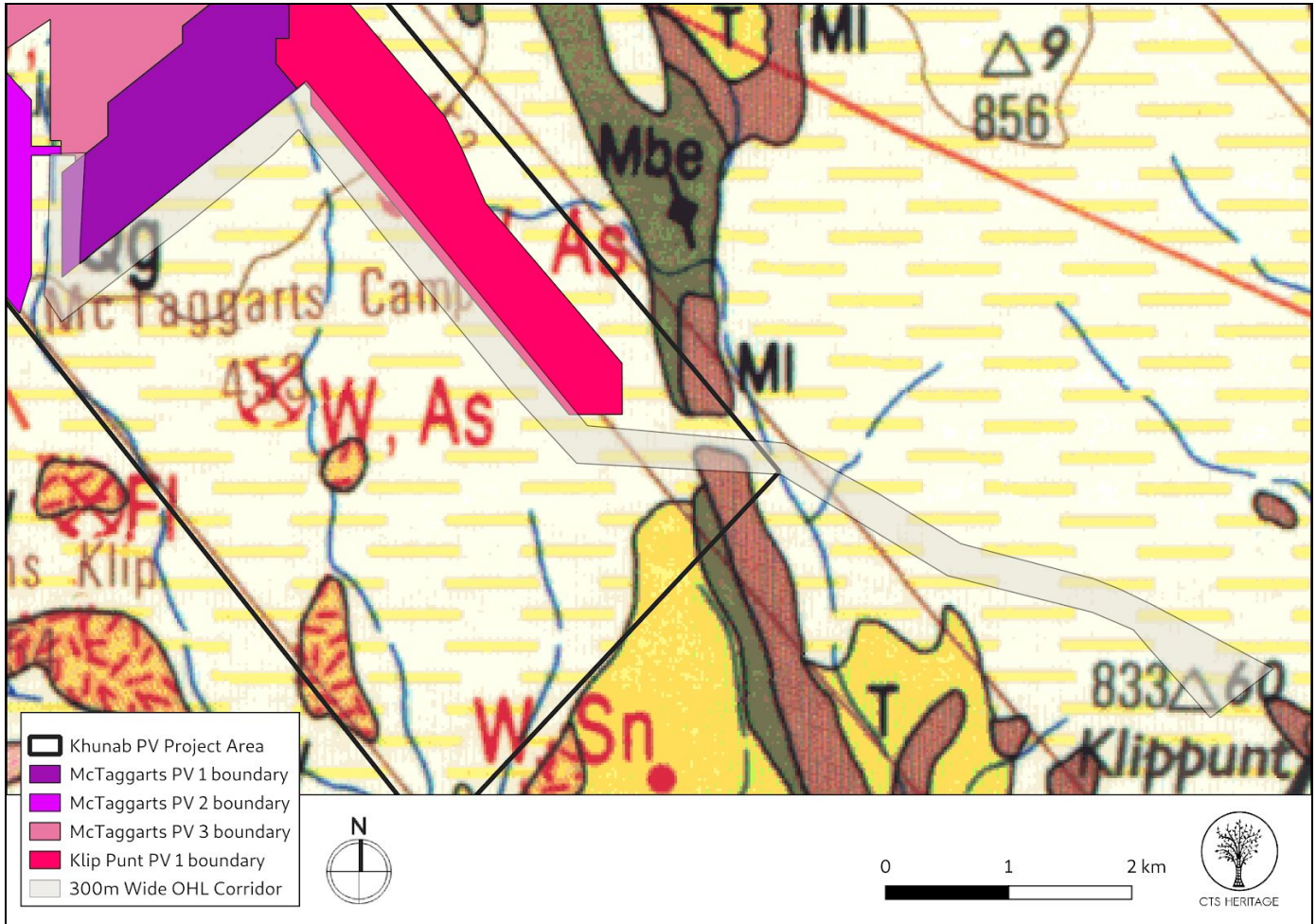
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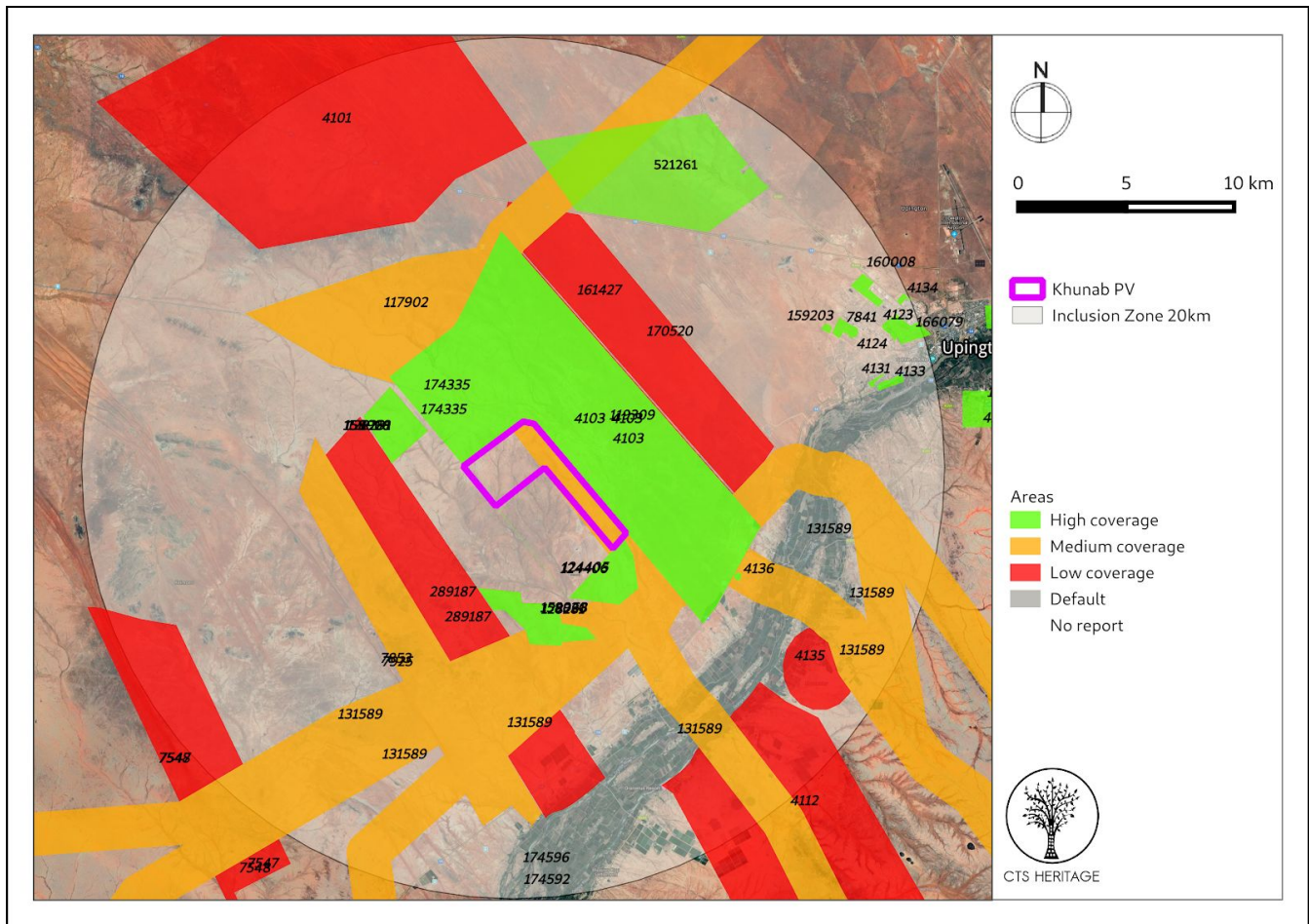
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Map 3b: Geology underlying the proposed grid connection corridor extracted from the Council of Geoscience Map (1:250 000) 2820  
Upington



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Map 4: Spatialisation of heritage assessments conducted in proximity to the proposed development

#### 4. IDENTIFICATION OF HERITAGE RESOURCES

##### 4.1 Summary of findings of Specialist Reports

###### *Archaeology*

Stone Age and historical archaeological resources were identified within the grid connection corridor, however these are considered to be not conservation-worthy as they are widely scattered and have no associated contextual material. The area assessed is by no means pristine as an existing overhead power line runs south of the grid connection corridor in the south-south-east from east to west. The footprint for the 132kV power line is bounded by farm fences on the north and west, while in the south is the existing Khi Solar One Concentrated Solar Power (CSP) Plant, and the east with a gravel road (i.e. the Lutzputs Road) and open fields. No formal or informal graves were identified within the grid connection corridor.

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16 Edison Way, Century City, Cape Town 7441

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### ***Palaeontology***

The Gordonia Formation rests on calcretes or directly on pre-Kalahari bedrock (Partridge et al., 2006). The sands can be up to 30m thick and frequently are linear dunes that have been stabilised by vegetation (ibid). In areas to the south there is evidence of palaeo-rivers, for example the Koa Valley where the so called Kalahari River flowed during wetter Cenozoic times before continental uplift occurred together with global aridity. After the mid Miocene pluvial phases the Koa River was captured by the Orange River and only palaeochannels remain (de Wit et al., 2000; Partridge et al., 2006). Some palaeochannels contain gravel clasts, diamonds, silicified wood and vertebrate bones (Dingle and Hendey, 1984; Pickford et al., de Wit and Bamford, 1993; De Wit et al., 2009).

Some Quaternary pans have fossil fauna and artefacts preserved within them, such as Kath Pan and Townlands near Kuruman (Beaumont, 2004; Walker et al., 2014) but no pans are visible on Google Earth and none have been reported from here.

## **4.2 Heritage Resources identified**

### ***Archaeology***

No significant heritage resources were identified within the grid connection corridor for the proposed Khunab Solar Grid Connection.

**Table 2: Artefacts identified during the field assessment within the Khunab Solar Grid Connection Corridor**

POINT ID	Site No	Site Name	Description	Co-ordinates		Grading	Mitigation
Pt 35	MTG 3/35	OHL Corridor	Core, retouched flakes debris and one hollow scraper. BIS and quartzite. 4 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 42.795" S	21° 05' 12.752" E	NCW	None
Pt 36	MTG 3/36	OHL Corridor	Existing OHL running through south-eastern part of the footprint McTaggart's Camp 2. Orientation: north-west to south-east	28° 31' 50.094" S	21° 05' 17.933" E	N/A	None
Pt 37	MTG 2/37	OHL Corridor	Retouched flakes debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 55.026" S	21° 05' 22.778" E	NCW	None
Pt 38	MTG 2/38	OHL Corridor	Chips, chunks and retouched flakes, debris. BIS and quartzite. 12 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 32' 11.545" S	21° 05' 38.581" E	NCW	None
Pt 39	MTG 2/39	OHL Corridor	Retouched flakes debris and one hollow scraper. BIS and quartzite. 6 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 32' 13.004" S	21° 05' 41.401" E	NCW	None
Pt 41	MTG 3/41	OHL Corridor	Retouched flakes and chunks debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no	28° 31' 43.477" S	21° 05' 37.534" E	NCW	None

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			context. MSA				
Pt 42	MTG 2/42	<b>OHL Corridor</b>	Retouched flakes, chips and hollow scraper debris. BIS and quartzite. 8 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 31' 20.894" S	21° 05' 31.087" E	NCW	None
Pt 45	MTG 3/45	<b>OHL Corridor</b>	Existing Eskom Sub-Station	28° 32' 39.989" S	21° 08' 10.172" E	N/A	None
Pt 46	MTG 3/46	<b>OHL Corridor</b>	Disturbed area: site office/camp for contractors building OHL's	28° 32' 37.045" S	21° 08' 10.888" E	N/A	None
Pt 48	MTG 3/48	<b>OHL Corridor</b>	Retouched chunks debris. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 53.511" S	21° 06' 18.428" E	NCW	None
Pt 50	MTG 3/50	<b>OHL Corridor</b>	Retouced chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 58.188" S	21° 06' 27.123" E	NCW	None
Pt 51	MTG 3/51	<b>OHL Corridor</b>	Retouched dolomite core. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 13.477" S	21° 07' 04.801" E	NCW	None
Pt 52	MTG 3/52	<b>OHL Corridor</b>	Hand soldered oil tin. Probably in context with mining or agricultural activities. MSA	28° 32' 17.284" S	21° 07' 02.702" E	NCW	None
Pt 53	MTG 3/53	<b>OHL Corridor</b>	Hand soldered tin. Probably in context with mining or agricultural activities. Colonial	28° 31' 48.400" S	21° 05' 34.875" E	NCW	None
Pt 54	MTG 2/54	<b>OHL Corridor</b>	Bifacial scraper. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 13.477" S	21° 07' 04.801" E	NCW	None
Pt 10	MTG 1/10	<b>OHL Corridor</b>	Core, hollow scraper, flakes and chips debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 30' 27.376" S	21° 03' 22.911" E	NCW	None
Pt 11	MTG 1/11	<b>OHL Corridor</b>	Flakes debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 05.807" S	21° 02' 33.875" E	NCW	None
Pt 12	MTG 1/12	<b>OHL Corridor</b>	Machine soldered square fish tin. Probably associated with mining activities. Colonial	28° 31' 05.878" S	21° 02' 33.730" E	NCW	None
Pt 13	MTG 1/13	<b>OHL Corridor</b>	Empty/fired cartridge: Positively identified as Marthini Henry round. Colonial	28° 30' 36.770" S	21° 03' 02.473" E	NCW	None
Pt 34	MTG 2/34	<b>OHL Corridor</b>	Flakes and blade debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 31' 10.628" S	21° 04' 42.233" E	NCW	None
Pt 47	MTG 3/47	<b>OHL Corridor</b>	Retouched chunks debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 43.786" S	21° 07' 09.152" E	NCW	None
Pt 49	MTG 3/49	<b>OHL Corridor</b>	Retouched chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 16.240" S	21° 06' 35.009" E	NCW	None



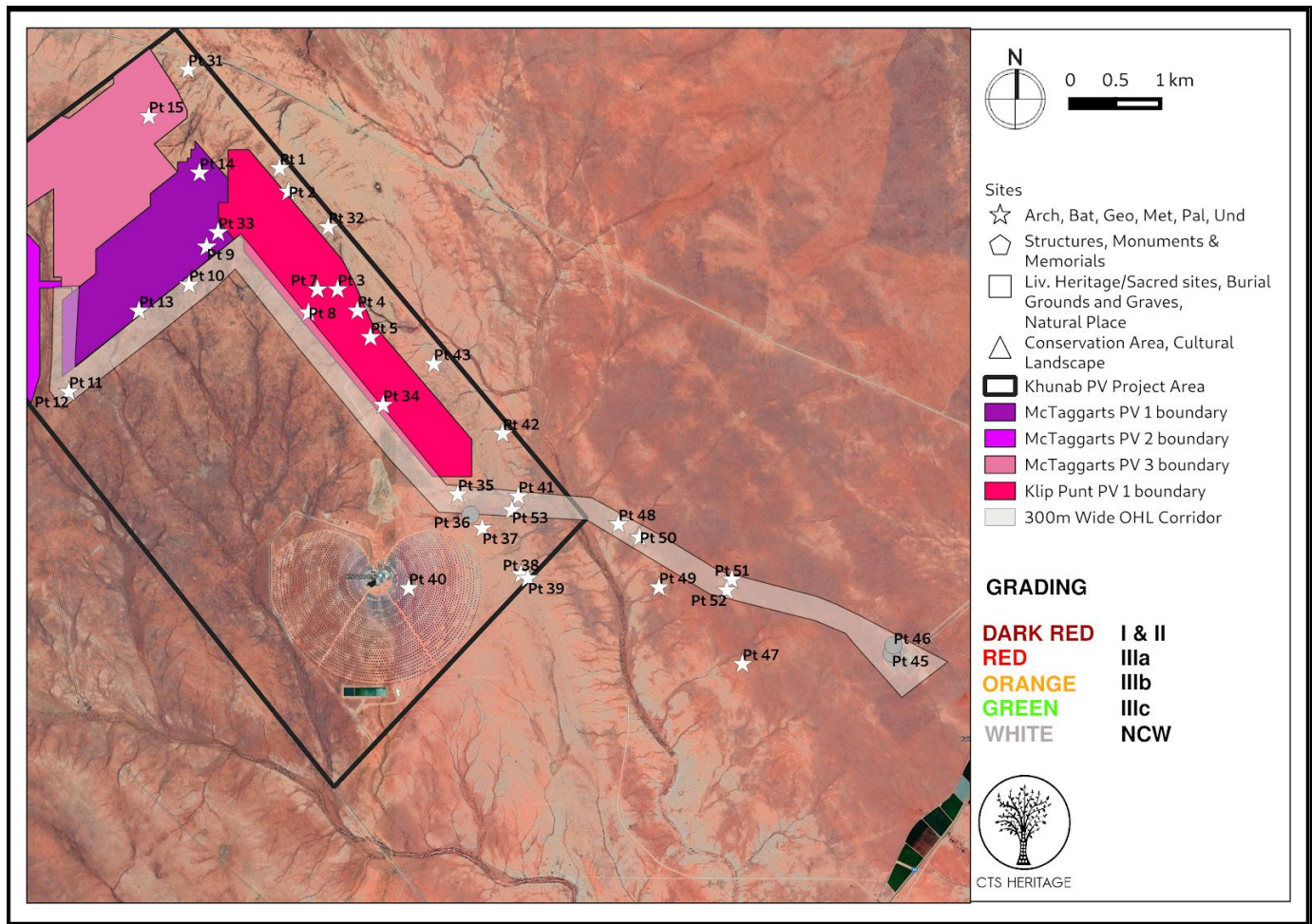


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### Palaeontology

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 igneous and much too old to contain fossils, or are alluvial and aeolian sands. The Gordonia Formation alluvial and aeolian sands are young and have been transported so are unlikely to preserve any fossils. Only if palaeo-pans or palaeo-channels are present is there a small chance of finding fossils, however none have been recorded and the geological maps and Google Earth imagery do not indicate the presence of these features in the project footprint. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

### 4.3 Mapping and spatialisation of heritage resources



Map 5: Heritage resources in the vicinity of and within the grid connection corridor

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





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## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

### 5.1 Assessment of impact to Heritage Resources

The proposed development will not have a negative impact on the heritage resources situated within the 300m wide grid connection corridor within which the powerline servitude will be placed. The lithic and historic material identified is of low significance, and even though the resources may be destroyed during the construction, the impact is inconsequential.

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 loose sands of the Quaternary. There is a very small chance that fossils may occur in the adjacent shales of the early Permian Vryheid Formation so a Chance Find Protocol should be added to the EMP. All proposed infrastructure lies on the Gordonia Formation dune and aeolian sands and as far as the palaeontology is concerned there is no impact anticipated.

**Table 3: Impacts of the Khunab Solar Grid connection corridor to heritage resources**

<b>NATURE:</b> No heritage resources of significance were identified during the field assessments for archaeology and palaeontology within the 300m wide grid connection corridor				
		<b>Archaeology</b>		<b>Palaeontology</b>
<b>MAGNITUDE</b>	<b>L (2)</b>	No significant archaeological resources were identified within the grid connection corridor, however a number of archaeological resources of low significance were identified	<b>L (2)</b>	Fluvial and aeolian sands do not preserve fossils; only palaeo-pans might but none has been recorded. Palaeo-channels might contain fossil wood and bones but none has been recorded from this site. The impact would be very unlikely.
<b>DURATION</b>	<b>H (5)</b>	Where manifest, the impact will be permanent.	<b>H (5)</b>	Where manifest, the impact will be permanent.
<b>EXTENT</b>	<b>L (1)</b>	Localised within the site boundary	<b>L (1)</b>	Since only the possible fossils within the area would be from palaeo-pans or palaeo-channels if present so the spatial scale will be localised within the boundary of the grid connection corridor.
<b>PROBABILITY</b>	<b>L (1)</b>	It is extremely unlikely that any significant archaeological resources will be impacted	<b>L (1)</b>	It is extremely unlikely that any fossils would be found in the alluvial and aeolian sands but the grid connection corridor is indicated as moderately sensitive.
<b>SIGNIFICANCE</b>	<b>L</b>	(2+5+1)x1=8	<b>L</b>	(2+5+1)x1=8
<b>STATUS</b>		Neutral		Neutral
<b>REVERSIBILITY</b>	<b>L</b>	Any impacts to heritage resources that do occur are irreversible	<b>L</b>	Any impacts to heritage resources that do occur are irreversible
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>L</b>	Unlikely due to the low significance of the archaeology identified	<b>L</b>	Unlikely due to the nature of the geology in this area

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<b>CAN IMPACTS BE MITIGATED</b>		NA		Yes
<b>MITIGATION:</b> No impacts are anticipated and as such, no mitigation is required. A Fossil Chance Find protocol should be added to the eventual EMP.				
<b>RESIDUAL RISK:</b> Should any significant resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources				

## 5.2 Sustainable Social and Economic Benefit

A Social Impact Assessment (SIA) has been conducted for the proposed development. This SIA focused on the collection of data to provide an understanding of the current social environment associated with the grid connection corridor within which the Khunab Solar Grid Connection is proposed and identify and assess social issues and potential social impacts associated with the development of such a nature. According to the SIA, the primary socio-economic benefits of the proposed development relate to the creation of direct and indirect employment and skills development opportunities, as well as the contribution of the proposed development to enable the supplementing of energy requirements through renewables.

The SIA concludes that the social impacts identified (including all positive and negative impacts) will be either of a low or medium significance. No negative impacts with a high significance rating have been identified to be associated with the development of the Khunab Solar Grid Connection. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The recommendations proposed for the project are considered to be appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts.

## 5.3 Proposed development alternatives

No grid connection corridor alternatives are being assessed as part of this proposal.

## 5.4 Cumulative Impacts

Cumulative impact in terms of heritage was assessed by reviewing the Heritage Impact Assessments completed within 20km of the proposed grid connection corridor. Impacts to heritage result from all kinds of development and as such, this assessment of cumulative impacts to heritage was not limited to impact from grid connection infrastructure. Of the 32 Heritage Assessments conducted within 20km of the proposed development area (Appendix 2), 3 are for electrical infrastructure (purple in the below table) and 9 are for Solar Energy/PV Facilities



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(orange in the below table). The remaining assessments relate to mining infrastructure and residential township developments. At this stage, there is the potential for the cumulative impact of proposed grid connection infrastructure and the associated solar energy facilities (proposed or existing) 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 the impact on the experience of the cultural landscape is not foreseen to be significant.

**Table 4: Development projects within 20km of the proposed grid connection corridor**

Nid	Report Type	Author/s	Date	Title
4103	AIA	Cobus Dreyer	10/03/2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape
4112	AIA	Peter Beaumont	29/01/2008	Phase 1 Heritage Impact Assessment Report on a Portion of the Farm Keboes 37, near Kanoneiland, Siyanda District Municipality, Northern Cape Province
4123	AIA	Peter Beaumont	01/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Residential Development Flanking Dakota Drive in Upington, //Khara Hais Municipality, Northern Cape Province
4101	AIA	Peter Beaumont	22/10/2005	Archaeological Impact Assessment at and in the Vicinity of a Quartzite Quarry on Portion 4 of the Farm Droogehout 442 near Upington
4135	AIA	Peter Beaumont	20/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Raaswater Township, Siyanda District Municipality, Northern Cape Province
4136	AIA	Peter Beaumont	22/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of Kalksloot Settlement, Siyanda District Municipality, Northern Cape
7547	AIA	Jaco van der Walt	30/10/2011	AIA for the proposed OfriZX Photovoltaic Plant, Keimoes, Northern Cape
7548	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed Ofir ZX Photovoltaic Plant near Keimoes, Northern Cape
4124	AIA	Peter Beaumont	24/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Settlement in Upington, //Khara Hais Municipality, Northern Cape Province
4131	AIA	Peter Beaumont	18/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Keimoesweg, //Khara Hais Municipality, Northern Cape Province
4133	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Lemoendraai in Upington, //Khara Hais Municipality, Northern Cape Province
4134	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Industrial Area Expansion at Laboria, //Khara Hais Municipality, Northern Cape Province
119309	HIA	Stephan Gaigher	10/10/2012	HERITAGE IMPACT ASSESSMENT REPORT Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
124405	HIA	Stephan Gaigher	29/10/2013	Heritage Impact Assessment Report for the Proposed Sirius Solar Project near Upington in the Northern Cape Province
124406	PIA	JF Durand	02/04/2013	Palaeontology Scoping Report

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16 Edison Way, Century City, Cape Town 7441

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128281	HIA	David Morris	30/07/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Scoping phase Heritage Input
7841	AIA	Peter Beaumont	17/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Township, //Khara Hais Municipality, Northern Cape Province
7853	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed S Kol Photovoltaic Plant near Keimoes, Northern Cape
7925	AIA	Jaco van der Walt	31/10/2011	AIA for the proposed S-Kol Photovoltaic Plant, Keimoes, Northern Cape
117902	HIA	Anton van Vollenhoven	25/05/2012	A REPORT ON A HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED SASOL CSP PROJECT NEAR UPINGTON IN THE NORTHERN CAPE PROVINCE
131589	AIA	Stephan Gaigher	22/02/2013	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
159203	HIA	Johnny Van Schalkwyk	11/03/2014	Cultural Heritage Impact Assessment Proposed Township development of Erf 1, UPINGTON, //KHARA HAIS MUNICIPALITY
160008	HIA	Johnny Van Schalkwyk	15/03/2014	Cultural Heritage Impact Assessment for the proposed township development, Paballelo, Upington, //Khara Hais Municipality
161427	HIA	Stephan Gaigher	15/04/2014	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
166079	HIA	Johnny Van Schalkwyk	12/03/2014	Proposed extension of Dakota Road, Upington
158920	HIA	David Morris	01/02/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Archaeological Impact Assessment proposed central development footprint
159068	PIA	John E Almond	07/03/2014	PALAEONTOLOGICAL HERITAGE BASIC ASSESSMENT: DESKTOP STUDY Proposed RE Capital 3 Solar Development on the property Dyason's Klip near Upington , Northern Cape
174596	PIA	John E Almond	05/08/2013	RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES: PROPOSED UPGRADE & REPAIR OF WATER SUPPLY INFRASTRUCTURE, EKSTEENSKUIL, SOVERBY & CURRIESKAMP NEAR KEIMOES, NORTHERN CAPE
289187	HIA	Jaco van der Walt	01/06/2015	Heritage Scoping Report for the proposed Bloemsmond Solar 1 and Solar 2 PV Project, Keimoes, NC Province
170520	HIA	Johnny Van Schalkwyk	01/01/2014	Heritage Impact Assessment Report for the proposed 1GW Upington Solar Park within the // Khara Hais Municipality, Northern Cape Province
174335	HIA	Wouter Fourie	24/03/2014	Heritage Impact Assessment for the proposed Solar Power Park for SolarReserve SA (Pty) Ltd, Farm Rooipunt 617, Gordonia RD, Siyanda District Municipal Region, Northern Cape.
174592	HIA	Cobus Dreyer	05/09/2013	FIRST PHASE ARCHAEOLOGICAL & HERITAGE ASSESSMENT OF THE BORROW PITS FOR THE REPAIR & UPGRADE OF THE IRRIGATION INFRASTRUCTURE AT SOVERBY & CURRIESKAMP NEAR KEIMOES, NORTHERN CAPE PROVINCE

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**Table 5: Cumulative Impact Table**

<b>NATURE:</b> Cumulative Impact to the sense of place				
		<b>Overall impact of the proposed project considered in isolation</b>		<b>Cumulative impact of the project and other projects in the area</b>
<b>MAGNITUDE</b>	<b>L (4)</b>	Low	<b>L (4)</b>	Low
<b>DURATION</b>	<b>M (3)</b>	Medium-term	<b>H (4)</b>	Long-term
<b>EXTENT</b>	<b>L (1)</b>	Low	<b>L (1)</b>	Low
<b>PROBABILITY</b>	<b>L (2)</b>	Improbable	<b>H (3)</b>	Probable
<b>SIGNIFICANCE</b>	<b>L</b>	$(4+3+1) \times 2 = 16$	<b>L</b>	$(4+4+1) \times 3 = 27$
<b>STATUS</b>		Neutral		Neutral
<b>REVERSIBILITY</b>	<b>H</b>	High	<b>L</b>	Low
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>L</b>	Unlikely	<b>L</b>	Unlikely
<b>CAN IMPACTS BE MITIGATED</b>		NA		NA
<b>CONFIDENCE IN FINDINGS:</b> High				
<b>MITIGATION:</b> No impacts are anticipated and as such, no mitigation is required				

## 6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the Environmental Assessment Practitioner (EAP) during the Basic Assessment (BA) process. No heritage-related comments have been received to-date. In terms of section 38(8) of the National Heritage Resources Act (Act 25 of 1999), the South African Heritage Resources Agency (SAHRA) is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation.

## 7. CONCLUSION

The proposed development will not have a negative impact on the heritage resources situated within the 300m wide grid connection corridor. The lithic and historic material identified is of low significance, and even though the resources may be destroyed during the construction, the impact is inconsequential. As such, there is no objection to the proposed development based on impacts to archaeological resources.

Based on the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose Quaternary sands. There is a very small chance that fossils may occur in the adjacent shales of the early Permian Vryheid Formation so a Chance Find Protocol should be added to the EMP. All



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proposed infrastructure lies on the Gordonia Formation dune and aeolian sands and as far as the palaeontology is concerned, no impact is anticipated.

In addition, the proposed development is located within a REDZ and Power Corridor. Due to the REDZ, there are a number of similar existing and/or proposed grid connection infrastructure projects and associated PV facilities in the area and as such, there is the potential for the cumulative impact of proposed and existing grid connection infrastructure and the associated solar energy facilities (proposed or existing) 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 the impact on the experience of the cultural landscape is not foreseen to be significant.

Therefore, in the 300m wide grid connection corridor for the Khunab Solar Grid Connection, no significant archaeological or palaeontological resources were identified. Therefore, no further mitigation is required, and from a heritage point of view, there is no objection to the proposed Khunab Solar Grid Connection within the grid connection corridor.

## 8. RECOMMENDATIONS

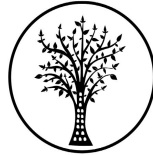
There is no objection to the proposed development on heritage grounds and the following is recommended:

- No mitigation is required prior to construction operations commencing.
- A Chance Fossil Finds Procedure must be implemented (see attached as part of Appendix 2)
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist must be contracted as soon as possible to inspect the findings. A Phase 2 rescue excavation operation may be required subject to permits issued by SAHRA.

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16 Edison Way, Century City, Cape Town 7441

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- The above recommendations must be included in the Environmental Management Programme (EMPr) for the project



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## 9. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
4103	AIA	Cobus Dreyer	10/03/2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape
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Northern Cape: Scoping phase Heritage Input				
7841	AIA	Peter Beaumont	17/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Township, //Khara Hais Municipality, Northern Cape Province
7853	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed S Kol Photovoltaic Plant near Keimoes, Northern Cape
7925	AIA	Jaco van der Walt	31/10/2011	AIA for the proposed S-Kol Photovoltaic Plant, Keimoes, Northern Cape
117902	HIA	Anton van Vollenhoven	25/05/2012	A REPORT ON A HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED SASOL CSP PROJECT NEAR UPINGTON IN THE NORTHERN CAPE PROVINCE
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161427	HIA	Stephan Gaigher	15/04/2014	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
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159068	PIA	John E Almond	07/03/2014	PALAEONTOLOGICAL HERITAGE BASIC ASSESSMENT: DESKTOP STUDY Proposed RE Capital 3 Solar Development on the property Dyason's Klip near Upington , Northern Cape
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16 Edison Way, Century City, Cape Town 7441

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



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**Cedar Tower Services (Pty) Ltd t/a CTS Heritage**

16 Edison Way, Century City, Cape Town 7441

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



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## APPENDICES



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## **APPENDIX 1: Archaeological Assessment**

# ARCHAEOLOGICAL SPECIALIST STUDY

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

**Proposed development of  
THE KHUNAB SOLAR DEVELOPMENT AND THE KHUNAB SOLAR GRID CONNECTION  
Upington, in the Northern Cape Province**

**Prepared by**



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In Association with

**Savannah**

And

**Ubique Heritage Consultants**

September 2019



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## THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Jan Engelbrecht and Jenna Lavin, as the appointed independent specialists hereby declare that we:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not; and
- are aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Jan Engelbrecht and Jenna Lavin

**Signature of the specialist**

Ubique Heritage Consultants and CTS Heritage

**Name of company**

26 June 2019

**Date**



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## EXECUTIVE SUMMARY

The developer is proposing the construction and operation of four Solar Energy Facilities and one associated grid solution on a site located within the Upington REDZ, close to and south west of Upington in the Northern Cape. Each proposed solar energy project is proposed to be 75MW in capacity and each facility will contain an on-site substation. A 132kV power line will connect to two proposed collector substations, each including a switching station component which will connect the four PV facilities to the national grid via the Upington Main Transmission Substation (MTS). The power line and the collector substations associated with the facilities are also assessed in this report.

The archaeological field assessment covered the area proposed for development thoroughly. Stone Age and historical archaeological resources were identified within the development footprints of the proposed projects, however these are considered to be not conservation-worthy as they are widely scattered and have no associated contextual material.

Significant resources associated with the tungsten mining industry that was present in this area during the 1930's and 1940's (associated with WWII) were also identified. These have been graded IIIB as they have moderate local significance however most of the mining activities observed are located outside of the development footprints of the proposed projects.

The area assessed is by no means pristine as an existing overhead power line runs to the south of the proposed projects in the south-south-east from east to west. The footprint for the PV facilities is bounded by farm fences on the north and west, while in the south is the existing Khi Solar One Concentrated Solar Power (CSP) Plant, and the east with a gravel road (ie. the Lutzputs Road) and open fields.

No formal or informal graves were identified within the development footprints of the proposed projects.

Based on the assessment of the potential impact of the developments on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits.

- In the eastern section of the Khunab Solar Development footprint, no significant heritage resources were identified. In addition, in the grid connection corridor for the Khunab Solar Grid Connection no significant heritage resources were identified. Therefore, no further mitigation is required, and from a heritage point of view, there is no objection to the proposed developments in the assessed areas.
- In the northern section (McTaggarts PV2) of the Khunab Solar Development, heritage resources of medium to high significance were identified which fall within the proposed development area (Pt 21, 22 and 27). The remnants of the 1930-40s tungsten mine is located inside and adjacent to the development footprint and should not be impacted by the proposed development. It is recommended that a no-go buffer of 50 m from the edge of each site extent (Pt 21 and 22) be implemented, and that Pt 27 be recorded on the Heritage Register.
- If it is not possible to avoid these sites (Pt 21 and 22), it is recommended that these sites be fully mitigated through detailed archaeological excavation conducted by a qualified archaeologist. A permit in terms of section



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35 of the NHRA and Chapter II and IV of the NHRA Regulations must be applied for from SAHRA via SAHRIS before construction.

- The sites that have been graded as IIIB should be placed on the heritage register in terms of section 30 of the National Heritage Resources Act.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist must be contracted as soon as possible to inspect the findings. A Phase 2 rescue excavation operation may be required subject to permits issued by SAHRA





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## CONTENTS

<b>1. INTRODUCTION</b>	<b>5</b>
1.1 Background Information on Project	5
1.2 Description of Property and Affected Environment	5
<b>2. METHODOLOGY</b>	<b>6</b>
2.1 Purpose of Archaeological Study	6
2.2 Summary of steps followed	6
2.3 Constraints & Limitations	7
<b>3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT</b>	<b>7</b>
<b>4. IDENTIFICATION OF HERITAGE RESOURCES</b>	<b>12</b>
4.1 Field Assessment	12
4.2 Archaeological Resources identified	19
4.3 Selected photographic record	23
<b>5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT</b>	<b>27</b>
5.1 Assessment of impact to Archaeological Resources	27
<b>6. CONCLUSION AND RECOMMENDATIONS</b>	<b>29</b>
<b>7. REFERENCES</b>	<b>30</b>



CTS HERITAGE

## 1. INTRODUCTION

### 1.1 Background Information on Project

The developer is proposing the construction and operation of four Solar Energy Facilities and one associated grid solution on a site located within the Upington REDZ, close to and south west of Upington in the Northern Cape. Each proposed solar energy project is proposed to be 75MW in capacity and each facility will contain an on-site substation. A 132kV power line will connect to two proposed collector substations, each including a switching station component which will connect the four PV facilities to the national grid via the Upington Main Transmission Substation (MTS). The power line and the collector substations associated with the facilities are also assessed in this report.

Klip Punt PV1 will be located on Portion 12 of Farm Klip Punt 452. McTaggarts PV1 and McTaggarts PV3 will be located on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 of Farm Klip Punt 452. McTaggarts PV2 will be located on Portion 3 of the Farm McTaggarts Camp 453.

The location of the projects within a REDZ and Power Corridor makes it possible to undertake Basic Assessment (BAR) processes for the projects in support of the application for authorisation. Separate applications for Authorisation are to be made for each solar energy facility and for the grid connection solution (i.e. collector substations and 132kV power line). This report is intended to inform the Heritage Impact Assessments that will form part of these BAR processes.

### 1.2 Description of Property and Affected Environment

The area proposed for development is rather flat and sandy with some vegetation cover. It has a slight slope from south to north. The site is still utilised for agricultural purposes (livestock farming) and several internal fences cross over the site. In the north-western section of the site previous mining activities were located, as well as old ruins associated with the mining. Several quartz and quartzite outcrops are scattered throughout the area under consideration. Dolomite outcrops were also identified, however these were not as numerous. A number of Limestone (calcrete) outcrops were noted as well.

The area under consideration is covered by various types of vegetation including Camel Thorn trees (*Acacia erioloba*), Black Thorn trees (*Acacia mellifera*), Three Thorn/Driedoring (*Rhigozum trichotomum*), Skaapbossie (*Aizoon schellenbergii*), Shepherd tree (*Boscia albitrunca*), Suurgras (*Enneapogon desvauxii*), Pencil Milkbush (*Euphorbia lignose*), Helichrysum tomentosulum (*Prosopis glandilosa*), Tall Bushman grass (*Stipagrostis hirtigluma*), Silky Bushman grass (*Stipagrostis uniplumis*) and Kortbeen Boesmangras. There are several dry river beds that are present flowing from north to south and from west to east. No perennial rivers or riverines were evident.



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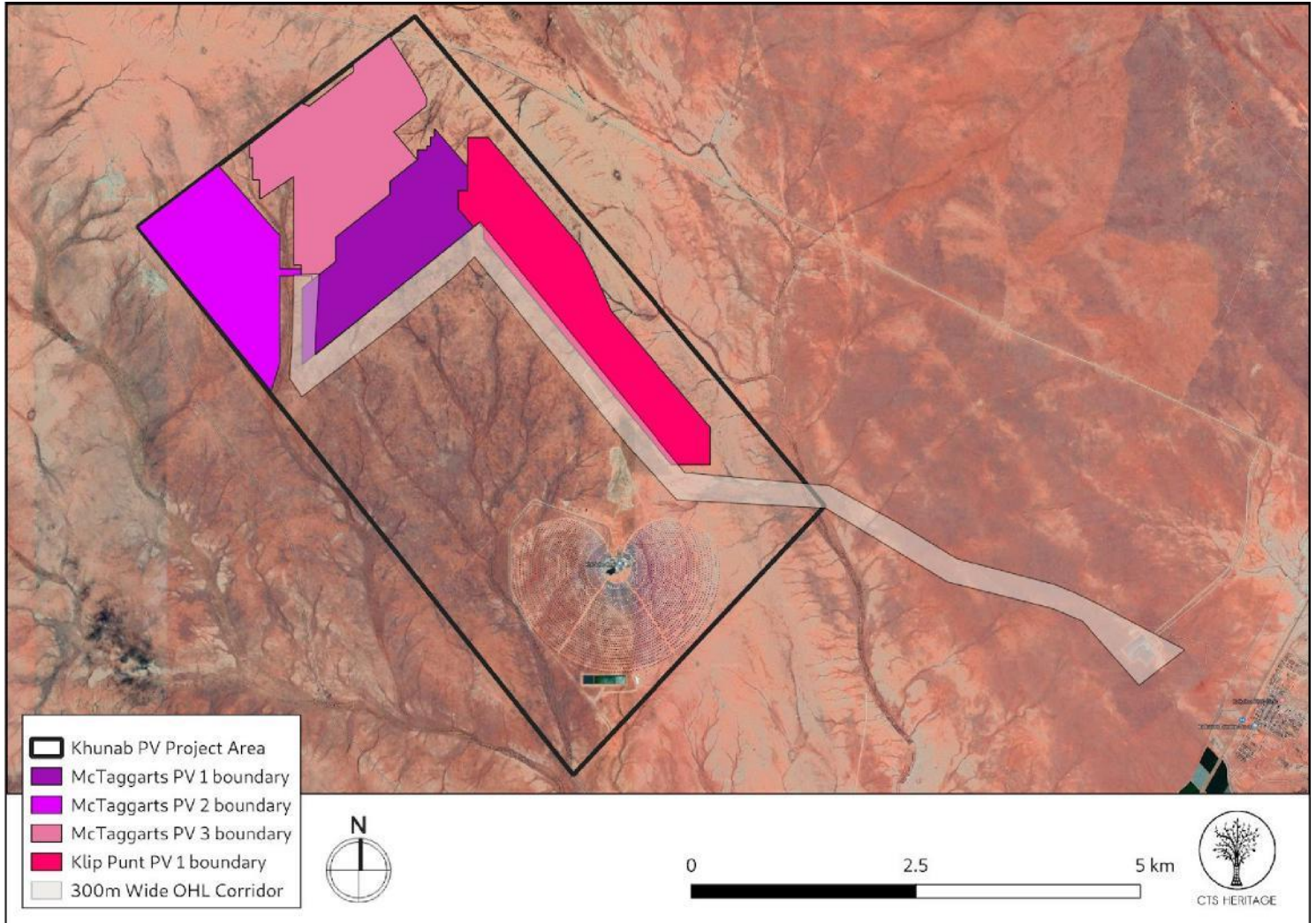


Figure 1.1: Close up satellite image indicating the proposed location of the developments under consideration

## 2. METHODOLOGY

### 2.1 Purpose of Archaeological Study

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

### 2.2 Summary of steps followed

- An archaeologist conducted a survey of the site and its environs from 10 to 14 June 2019 and 21 to 23 June 2019 to determine what archaeological resources are likely to be impacted by the proposed development. All areas under consideration for development were surveyed in transects of approximately 30 - 50m. The areas were surveyed on foot and with a field motorbike by a team of three surveyors.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.





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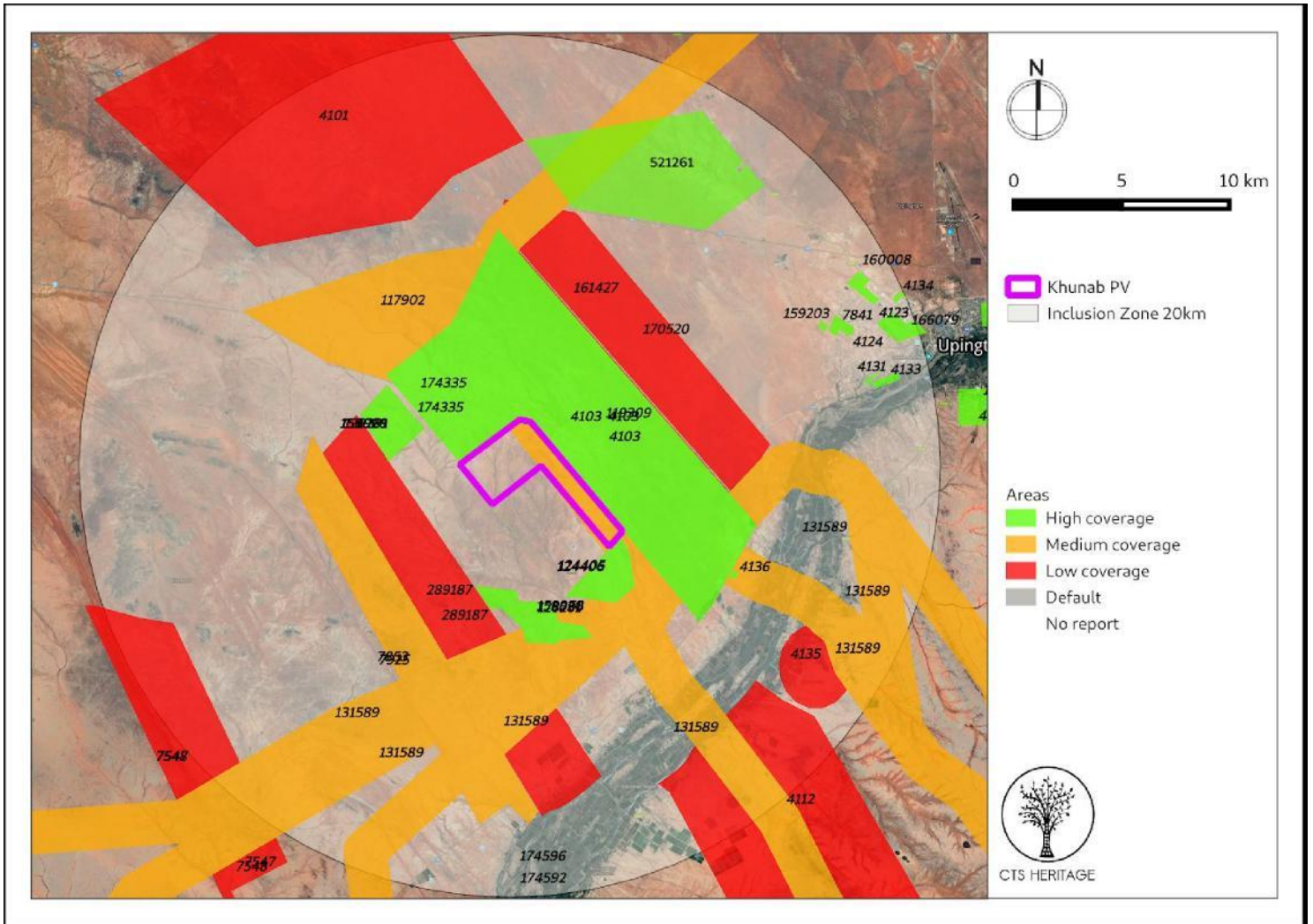


Figure 2: Close up satellite image indicating proposed location of the development in relation to heritage studies previously conducted

### 2.3 Constraints & Limitations

The area under consideration for the developments was thoroughly surveyed for impacts to heritage resources. Access into the Khi Solar One CSP Plant already located on the McTaggart's Camp Farm was not possible for security reasons and as such, the part of the corridor associated with the Khunab Solar Grid Connection was not surveyed for impacts to heritage resources (Figure 5). However, this area has been subject to a previous HIA (SAHRIS NID 124405) for the Sirius Solar Project by Gaigher (2013). See Figure 2.

The experience of the heritage practitioner, and observations made during the study, allow us to predict with some accuracy the archaeological sensitivity of the receiving environment.

### 3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

Klip Punt PV1 will be located on Portion 12 of Farm Klip Punt 452. McTaggart's PV1 and McTaggart's PV3 will be located on Portion 3 of the Farm McTaggart's Camp 453 and Portion 12 of Farm Klip Punt 452. McTaggart's PV2 will be located on Portion 3 of the Farm McTaggart's Camp 453.



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## **Cultural Landscape**

According to Van Schalkwyk (2014 SAHRIS NID 170520), "The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (stone age) component and a later colonial (farmer) component. This rural landscape has always been sparsely populated. The second component is an urban one, consisting of a number of smaller towns, most of which developed during the last 150 years or less." According to Von Vollenhoven (2012 SAHRIS NID 117902), "the environment of the area is mostly undisturbed although it is being used for sheep farming... The natural topography... is reasonably flat, but in the north-west, a hill dominates the area resulting in an even slope up to the crest. This area also is very rocky. The stones here are dark in colour and may be of a basaltic origin. However in the flat areas adjacent to the hill the rocks are white coloured and most likely are soft calcrete, which would not have been suitable for the manufacture of stone tools. Different non-perennial streams run through the area..." According to Fourie's assessment of the impacts of similar infrastructure in this area (2014), due to the landscape's topography the solar PV infrastructure will be prominent in the landscape and alter the rural appearance. Due to the remoteness of the area the impact on the experience of the cultural landscape is not foreseen to be significant. In addition, there is an existing solar park located in very close proximity to the proposed projects (Figure 1c), setting a precedent for this kind of infrastructure in this area.

## **Archaeology and the Built Environment**

Many farm portions in the immediate vicinity of the area proposed for development have been assessed in terms of impacts to heritage resources (Figure 2). It has been found that the area surrounding Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335). Based on the outcomes of these assessments, it is noted that most of the heritage resources identified are stone age artefact scatters of varying significance. In Fourie's assessment (2014), the field work identified numerous areas where low density scatters of Middle and Later Stone Age lithics were found. As no context and *in situ* preservation were identified these sites were graded as having low heritage significance. In addition, one possible herder site was identified during the survey. No other material or deposits were identified but does not exclude the possibility of subsurface material. The ruins of old mining infrastructure were also identified. In Von Vollenhoven's assessment (2012 SAHRIS NID 117902), he identified a number of very interesting and significant rock art engravings depicting various animals including giraffes and an aardvark. In addition, he identified a significant historical site known as the "Rebellion Tree" as well as graves associated with farmers in this area.

Numerous heritage resources have been identified within the immediate vicinity of the area proposed for development (Figure 3 and insets b, c and d). The vast majority of these are archaeological artefacts with little or no contextual information associated with them, resulting in their low heritage significance assessment. Dreyer (2006, SAHRIS NID 4103) identified a number of stone flakes and flaked stone cores on the surface of a neighbouring site (Figure 2). He determined that the raw material originated from the local geological horizon and is broadly described as chalcedony, meta-quartzite and banded ironstone from the Griquastad Layer. He also identified a heavily soldered food tin resembling British rations from the Anglo-Boer War (1899-1902). Dreyer (2006) anticipated that there could have been a British camp in the vicinity during the War, but nothing else to confirm this expectation was discovered. Fourie (2014, SAHRIS NID 174335) identified a number of heritage resources in his assessment of Farm Rooipunt 617 including stone



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age tools and sites, possible herder sites and historical structures associated with mining and prospecting.

Based on the available information, it is likely that the proposed development will impact on 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 construction phase and disturbance during the operation phase.

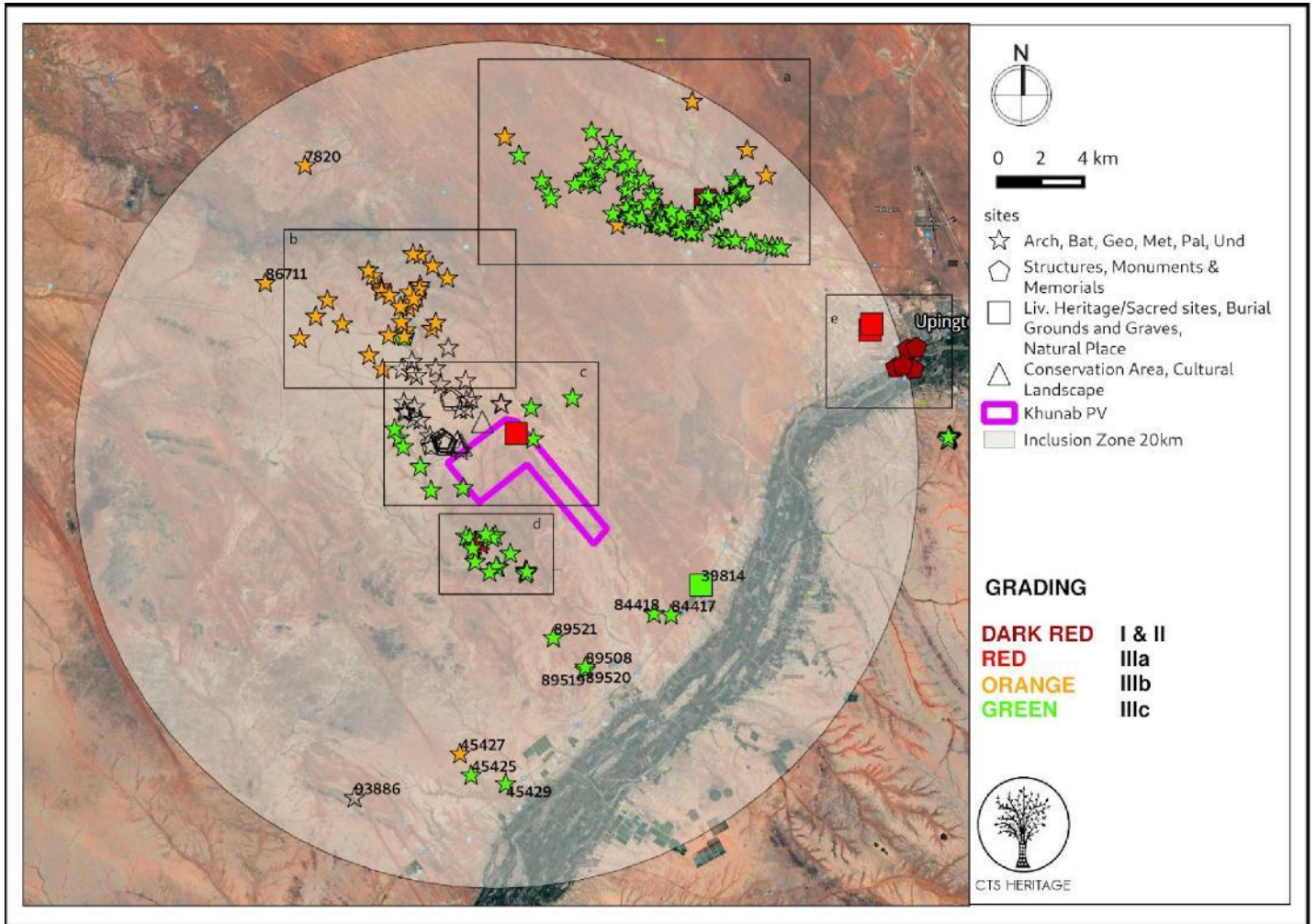


Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the area under consideration for the proposed projects, with SAHRIS Site IDs indicated



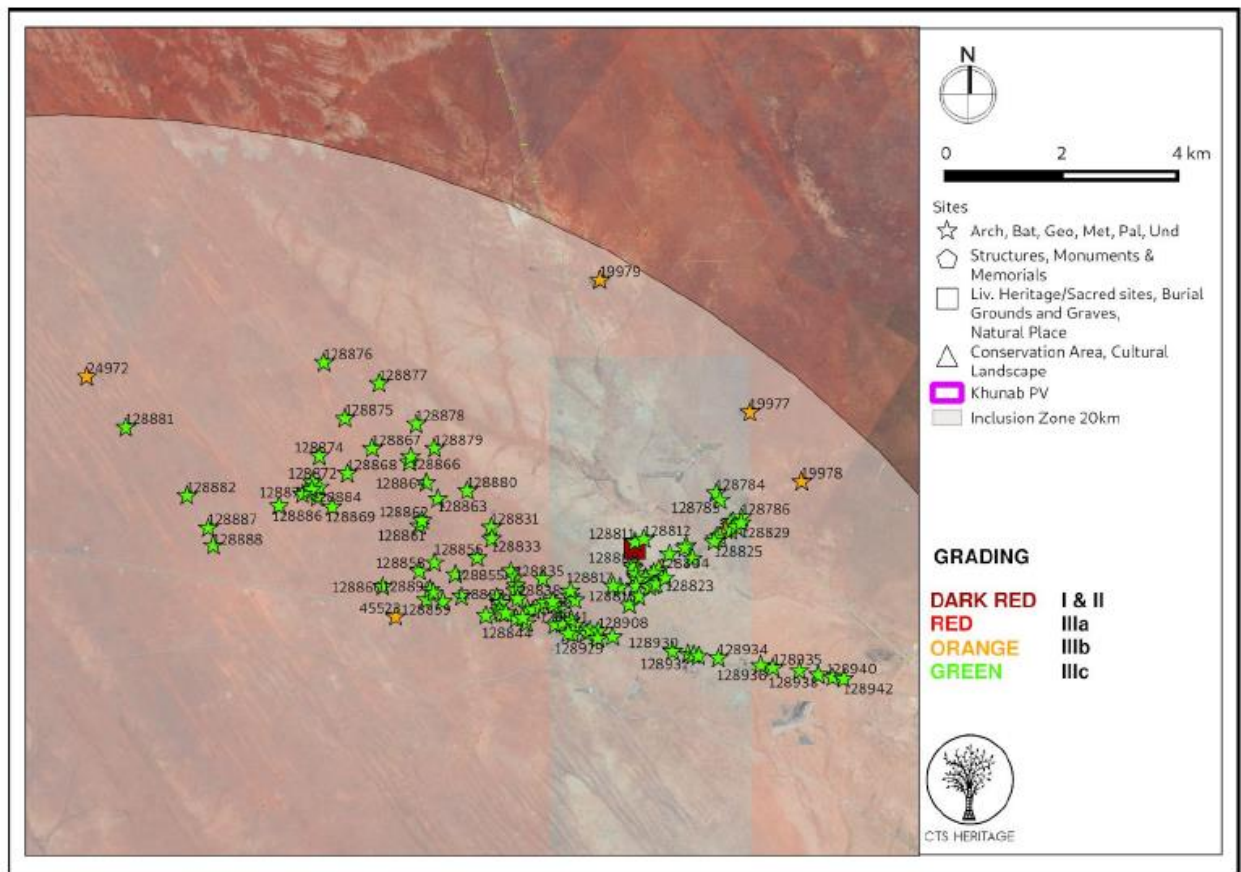


Figure 3a. Inset

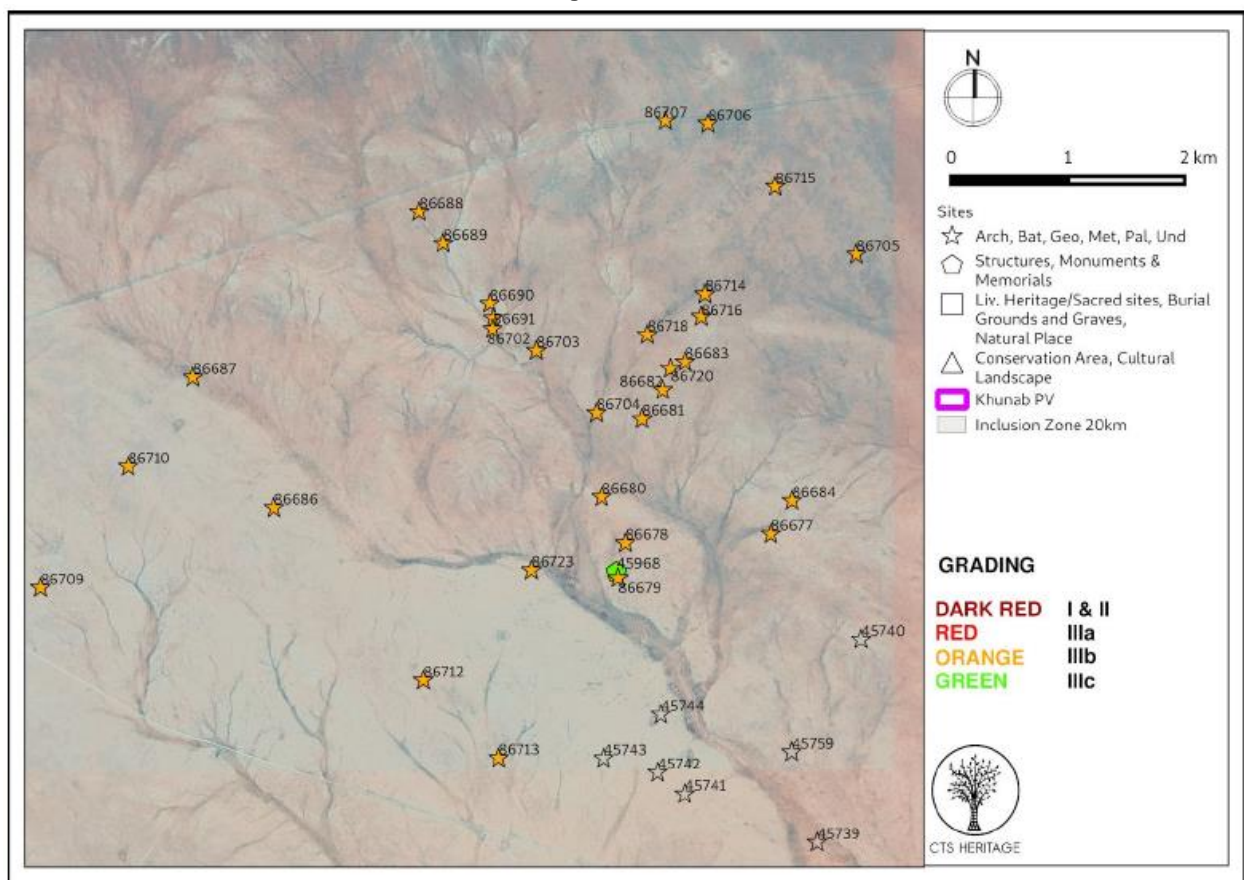


Figure 3b. Inset

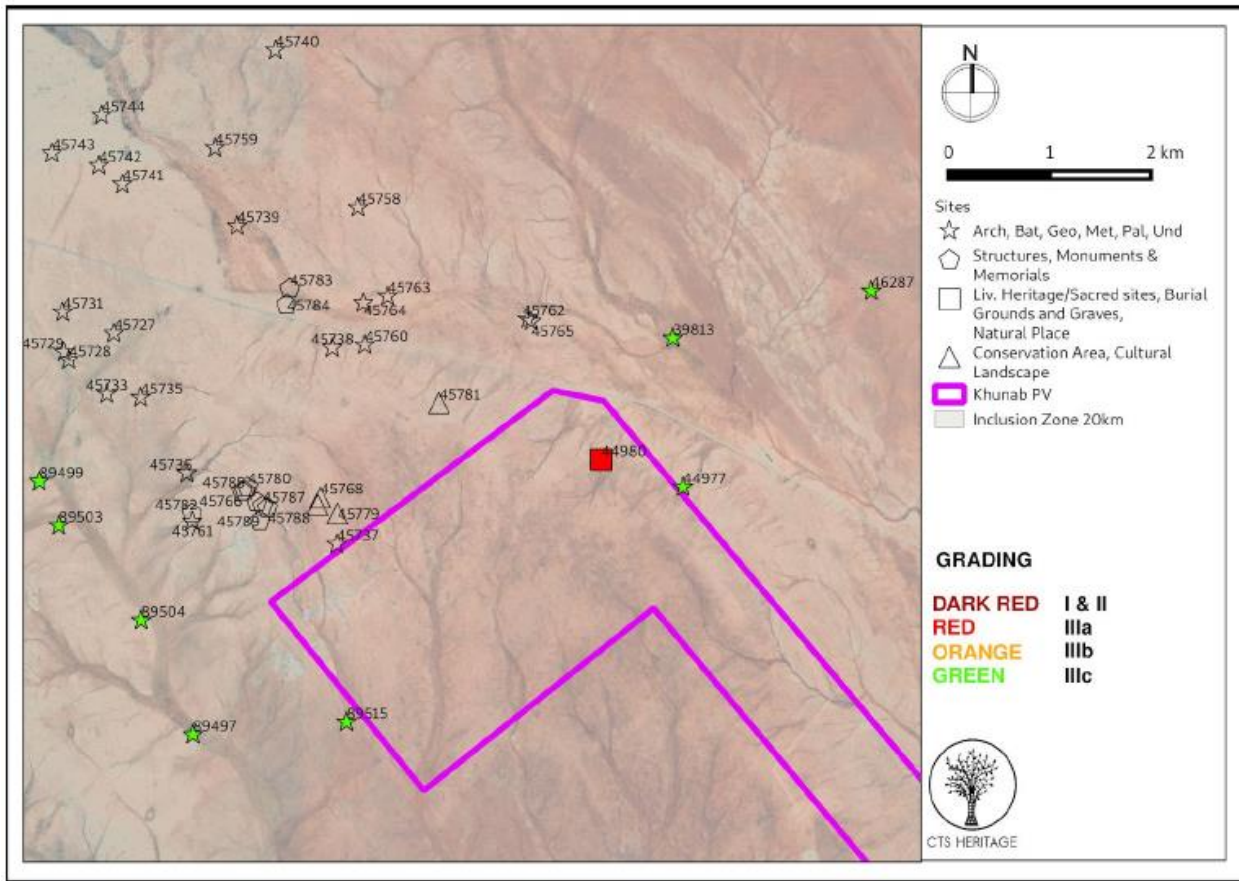


Figure 3c. Inset

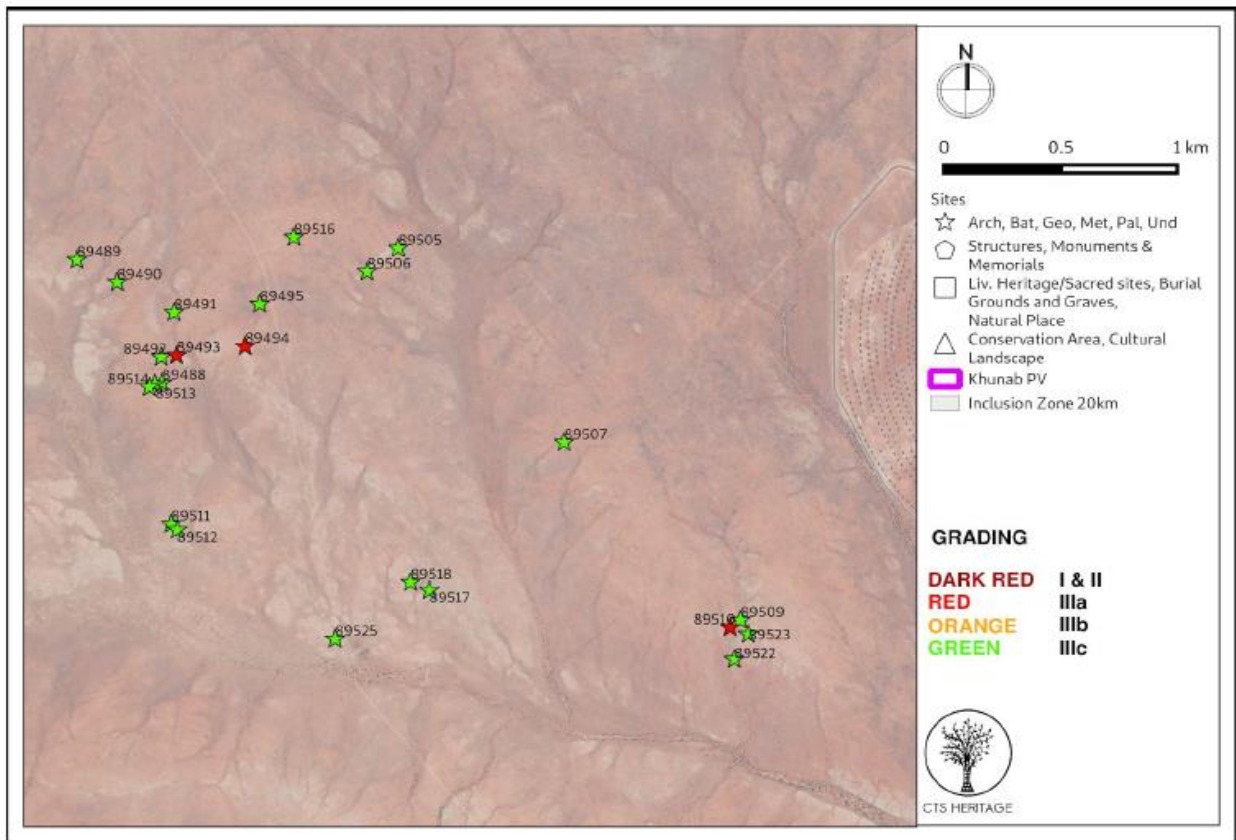


Figure 3d. Inset





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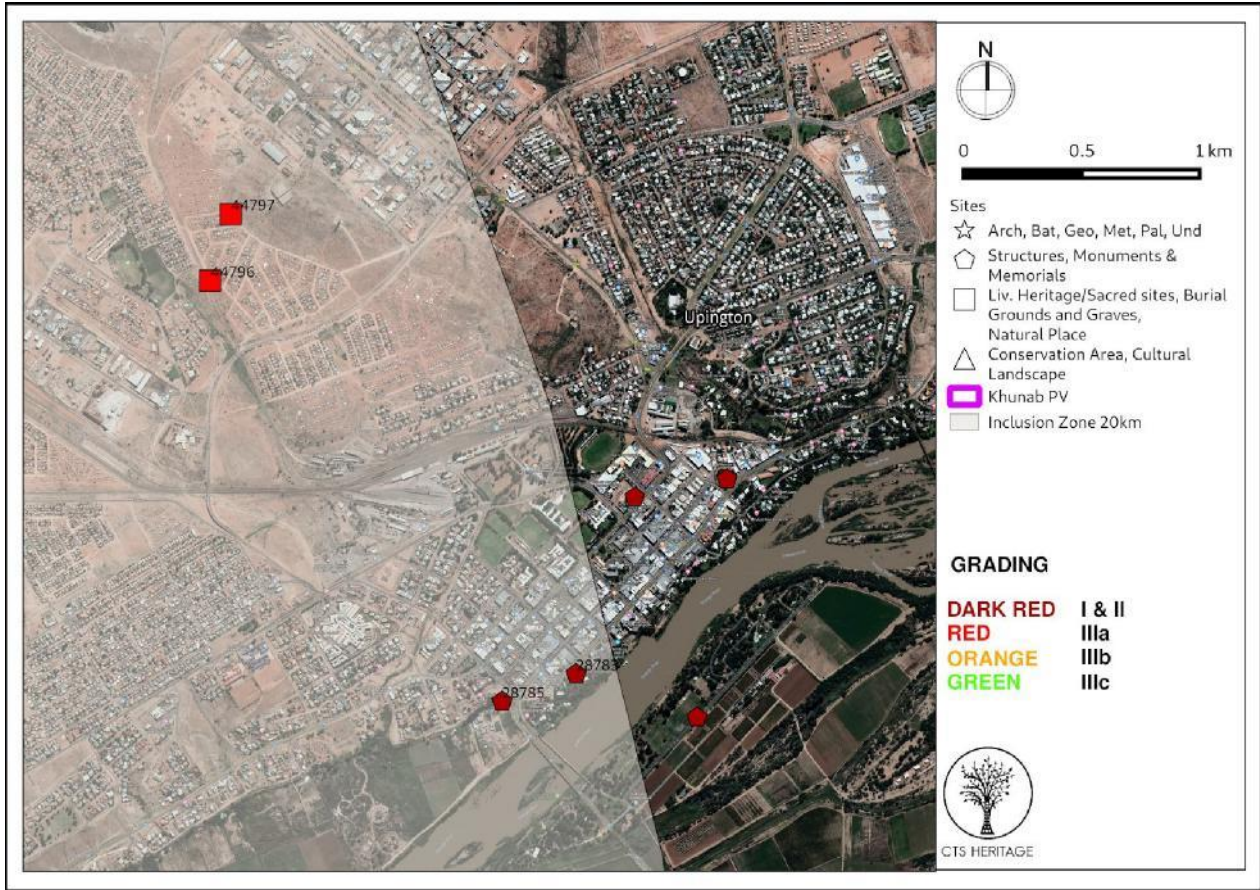


Figure 3e. Inset

#### 4. IDENTIFICATION OF HERITAGE RESOURCES

##### 4.1 Field Assessment

The archaeological field assessment covered the area proposed for development thoroughly. Stone Age and historical archaeological resources were identified within the area under consideration for the projects, however these are considered to be not conservation-worthy as they are widely scattered and have no associated contextual material.

Significant resources associated with the tungsten mining industry that was present in this area during the 1930's and 1940's (associated with WWII) were also identified. These have been graded IIIB as they have moderate local significance however most of the mining activities observed are located outside of the development footprints proposed for the projects.

The area assessed is by no means pristine as an existing overhead power line runs south of the area under consideration in the south-south-east from east to west. The footprint for the PV facilities is bounded by farm fences on the north and west, while in the south is the existing Khi Solar One CSP Plant, and the east with a gravel road (i.e Lutzputs Road) and open fields.

No formal or informal graves were identified within the development footprints of the proposed projects.





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Figure 4.1: Contextual Images from Klip Punt PV1 View from east to west, towards the existing Khi Solar One CSP Plant in the background



Figure 4.2: Contextual Images from Klip Punt PV1 View from east towards the south



Figure 4.3: Contextual Images from Klip Punt PV1 View from East towards the south-west





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Figure 4.4: Contextual Images from Klip Punt PV1 View from south-east towards north-west



Figure 4.5: Contextual Images from Klip Punt PV1 View from west towards the east on footprint



Figure 4.6: Contextual Images - View from the north towards the south





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Figure 4.7: Contextual Images of McTaggarts PV1 View from south to north



Figure 4.8: Contextual Images of McTaggarts PV2 View from north-east to south-west including remnants of previous tungsten mining in the north-western corner



Figure 4.9: Contextual Images of McTaggarts PV3 View from the north towards the south with the existing Khi Solar One CSP Plant in the background/horizon





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**Figure 4.10: Contextual Images from McTaggarts PV1 View from South-east towards the northwest along two track internal gravel road**



**Figure 4.11: Contextual Images of existing OHL's View from east towards the west**



**Figure 4.12: Contextual Images of existing OHL's View from north-east to south-west**



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## **PV Facilities**

A total of 26 occurrences of Stone Age archaeological material were recorded across the areas under consideration for the PV facilities, with the largest concentrations documented in the north-western corner of the northern section, and the western centre of the eastern section. These occurrences consist of isolated finds, and low-density ex-situ surface scatters containing predominantly of Middle Stone Age (MSA) material, with a few incidences of Early (ESA) and Later Stone Age (LSA) lithics. The majority of the raw material utilised for the lithics found is from Banded Ironstone Formation (BIF) and quartzite. Over 90% of the lithics recorded consist of flakes, cores, chunks and debris, with three hollow scrapers, two bifacial scrapers, a punch, and blades making up the remainder. Whether indicative of the original discard patterns, or subsequent displacement by erosion and animal activity, the material is too scattered to be connected to knapping sites, and no evidence of concurrent human occupation was found in association with the lithics. The identified archaeological materials are therefore of low significance, as the archaeological sample is small and without context, and therefore of little scientific value. These Stone Age heritage finds are considered not conservation-worthy. This means these sites have been sufficiently recorded and no further action is required.

Seven occurrences of archaeological surface material dating to the 19th and early 20th century were recorded. These include two Martini-Henry bullet casings dating between 1870 and the turn of the century. The area under consideration is well known for conflict between British forces and the Koranna people living on the Orange River islands. The region was also actively monitored by the Cape Colonial Police as from the 1890s, and military operation during the South African War (Anglo Boer War 1899- 1902). The spent cartridges, though exciting, are of little scientific value, as they are without context and only a small sample. These heritage finds are considered not conservation-worthy. This means these sites have been sufficiently recorded and no further action is required.

During the 1930s and 1940s extensive tungsten mining was done in support of the Second World War effort. Tungsten was used in the manufacturing of various weapons, ammunition and other industrial application. In the north-western area of the northern section of the area under consideration, numerous ruins, buildings and artefacts associated with the mining activities were recorded. Most of these buildings are located outside the proposed development footprints of the projects except for a square moulded concrete structure (storeroom or machine room) with vents, roof and single door/entrance, and a hexagonal building utilised as a safe bunker (magazine) for storing explosives. By the end of WWII in Southern Africa, the mining ceased, and the site, as well as the mining activities, were abandoned. Cultural material such as tins, ceramics, and other household material associated with the 1930-40 mining living quarters was documented. A 1940-50's IMCO lighter was also found. The mine and associated infrastructure are deemed as a unique and essential feature of local industrial history. The buildings are older than 60 years and are generally protected in terms of section 34 of the National Heritage Resources Act (Act 25 of 1999) (NHRA).

These heritage finds are graded IIIIB. These sites should be included in the heritage register and impacts to these resources must be avoided.

No formal or informal graves were identified within the development footprints of the proposed projects.



### Grid Connection Corridor

In the area impacted upon by the grid connection corridor, six occurrences of lithic material were recorded on the surface. These include chunks, flakes and a scraper made from Banded Ironstone Formation, and a dolomite core. The lithics are isolated and without archaeological context. They are of low significance and are considered not conservation-worthy. This means these sites have been sufficiently recorded and no further action is required.

Material associated with the early 20th century includes metal "oil" cans with locked, double-end seams. They could be related to mining activity in the area but are without context and therefore of low insignificance. These sites are considered not conservation-worthy. This means these sites have been sufficiently recorded and no further action is required.

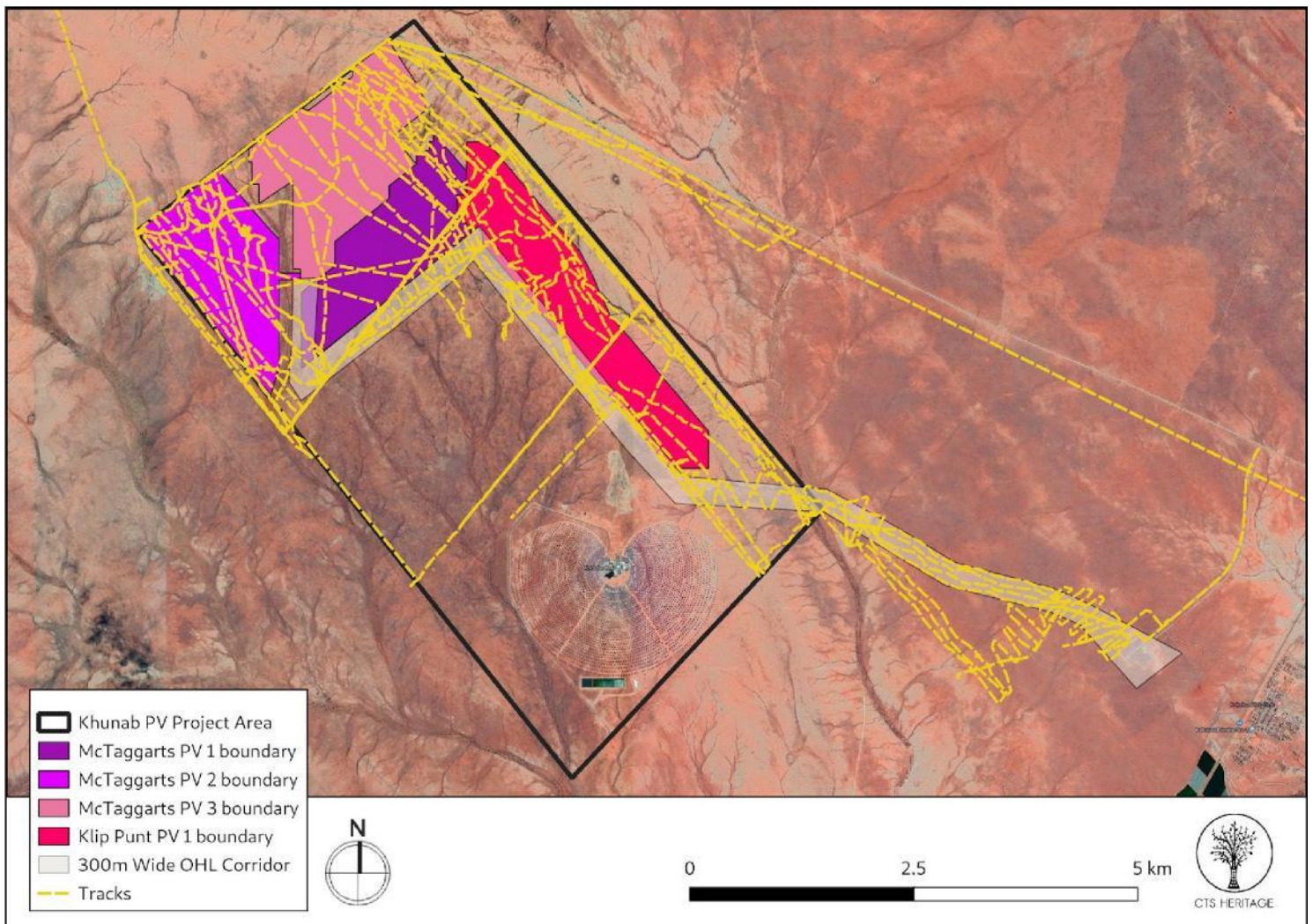


Figure 5: Overall track paths of foot survey



## 4.2 Archaeological Resources identified

**Table 1: Artefacts identified during the field assessment within the areas under consideration for the development of the proposed projects**

POINT ID	Site No	Site Name	Description	Co-ordinates		Grading	Mitigation
Pt 13	MTG 1/13	McTaggarts PV1	Empty/fired cartridge: Positively identified as Marthini Henry round.	28° 30' 36.770" S	21° 03' 02.473" E	NCW	None
Pt 14	MTG 2/14	McTaggarts PV1	Retouched flakes debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 47.058" S	21° 03' 27.211" E	NCW	None
Pt 33	MTG 1/33	McTaggarts PV1	Retouched flakes and bifacial scraper with debris. BIS. 4 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 08.502" S	21° 03' 34.816" E	NCW	None
Pt 9	MTG 1/9	McTaggarts PV1	Musket fired/empty cartridge (most probably Marthini Henry). Otherwise no context/random.	28° 30' 13.674" S	21° 03' 30.134" E	NCW	None
Pt 17	MTG 1/17	McTaggarts PV2	Cores, chips, chunks and flakes. BIS and quartzite. 12 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 59.887" S	21° 01' 48.921" E	NCW	None
Pt 18	MTG 1/18	McTaggarts PV2	Previous mining disturbances.	28° 30' 08.001" S	21° 01' 53.667" E	N/A	None
Pt 19	MTG 1/19	McTaggarts PV2	Previous mining disturbances.	28° 30' 10.784" S	21° 01' 48.667" E	N/A	None
Pt 20	MTG 1/20	McTaggarts PV2	Flakes debris. BIS. 3 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 01.071" S	21° 01' 44.567" E	NCW	None
Pt 21	MTG 1/21	McTaggarts PV2	Previous settlement. Square concrete moulded building (store room or machine room) with vents, roof and single door/entrance.	28° 29' 58.665" S	21° 01' 58.253" E	IIIB	No development within 50m boundary around structure. Retain in heritage register
Pt 22	MTG 1/22	McTaggarts PV2	Previous settlement. Hexagonal building. Bunker for safe keeping of mining explosives.	28° 29' 59.800" S	21° 01' 59.075" E	IIIB	No development within 50m boundary around structure. Retain in heritage register
Pt 23	MTG 1/23	McTaggarts PV2	Retouched flakes debris. BIS and quartzite. 6 per 100 m <sup>2</sup> . Surface scatter: no context. Located near historical ruins.	28° 29' 58.456" S	21° 01' 58.323" E	NCW	None
Pt 24	MTG 1/24	McTaggarts PV2	Various ceramics and metal objects associated with mining activities located near ruins.	28° 29' 58.266" S	21° 01' 58.507" E	NCW	None
Pt 25	MTG 1/25	McTaggarts PV2	Previous mining disturbances.	28° 30' 13.262" S	21° 01' 58.726" E	N/A	None
Pt 26	MTG 1/26	McTaggarts PV2	Retouched flakes debris. BIS. 4 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 58.456" S	21° 01' 58.323" E	NCW	None
Pt 27	MTG 1/27	McTaggarts PV2	Ruins associated with previous mining	28° 30' 12.182" S	21° 02' 07.892" E	IIIB	No



			activities. Probably living quarters.				mitigation necessary, but retain in heritage register
Pt 28	MTG 1/28	McTaggarts PV2	Various tins and domestic artifacts close to historical ruins.	28° 30' 12.886" S	21° 02'09.205" E	NCW	None
Pt 29	MTG 1/29	McTaggarts PV2	Flakes, hollow scraper and lithic punch. BIS and quartzite/dolomite. 4 per 100 m <sup>2</sup> . Surface scatter: no context. Located near ruins.	28° 30' 12.337" S	21° 02'09.854" E	NCW	None
Pt 30	MTG 1/30	McTaggarts PV2	Livestock feeding and drinking post.	28° 31' 01.259" S	21° 02'11.008" E	N/A	None
Pt 55	MTG 1/55	McTaggarts PV2	Previous mining disturbances. MSA	28° 30' 22.401" S	21° 01'40.196" E	N/A	None
Pt 15	MTG 2/15	McTaggarts PV3	Retouched flakes debris and one possible bifacial scraper. Quartzite and dolomite. 3 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 26.718" S	21° 03'06.504" E	NCW	None
Pt 1	MTG 2/ 1	Klip Punt PV1	Retouched flakes debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 45.391" S	21° 03'59.893" E	NCW	None
Pt 2	MTG 2/ 2	Klip Punt PV1	Core/chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 29' 53.838" S	21° 04'03.547" E	NCW	None
Pt 3	MTG 2/ 3	Klip Punt PV1	Fire lighter IMCO style, metal.	28° 30' 28.991" S	21° 04'23.668" E	NCW	None
Pt 32	MTG 2/32	Klip Punt PV1	Chunks debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 06.562" S	21° 04'19.819" E	NCW	None
Pt 34	MTG 2/34	Klip Punt PV1	Flakes and blade debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 31' 10.628" S	21° 04'42.233" E	NCW	None
Pt 4	MTG 2/4	Klip Punt PV1	Retouched flakes debris. BIS and quartzite. 4 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 36.730" S	21° 04'31.748" E	NCW	None
Pt 42	MTG 2/42	Klip Punt PV1	Retouched flakes, chips and hollow scraper debris. BIS and quartzite. 8 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 31' 20.894" S	21° 05'31.087" E	NCW	None
Pt 43	MTG 2/43	Klip Punt PV1	Retouched flakes debris. BIS and quartzite. 9 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 55.823" S	21° 05'02.979" E	NCW	None
Pt 5	MTG 2/5	Klip Punt PV1	Chips and retouched flakes, debris. BIS. 4 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 46.248" S	21° 04'37.063" E	NCW	None
Pt 6	MTG 2/6	Klip Punt PV1	Flakes and chips debris. 3 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 28.939" S	21° 04'15.190" E	NCW	None
Pt 7	MTG 2/7	Klip Punt PV1	European industrial ware ceramics: banded. In context with previous mining activities and settlement.	28° 30' 29.016" S	21° 04'15.447" E	NCW	None
Pt 8	MTG 2/8	Klip Punt PV1	Previous mining disturbances.	28° 30' 37.390" S	21° 04'11.725" E	NCW	None
Pt 44	MTG 4/44	Outside Footprint	Ruins associated with mining activities	28° 30' 06.401" S	21° 01'22.493" E	IIIB	No mitigation necessary, but retain in heritage register
Pt 56	MTG 4/56	Outside Footprint	Mining houses/ruins. Ruins are associated with mining previous activities	28° 29' 59.258" S	21° 01'28.953" E	IIIB	No mitigation necessary, but retain in



							heritage register
Pt 57	MTG 4/57	<b>Outside Footprint</b>	Dry stonewall house/ruin associated with previous mining activities	28° 29' 45.141" S	21° 01' 13.291" E	IIIB	<b>No mitigation necessary, but retain in heritage register</b>
Pt 43	MTG 2/43	<b>Outside Footprint</b>	Retouched flakes debris. BIS and quartzite. 9 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 30' 55.823" S	21° 05' 02.979" E	NCW	None
Pt 40	MTG 2/40	<b>Outside Footprint</b>	Chunks and flakes debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no context.	28° 32' 16.544" S	21° 04' 52.750" E	NCW	None
Pt 1	MTG 2/1	<b>Outside Footprint</b>	Retouched flakes debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 29' 45.391" S	21° 03' 59.893" E	NCW	None
Pt 2	MTG 2/2	<b>Outside Footprint</b>	Core/chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 29' 53.838" S	21° 04' 03.547" E	NCW	None
Pt 31	MTG 2/31	<b>Outside Footprint</b>	Retouched flakes debris. BIS. 5 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 29' 09.920" S	21° 03' 22.523" E	NCW	None
Pt 32	MTG 2/32	<b>Outside Footprint</b>	Chunks debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 30' 06.562" S	21° 04' 19.819" E	NCW	None
Pt 42	MTG 2/42	<b>Outside Footprint</b>	Retouched flakes, chips and hollow scraper debris. BIS and quartzite. 8 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 31' 20.894" S	21° 05' 31.087" E	NCW	None
UP09	Upington 09	<b>Outside Footprint</b>	Possible Grave Site ( <i>mapped incorrectly</i> on SAHRIS - actually nowhere near the Khunab Solar Development footprint - Site SIF1 002 in Gaigher 2012, SAHRIS Site ID 44980)	28° 29' 25.645" S	21° 3' 24.0156" E	IIIA	<b>No mitigation necessary</b>

**Table 2: Artefacts identified during the field assessment within the powerline area**

POINT ID	Site No	Site Name	Description	Co-ordinates		Grading	Mitigation
Pt 35	MTG 3/35	<b>OHL Corridor</b>	Core, retouched flakes debris and one hollow scraper. BIS and quartzite. 4 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 42.795" S	21° 05' 12.752" E	NCW	None
Pt 36	MTG 3/36	<b>OHL Corridor</b>	Existing OHL running through south-eastern part of the footprint McTaggart's Camp 2. Orientation: north-west to south-east	28° 31' 50.094" S	21° 05' 17.933" E	N/A	None
Pt 37	MTG 2/37	<b>OHL Corridor</b>	Retouched flakes debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 55.026" S	21° 05' 22.778" E	NCW	None
Pt 38	MTG 2/38	<b>OHL Corridor</b>	Chips, chunks and retouched flakes, debris. BIS and quartzite. 12 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 32' 11.545" S	21° 05' 38.581" E	NCW	None
Pt 39	MTG 2/39	<b>OHL Corridor</b>	Retouched flakes debris and one hollow scraper. BIS and quartzite. 6 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 32' 13.004" S	21° 05' 41.401" E	NCW	None
Pt 41	MTG 3/41	<b>OHL Corridor</b>	Retouched flakes and chunks debris. BIS and quartzite. 5 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 43.477" S	21° 05' 37.534" E	NCW	None
Pt 42	MTG 2/42	<b>OHL Corridor</b>	Retouched flakes, chips and hollow scraper	28° 31' 20.894" S	21° 05' 31.087" E	NCW	None





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			debris. BIS and quartzite. 8 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA				
Pt 45	MTG 3/45	<b>OHL Corridor</b>	Existing Eskom Sub-Station Serving Khunab Solar Development	28° 32' 39.989" S	21° 08' 10.172" E	N/A	None
Pt 46	MTG 3/46	<b>OHL Corridor</b>	Disturbed area: site office/camp for contractors building OHL's	28° 32' 37.045" S	21° 08' 10.888" E	N/A	None
Pt 48	MTG 3/48	<b>OHL Corridor</b>	Retouched chunks debris. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 53.511" S	21° 06' 18.428" E	NCW	None
Pt 50	MTG 3/50	<b>OHL Corridor</b>	Retouched chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 58.188" S	21° 06' 27.123" E	NCW	None
Pt 51	MTG 3/51	<b>OHL Corridor</b>	Retouched dolomite core. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 13.477" S	21° 07' 04.801" E	NCW	None
Pt 52	MTG 3/52	<b>OHL Corridor</b>	Hand soldered oil tin. Probably in context with mining or agricultural activities. MSA	28° 32' 17.284" S	21° 07' 02.702" E	NCW	None
Pt 53	MTG 3/53	<b>OHL Corridor</b>	Hand soldered tin. Probably in context with mining or agricultural activities. Colonial	28° 31' 48.400" S	21° 05' 34.875" E	NCW	None
Pt 54	MTG 2/54	<b>OHL Corridor</b>	Bifacial scraper. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 13.477" S	21° 07' 04.801" E	NCW	None
Pt 10	MTG 1/10	<b>OHL Corridor</b>	Core, hollow scraper, flakes and chips debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 30' 27.376" S	21° 03' 22.911" E	NCW	None
Pt 11	MTG 1/11	<b>OHL Corridor</b>	Flakes debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 31' 05.807" S	21° 02' 33.875" E	NCW	None
Pt 12	MTG 1/12	<b>OHL Corridor</b>	Machine soldered square fish tin. Probably associated with mining activities. Colonial	28° 31' 05.878" S	21° 02' 33.730" E	NCW	None
Pt 13	MTG 1/13	<b>OHL Corridor</b>	Empty/fired cartridge: Positively identified as Marthini Henry round. Colonial	28° 30' 36.770" S	21° 03' 02.473" E	NCW	None
Pt 34	MTG 2/34	<b>OHL Corridor</b>	Flakes and blade debris. BIS and quartzite. 3 per 100 m <sup>2</sup> . Surface scatter: no context. MSA and LSA	28° 31' 10.628" S	21° 04' 42.233" E	NCW	None
Pt 47	MTG 3/47	<b>OHL Corridor</b>	Retouched chunks debris. BIS. 2 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 43.786" S	21° 07' 09.152" E	NCW	None
Pt 49	MTG 3/49	<b>OHL Corridor</b>	Retouched chunk. BIS. 1 per 100 m <sup>2</sup> . Surface scatter: no context. MSA	28° 32' 16.240" S	21° 06' 35.009" E	NCW	None





### 4.3 Selected photographic record

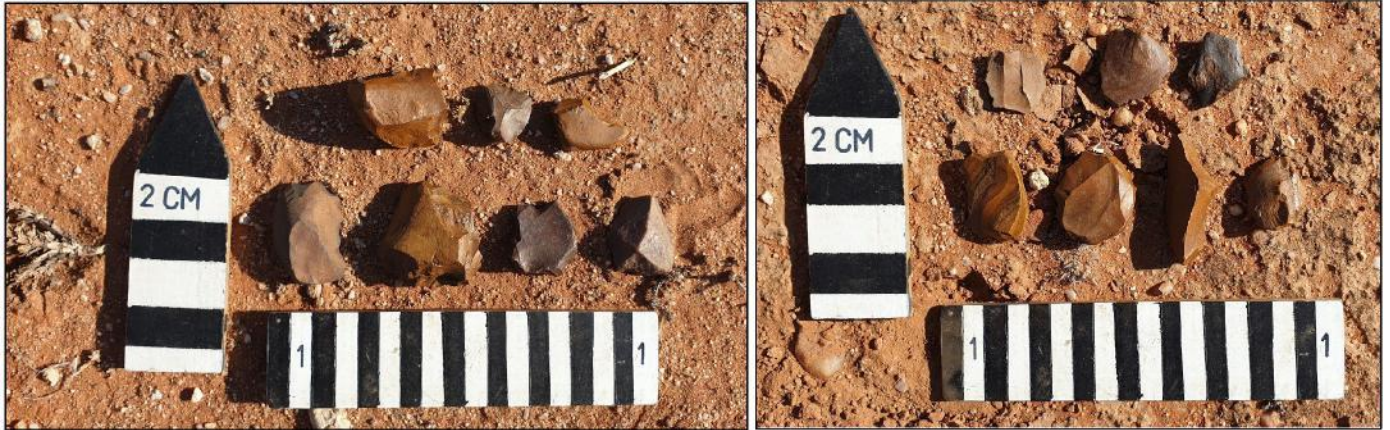


Figure 6.1 and 6.2 MSA Artefacts



Figure 6.3 Ruins associated with tungsten mining, possible workers living quarters (Pt 27)



Figure 6.4 Remnants of bunker used for storage of explosives used during mining of tungsten (Pt 22)





Figure 6.5 Evidence of previous Tungsten Mining in the area under consideration



Figure 6.6 Housing ruins associated with the Tungsten mining

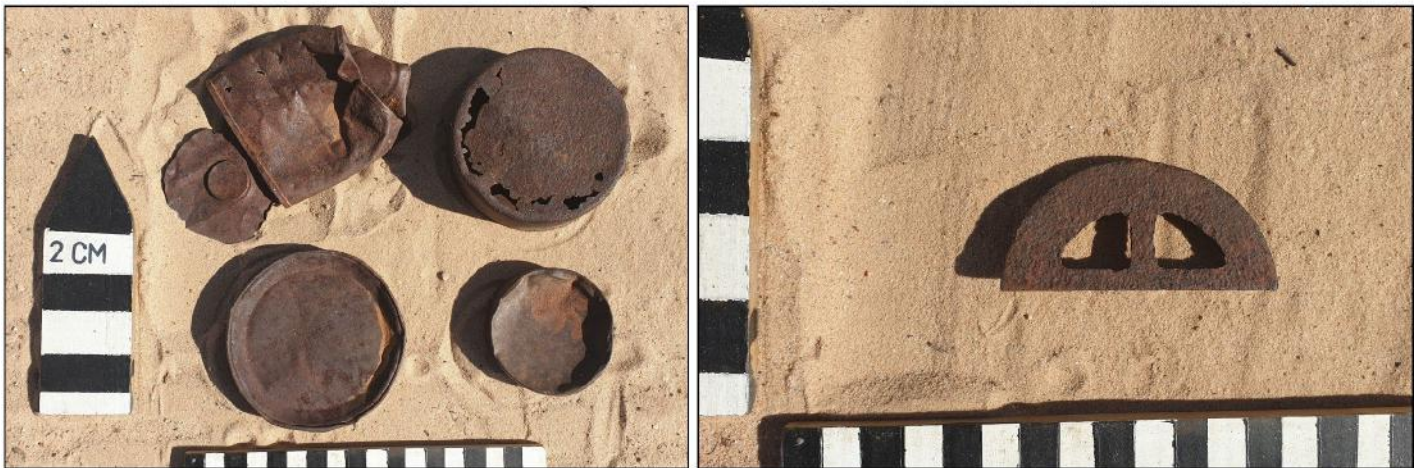


Figure 6.7 Metal fire lighter (IMCO type) dated 1940's to 1950's (Pt 3) and Figure 6.8 Marthini Henry Cartridge

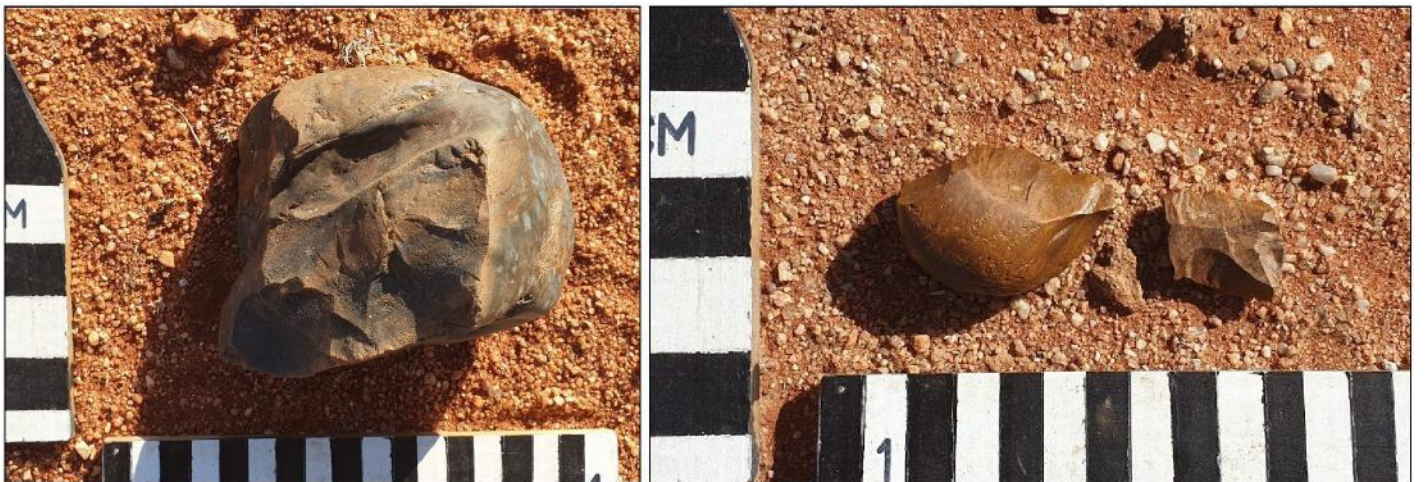




Figure 6.9 and 6.10 Domestic artefacts associated with ruins



Figures 6.11 and 6.12 Domestic artefacts associated with ruins



Figures 6.13 and 6.14 ESA and MSA Artefacts





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Figures 6.15 Store room or machine room associated with the historic tungsten mine (Pt 21)



Figures 6.16 Store room or machine room associated with the historic tungsten mine (Pt 21)



## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

### 5.1 Assessment of impact to Archaeological Resources

The proposed development will have a negative impact on the heritage resources identified within the Khunab Solar Development footprint. The lithic and historic material identified is of low significance (not conservation-worthy), and even though the resources may be destroyed during the construction, the impact is inconsequential. No mitigation is required.

Some of the remnants of the heritage resources that have been graded IIIB and are associated with the historic tungsten mine infrastructure fall within the development area of McTaggart's PV2. These heritage resources may not be impacted and a 50m no-go buffer is recommended around these sites (Pt 21 and Pt 22). Pt 27 has also been graded IIIB and must be placed on the heritage register.

The proposed development will not have a negative impact on the heritage resources situated in the grid connection corridor. The lithic and historic material identified is of low significance, and even though the resources may be destroyed during the construction, the impact is inconsequential.

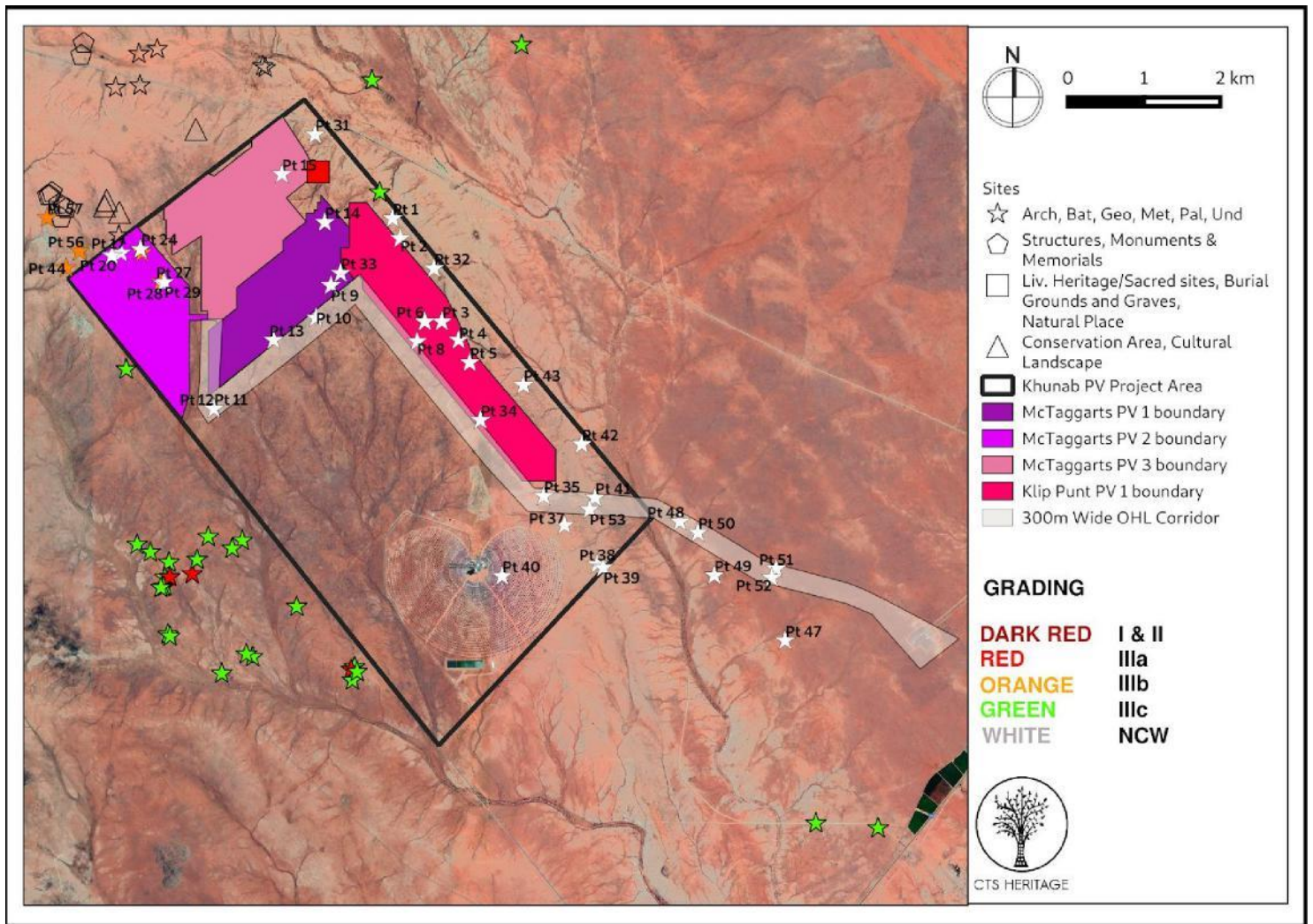


Figure 7: Map of heritage resources identified during the field assessment relative to the proposed development





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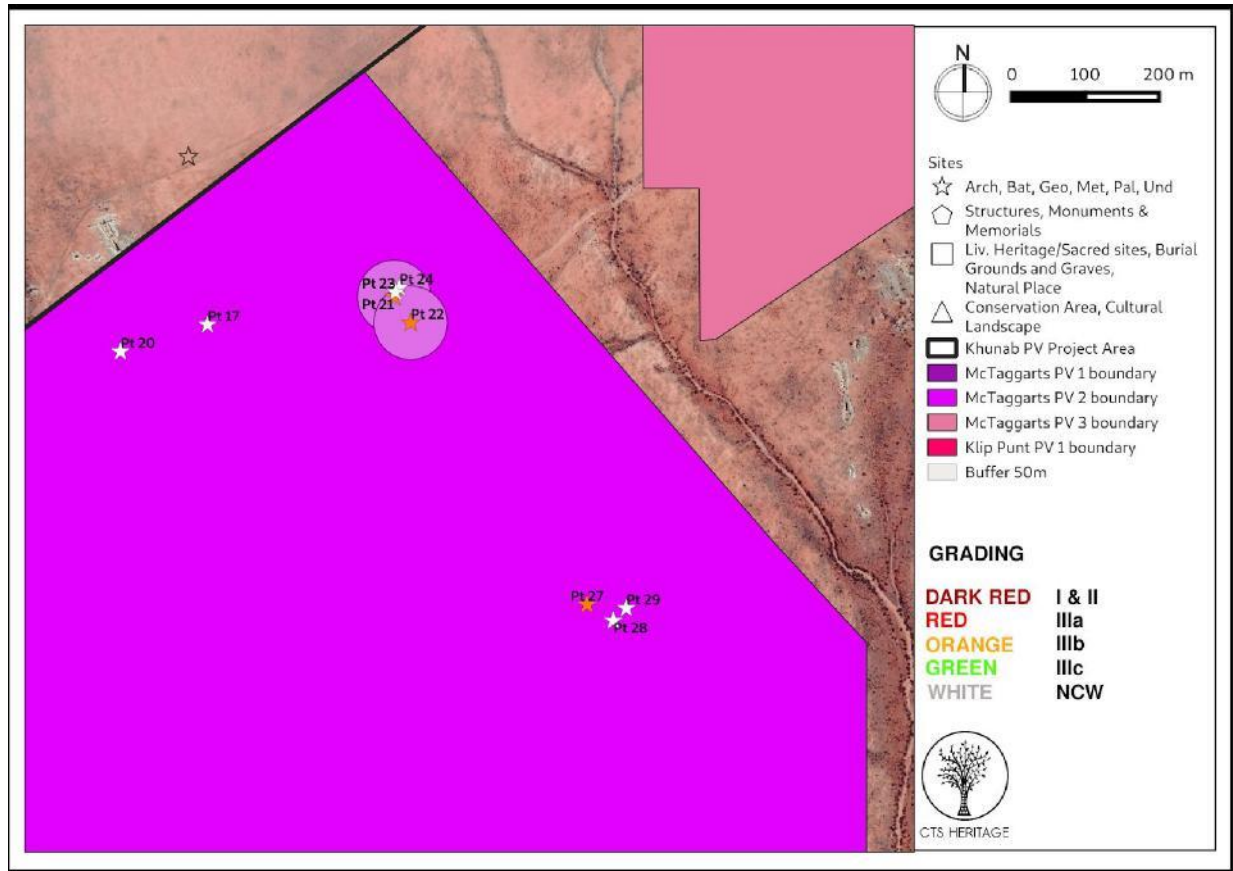


Figure 7.1: Map of Grade IIIB heritage resources within McTaggart's PV2 indicating the recommended buffer area of 50m

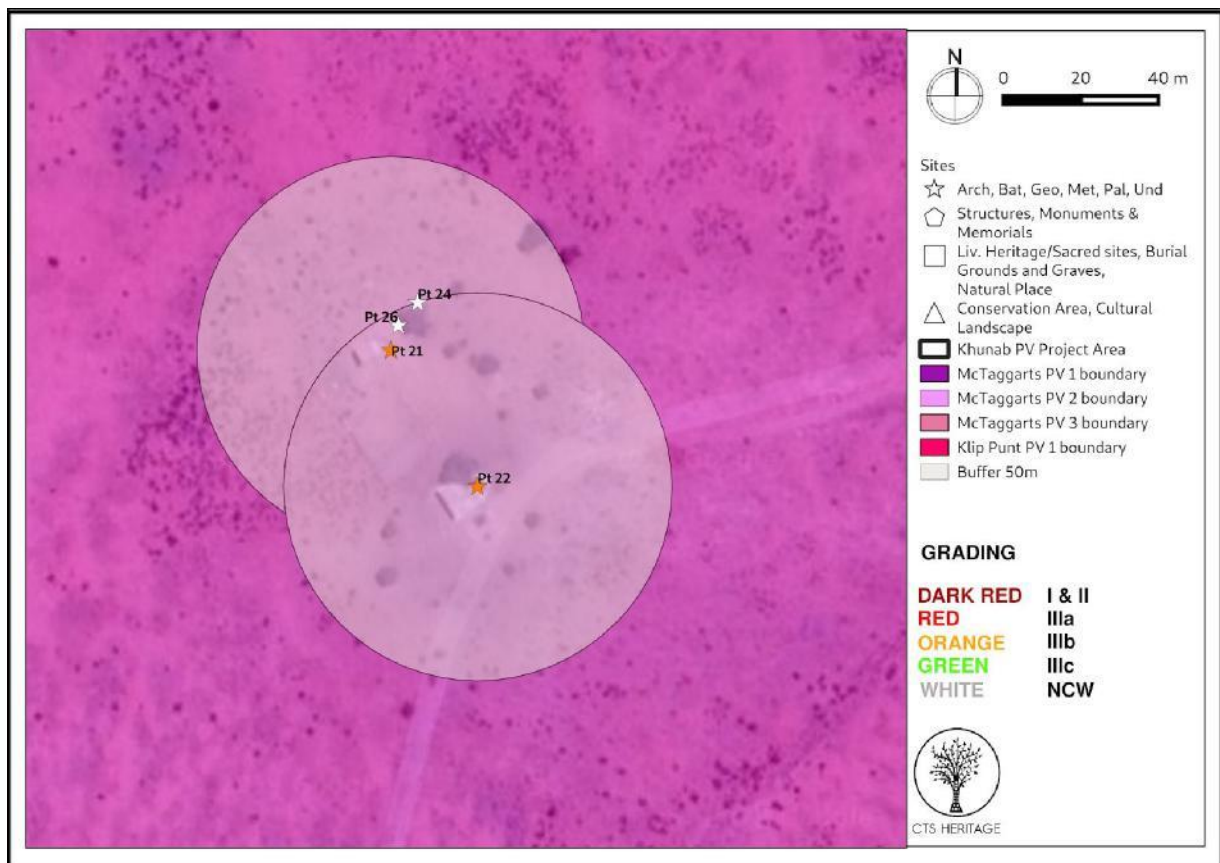


Figure 7.2: Map of Grade IIIB heritage resources within McTaggart's PV2 indicating recommended buffer area of 50m (Pt 21 and 22)



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## 6. CONCLUSION AND RECOMMENDATIONS

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits.

- In the eastern section of the Khunab Solar Development footprint, no significant heritage resources were identified. In addition, in the grid connection corridor for the Khunab Solar Grid Connection no significant heritage resources were identified. Therefore, no further mitigation is required, and from a heritage point of view, there is no objection to the proposed developments in the assessed areas.
- In the northern section (McTaggart PV2) of the Khunab Solar Development, heritage resources of medium to high significance were identified which fall within the proposed development area (Pt 21, 22 and 27). The remnants of the 1930-40s tungsten mine is located inside and adjacent to the development footprint and should not be impacted by the proposed development. It is recommended that a no-go buffer of 50 m from the edge of each site extent (Pt 21 and 22) be implemented, and that Pt 27 be recorded on the Heritage Register.
- If it is not possible to avoid these sites (Pt 21 and 22), it is recommended that these sites be fully mitigated through detailed archaeological excavation conducted by a qualified archaeologist. A permit in terms of section 35 of the NHRA and Chapter II and IV of the NHRA Regulations must be applied for from SAHRA via SAHRIS before construction.
- The sites that have been graded as IIIB should be placed on the heritage register in terms of section 30 of the National Heritage Resources Act.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist must be contracted as soon as possible to inspect the findings. A Phase 2 rescue excavation operation may be required subject to permits issued by SAHRA



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## 7. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
4103	AIA	Cobus Dreyer	10/03/2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape
4112	AIA	Peter Beaumont	29/01/2008	Phase 1 Heritage Impact Assessment Report on a Portion of the Farm Keboes 37, near Kanoneiland, Siyanda District Municipality, Northern Cape Province
4123	AIA	Peter Beaumont	01/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Residential Development Flanking Dakota Drive in Upington, //Khara Hais Municipality, Northern Cape Province
4101	AIA	Peter Beaumont	22/10/2005	Archaeological Impact Assessment at and in the Vicinity of a Quartzite Quarry on Portion 4 of the Farm Droogehout 442 near Upington
4135	AIA	Peter Beaumont	20/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Raaswater Township, Siyanda District Municipality, Northern Cape Province
4136	AIA	Peter Beaumont	22/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of Kalksloot Settlement, Siyanda District Municipality, Northern Cape
7547	AIA	Jaco van der Walt	30/10/2011	AIA for the proposed OfriZX Photovoltaic Plant, Keimoes, Northern Cape
7548	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed Ofir ZX Photovoltaic Plant near Keimoes, Northern Cape
4124	AIA	Peter Beaumont	24/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Settlement in Upington, //Khara Hais Municipality, Northern Cape Province
4131	AIA	Peter Beaumont	18/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Keimoesweg, //Khara Hais Municipality, Northern Cape Province
4133	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Lemoendraai in Upington, //Khara Hais Municipality, Northern Cape Province
4134	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Industrial Area Expansion at Laboria, //Khara Hais Municipality, Northern Cape Province
119309	HIA	Stephan Gaigher	10/10/2012	HERITAGE IMPACT ASSESSMENT REPORT Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
124405	HIA	Stephan Gaigher	29/10/2013	Heritage Impact Assessment Report for the Proposed Sirius Solar Project near Upington in the Northern Cape Province
124406	PIA	JF Durand	02/04/2013	Palaeontology Scoping Report
128281	HIA	David Morris	30/07/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Scoping phase Heritage Input
7841	AIA	Peter Beaumont	17/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Township, //Khara Hais Municipality, Northern Cape Province
7853	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed S Kol Photovoltaic Plant near Keimoes, Northern Cape
7925	AIA	Jaco van der Walt	31/10/2011	AIA for the proposed S-Kol Photovoltaic Plant, Keimoes, Northern Cape
117902	HIA	Anton van	25/05/2012	A REPORT ON A HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED SASOL CSP



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		Vollenhoven		PROJECT NEAR UPINGTON IN THE NORTHERN CAPE PROVINCE
131589	AIA	Stephan Gaigher	22/02/2013	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
159203	HIA	Johnny Van Schalkwyk	11/03/2014	Cultural Heritage Impact Assessment Proposed Township development of Erf 1, UPINGTON, //KHARA HAIS MUNICIPALITY
160008	HIA	Johnny Van Schalkwyk	15/03/2014	Cultural Heritage Impact Assessment for the proposed township development, Paballelo, Upington, //Khara Hais Municipality
161427	HIA	Stephan Gaigher	15/04/2014	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
166079	HIA	Johnny Van Schalkwyk	12/03/2014	Proposed extension of Dakota Road, Upington
158920	HIA	David Morris	01/02/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Archaeological Impact Assessment proposed central development footprint
159068	PIA	John E Almond	07/03/2014	PALAEONTOLOGICAL HERITAGE BASIC ASSESSMENT: DESKTOP STUDY Proposed RE Capital 3 Solar Development on the property Dyason's Klip near Upington , Northern Cape
174596	PIA	John E Almond	05/08/2013	RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES: PROPOSED UPGRADE & REPAIR OF WATER SUPPLY INFRASTRUCTURE, EKSTEENSKUIL, SOVERBY & CURRIESKAMP NEAR KEIMOOES, NORTHERN CAPE
289187	HIA	Jaco van der Walt	01/06/2015	Heritage Scoping Report for the proposed Bloemsmond Solar 1 and Solar 2 PV Project, Keimoes, NC Province
170520	HIA	Johnny Van Schalkwyk	01/01/2014	Heritage Impact Assessment Report for the proposed 1GW Upington Solar Park within the // Khara Hais Municipality, Northern Cape Province
174335	HIA	Wouter Fourie	24/03/2014	Heritage Impact Assessment for the proposed Solar Power Park for SolarReserve SA (Pty) Ltd, Farm Rooipunt 617, Gordonia RD, Siyanda District Municipal Region, Northern Cape.
174592	HIA	Cobus Dreyer	05/09/2013	FIRST PHASE ARCHAEOLOGICAL & HERITAGE ASSESSMENT OF THE BORROW PITS FOR THE REPAIR & UPGRADE OF THE IRRIGATION INFRASTRUCTURE AT SOVERBY & CURRIESKAMP NEAR KEIMOOES, NORTHERN CAPE PROVINCE







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## APPENDIX 2: Palaeontological Assessment

# **Palaeontological Impact Assessment for the proposed development of the Khunab Solar Development and the Khunab Solar Grid Connection to the west of Upington, Northwest Province**

**Desktop Study**

**For**

**CTS Heritage and Savannah**

**20 June 2019**

**Prof Marion Bamford**  
Palaeobotanist  
P Bag 652, WITS 2050  
Johannesburg, South Africa  
[Marion.bamford@wits.ac.za](mailto:Marion.bamford@wits.ac.za)

## **Expertise of Specialist**

The Palaeontologist Consultant is: Prof Marion Bamford  
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf  
Experience: 30 years research; 22 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 Khunab Solar Development and Khunab Solar Grid Connection that will comprise the construction and operation of four Solar Energy Facilities and two associated grid solutions to the west of Upington. The project will be on portions of the Farms Klip Punt 452 and McTaggarts camp 453. To comply with 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 (PV facilities, infrastructure and powerline corridors) lies on the red aeolian and alluvial sands of the Quaternary Gordonia Formation, Kalahari Group, that are underlain by other Kalahari Group sediments, probably calcretes. Fossils are not preserved in loose sands but can occur in palaeo-pans and palaeo-channels from past rivers. None has been recorded in this footprint and are not evident from the geological maps or Google-Earth imagery. The area is indicated as moderately sensitive on the SAHRIS map but this seems unlikely. Nonetheless a Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no palaeontological site visit is required unless fossils are discovered when excavations commence. As far as the palaeontology is concerned there is no preferred alternative route.

## Table of Contents

Expertise of Specialist .....	1
Declaration of Independence .....	1
1. Background .....	4
2. Methods and Terms of Reference.....	6
i. Project location and geological context.....	7
ii. Palaeontological context .....	8
4. Impact assessment .....	10
5. Assumptions and uncertainties .....	11
6. Recommendation .....	11
7. References .....	12
8. Chance Find Protocol .....	13
Appendix A (examples of fossils .....	14
Appendix B (short CV of specialist) .....	15

# 1. Background

A Palaeontological Impact Assessment was requested for the proposed construction of four Photovoltaic facilities, west of Upington, the Khunab Solar Development and associated overhead powerline (OHP) project (Khunab Solar Grid Connection). The project will be on central portions of Farms Klip Punt 452 and McTaggarts Camp 453 (Figure 1).

The developer is proposing the construction and operation of four Solar Energy Facilities and two associated grid solutions on a site located within the Upington REDZ, close to and south west of Upington in the Northern Cape. Each proposed solar energy project is proposed to be 75MW in capacity. Each facility will consist of an on-site substation and a 132kV power line. The 132kV power line associated with each facility will connect to a proposed collector substation and an associated 400kV power line which will connect the four PV facilities to the national grid. The power lines associated with the facilities and the collector substation will be assessed as part of a 300m power line corridor (two alternatives are proposed) and as part of two separate basic assessment processes.

The location of the project site within a REDZ and Power Corridor makes it possible to undertake Basic Assessment (BAR) processes for the projects in support of the application for authorisation. Separate applications for Authorisation are to be made for each solar energy facility and for each grid connection solution (i.e. collector substation and 400kV power line).

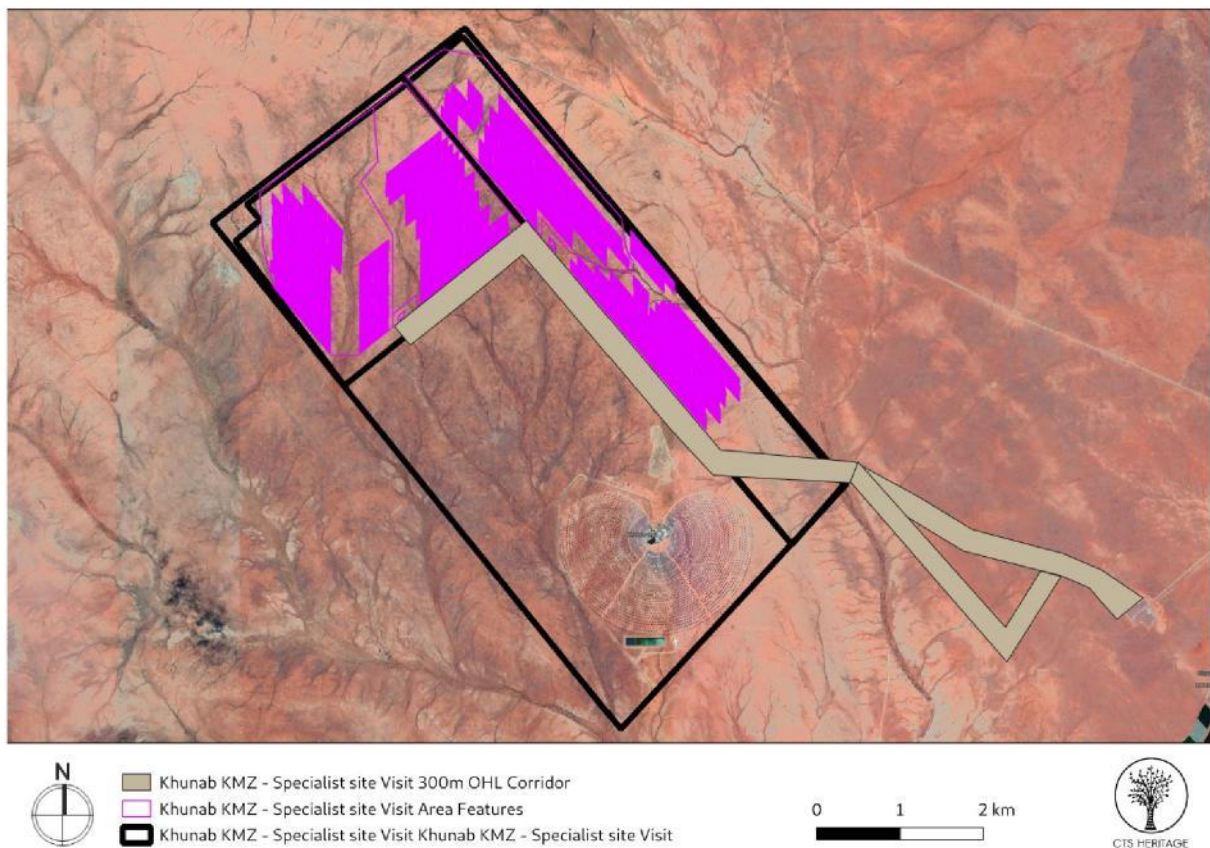
To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development of the PV facilities as well as the powerlines.

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

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
ai	Details of the specialist who prepared the report	Appendix B
a ii	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 1
ci	An indication of the quality and age of the base data used for the specialist report:	Yes



	SAHRIS palaeosensitivity map accessed – date of this report	
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 2
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 5
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 4
k	Any mitigation measures for inclusion in the EMPr	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	Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
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	N/A
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 Khunab Solar Development and Khunab Solar Grid Connection to the west south west of Upington on portions of Farms Klip Punt 452 and McTaggart's Camp 453. Map supplied by CTS Heritage.**

## 2. 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*).

### 3. Geology and Palaeontology

#### i. Project location and geological context

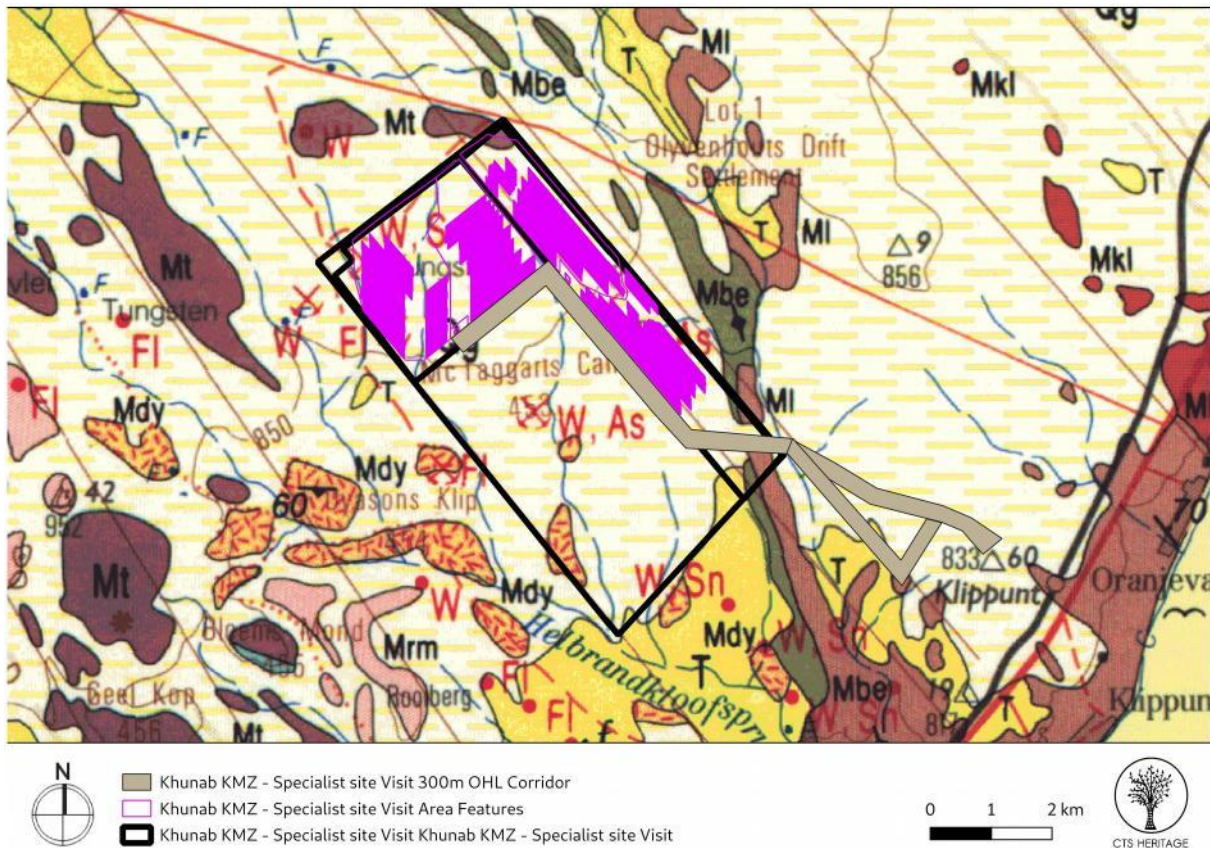


Figure 2: Geological map of the area around the proposed for the Khunab Solar Development. The location of the proposed project is indicated within the lilac colour and the overhead powerline corridors in grey. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 1984.

Table 2: Explanation of symbols for the geological map and approximate ages (Cornell et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation. Ma = million years. Grey shading = potentially fossiliferous lithology in the project footprint.

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Gordonia Fm, Kalahari Group	Red-brown alluvial and aeolian sands	Last 2.5 Ma
T	Tertiary	Calcrete	Last 65 Ma
MI	Louisvale Granite, Keimos Suite, Natal-Namaqua Province	Light-grey moderately to well foliated granite	Ca 1000 Ma
Mbe	Bethesda Fm, Areachap Sequence, Natal-Namaqua Province	Migmatitic, biotite-rich and aluminous gneisses	1200 – 1000 Ma
Mt	Toeslaan Fm, Biesjepoort Group, Korannaland Sequence, Natal - Namaqua Province	Kinzigite, politic gneisses, biotite gneiss, leucocratic paragneisses	1200 – 1000 Ma



The Namaqua sector of the Namaqua-Natal Province is the geological setting of the region around Upington. These are igneous and metamorphic rocks that were formed or metamorphosed during the Namaqua Orogeny approximately 1200 – 1000 million years ago. The Namaqua-Natal Province has been divided into a number of tectonostratigraphic terranes based on common rock types and bounded by shear zones. There have also been some mafic or ultramafic intrusions into the terranes. Upington falls in the Areachap terrane and is bounded to the northeast by the Brakbosch-Trooilaspan Shear Zone and to the southwest by the Boven Rugzeer Shear Zone (Cornell et al., 2006).

There are scattered outcrops of the intrusive Louisvale Granites, Bethesda Formation gneisses and Toeslaan Formation Gneisses (Figure 2). Apart from the age of these rocks pre-dating body fossils, these are all volcanic rocks and have been metamorphosed, so they do not preserve any fossils. They will not be considered any further.

Overlying these complex ancient rocks are much younger sediments of the Tertiary and Quaternary, in particular calcretes that indicate drying out of the surface, and alluvial and aeolian sands of the Gordonia Formation.

## ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 3. The proposed site for the Khunab Solar Development and Khunab Solar Grid Connection lie on the alluvial and aeolian sands of the Gordonia Formation that is Quaternary in age.

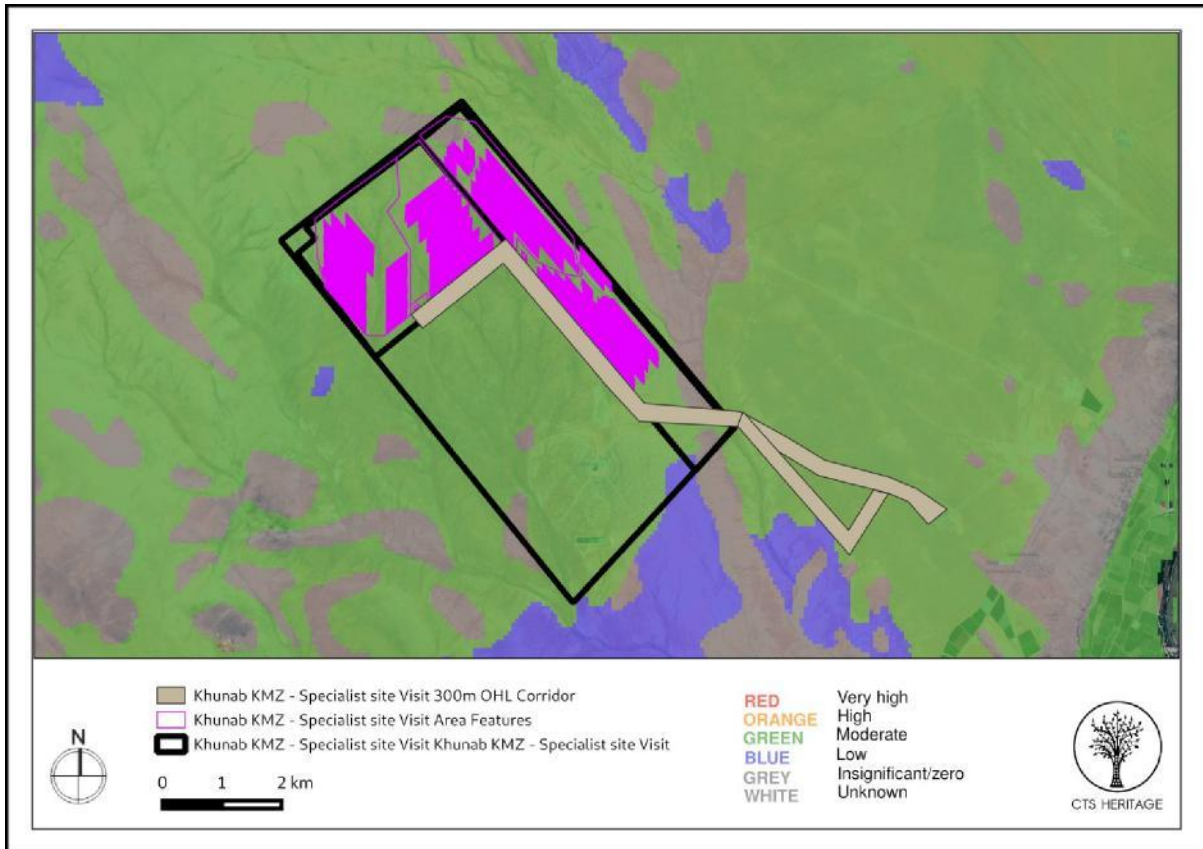


Figure 3: SAHRIS palaeosensitivity map of the site for the proposed Khunab Solar Development, The project footprint is within the lilac colour and the OHP corridors in grey. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the areas for the PV collectors and the OHP corridors are indicated as moderately sensitive (green) so a palaeontological impact assessment is presented here. The Gordonia Formation rests on calcretes or directly on pre-Kalahari bedrock (Partridge et al., 2006). The sands can be up to 30m thick and frequently are linear dunes that have been stabilised by vegetation (ibid). In areas to the south there is evidence of palaeo-rivers, for example the Koa Valley where the so called Kalahari River flowed during wetter Cenozoic times before continental uplift occurred together with global aridity. After the mid Miocene pluvial phases the Koa River was captured by the Orange River and only palaeochannels remain (de Wit et al., 2000; Partridge et al., 2006). Some palaeochannels contain gravel clasts, diamonds, silicified wood and vertebrate bones (Dingle and Hendey, 1984; Pickford et al., de Wit and Bamford, 1993; De Wit et al., 2009).

Some Quaternary pans have fossil fauna and artefacts preserved within them, such as Kath Pan and Townlands near Kuruman (Beaumont, 2004; Walker et al., 2014) but no pans are visible on Google Earth and none have been reported from here.

## 4. 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**

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

**TABLE 3B: IMPACT ASSESSMENT**

<b>PART B: ASSESSMENT</b>	
<b>SEVERITY/NATURE</b>	<b>H</b> -
	<b>M</b> -
	<b>L</b> Fluvial and aeolian sands do not preserve fossils; only palaeo-pans might but none has been recorded from here. Palaeo-channels might contain fossil wood and bones but none has been recorded from this site. The impact would be very unlikely.
	<b>L+</b> -
	<b>M+</b> -
	<b>H+</b> -
<b>DURATION</b>	<b>L</b> -
	<b>M</b> -
	<b>H</b> Where manifest, the impact will be permanent.
<b>SPATIAL SCALE</b>	<b>L</b> Since only the possible fossils within the area would be from palaeo-pans or palaeo-channels if present so the spatial scale will be localised within the site boundary.
	<b>M</b> -
	<b>H</b> -



PART B: ASSESSMENT	
PROBABILITY	H -
	M -
	L It is extremely unlikely that any fossils would be found in the alluvial and aeolian sand s but the site is indicated as moderately sensitive. Therefore 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 igneous and much too old to contain fossils, or are alluvial and aeolian sands. The Gordonia Formation alluvial and aeolian sands are young and have been transported so are unlikely to preserve any fossils. Only if palaeo-pans or palaeo-channels are present is there a small chance of finding fossils, however none have been recorded and the geological maps and Google Earth imagery do not indicate the presence of these features in the project footprint. The SAHRIS palaeosensitivity map indicates that the area is moderately sensitive so 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 extremely low.

## 5. 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 dolomites, sandstones, shales and sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary Gordonia Formation would not preserve fossils.

## 6. 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 loose sands of the Quaternary. There is very small chance that fossil may occur in the adjacent shales of the early Permian Vryheid Formation so a Chance Find Protocol should be added to the EMPr: if fossils are found once Excavations for the foundations for the PV collectors, pylons and substations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. All proposed constructions lie on the Gordonia Formation dune and aeolian sands and as far as the palaeontology is concerned there is no preferred alternative route or location.

## 7. References

- Beaumont, P.B., 2004. Kathu Pan and Kathu Townlands/Uitkoms. In: Beaumont, P.B., Morris, D. (Eds.), *Archaeology in the Northern Cape: Some Key Sites*. McGregor Museum, Kimberley, pp. 50-52.
- Cornell, D.H., Thomas, R.J., Moen, H.F.G., Reid, D.L., Moore, J.M., Gibson, R.L., 2006. The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 325-379.
- De Wit, M.C.J., Bamford, M.K. 1993. Fossil wood from the Brandvlei area, Bushmanland, as an indication of palaeoenvironmental changes during the Cainozoic. *Palaeontologia africana* 30, 81-89.
- De Wit, M.C.J., Marshall, T.R., Partridge, T.C., 2000. Fluvial depoists and drainage evolution. In: Partridge, T.C., & Maud, R.R. (Eds), *The Cainozoic of Southern Africa*. Oxford University Press, New York, 55-72.
- De Wit, M.C.J. Ward, J.D., Bamford, M.K., Roberts, M., 2009. The significance of the Cretaceous Diamondiferous gravel deposit at Mahura Muthla in the Vryburg District of the Northern Cape Province in South Africa. *South African Journal of Geology* 112, 89-108.
- Dingle, R.V., Hendey, Q.B., 1984. Late Mesozoic and Tertiary sediment supply to the eastern Cape Basin (S.E. Atlantic) and palaeo-drainage systems in southwestern Africa. *Marine Geology* 56, 13-26.
- Partridge, T.C., Botha, G.A., Haddon, I.G., 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 585-604.
- Pickford, M., Senut, B., Mein, P., Morales, J., Soria, D., Neito, M., Ward, J., Bamford, M. 1995. The discovery of Lower and middle Miocene vertebrates at Auchas, southern Namibia. *Comptes Rendus de l' Académie des Sciences.*, Paris, Ser IIa, 322,901-906.
- Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.
- Walker, S.J.H., Lukich, V., Chazan, M., 2014. Kathu Townlands: A high density Earlier Stone Age locality in the interior of South Africa. *PLoS ONE* 9(7):

## 8. Chance Find Protocol

### **Monitoring Programme for Palaeontology – to commence once the excavations for photovoltaic structures, powerlines, roads and infrastructure begin.**

1. The following procedure is only required if fossils are seen on the surface and when 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 (silicified wood, plants, insects, bone, shells) should be put aside in a suitably protected place. This way the construction activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants and bones in the pans or channels (for example see Figures 4-6). 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 excavations 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 any site inspections by the palaeontologist will not be necessary.
8. If no fossils are found and the excavations have finished then no further monitoring is required.



**Appendix A – Examples of fossils from Quaternary deposits**



**Figure 4 – pieces of silicified woods.**



**Figure 5: Example of fragments of bone as seen in the field. (From Pleistocene deposits at Koobi Fora, Kenya)**



**Figure 6 – example of a fossil leaf impression on a fine-grained sandstone. (Miocene age, Rusinga Island).**

## **Appendix B – Details of specialist**

# **Curriculum vitae (short) - Marion Bamford PhD June 2019**

### **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](mailto:marion.bamford@wits.ac.za) ;  
[marionbamford12@gmail.com](mailto: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 Universit

Degree	Graduated/ completed	Current
Honours	6	1
Masters	8	1
PhD	10	3
Postdoctoral fellows	9	3

#### **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 –  
*Cretaceous Research*: 2014 -

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
- SARA0 2018 for Digby Wells
- Ventersburg B 2018 for NGT
- Hanglip Service Station 2018 for HCAC
- Woodlands MR 2019 for NGT
- Remhoogte PR 2019 for EM
- Terreco-Mdantsane bridges 2019 for CTS Heritage

## **xi) Research Output**

**Publications by M K Bamford up to June 2018 peer-reviewed journals or scholarly books: over 130 articles published; 5 submitted/in press; 8 book chapters.**

**Scopus h index = 26; Google scholar h index = 30;**

**Conferences: numerous presentations at local and international conferences.**

## **xii) NRF Rating**

**NRF Rating: B-2 (2016-2020)**

**NRF Rating: B-3 (2010-2015)**

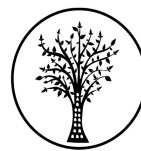
**NRF Rating: B-3 (2005-2009)**

**NRF Rating: C-2 (1999-2004)**



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### **APPENDIX 3: Heritage Screening Assessment**



CTS HERITAGE

## HERITAGE SCREENER

CTS Reference Number:	<b>CTS19_016</b>
SAHRA Case No:	
Client:	<b>Savannah</b>
Date:	<b>1 March 2019</b>
Author:	<b>Jenna Lavin</b>
Title:	<b>Proposed development of Khunab PV Facilities</b>

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

Recommendation by CTS Heritage Specialists	<p><b>RECOMMENDATION:</b> <b>The heritage resources in the area proposed for development are not sufficiently recorded.</b> Based on the available information, including the scale and nature of the proposed development, it is likely that significant heritage resources will be impacted by the proposed development and as such it is recommended that an archaeological field assessment and a desktop palaeontological assessment be conducted to inform a full Heritage Impact Assessment. (see section 8 for details)</p>
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CTS Heritage

16 Edison Way, Century City, 7441

Tel: +27 (0)87 073 5739 Email: info@ctsheritage.com Web: www.ctsheritage.com



CTS HERITAGE

## 1. Proposed Development Summary

*Information about project required*

## 2. Application References

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

## 3. Property Information

Latitude / Longitude	28°30'8.22"S 21° 2'46.03"E
Erf number / Farm number	<i>Information about project required</i>
Local Municipality	Dawid Kruiper
District Municipality	ZF Mgcawu
Previous Magisterial District	Gordonia
Province	Northern Cape
Current Use	None
Current Zoning	Agriculture
Total Extent	

## 4. Nature of the Proposed Development

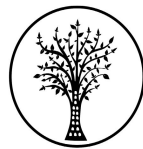
Total Surface Area	<i>Information about project required</i>
Depth of excavation (m)	3m
Height of development (m)	3m
Expected years of operation before decommission	NA

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## 5. Category of Development

<b>x</b>	<b>Triggers: Section 38(8) of the National Heritage Resources Act</b>
	<b>Triggers: Section 38(1) of the National Heritage Resources Act</b>
	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.
	3. Any development or activity that will change the character of a site-
<b>x</b>	a) exceeding 5 000m <sup>2</sup> 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 <sup>2</sup>
	5. Other (state):

## 6. Additional Infrastructure Required for this Development

*Information about project required*

CTS Heritage

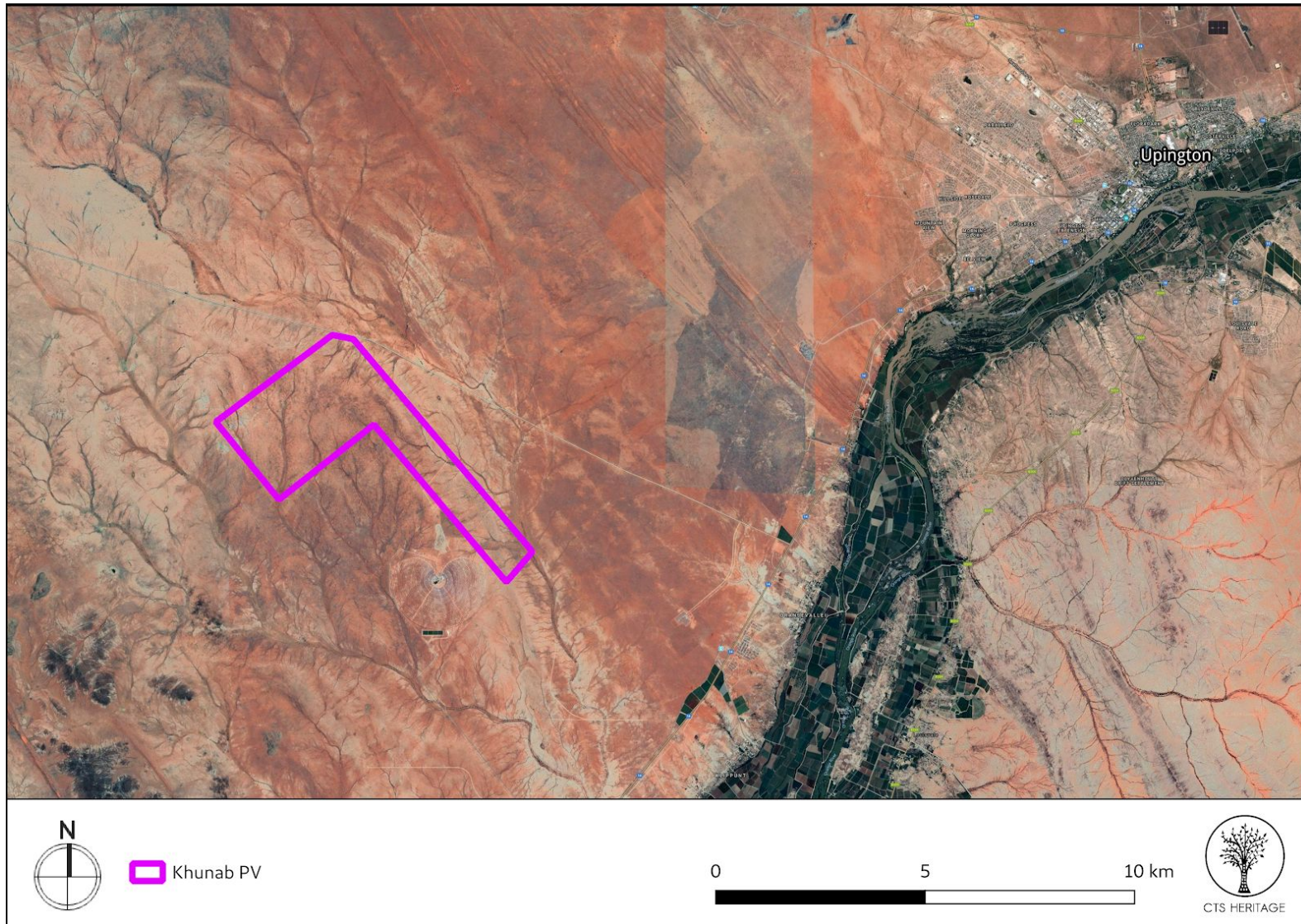
16 Edison Way, Century City, 7441

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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 (2017) indicating the proposed development area at closer range, relative to Uppington.

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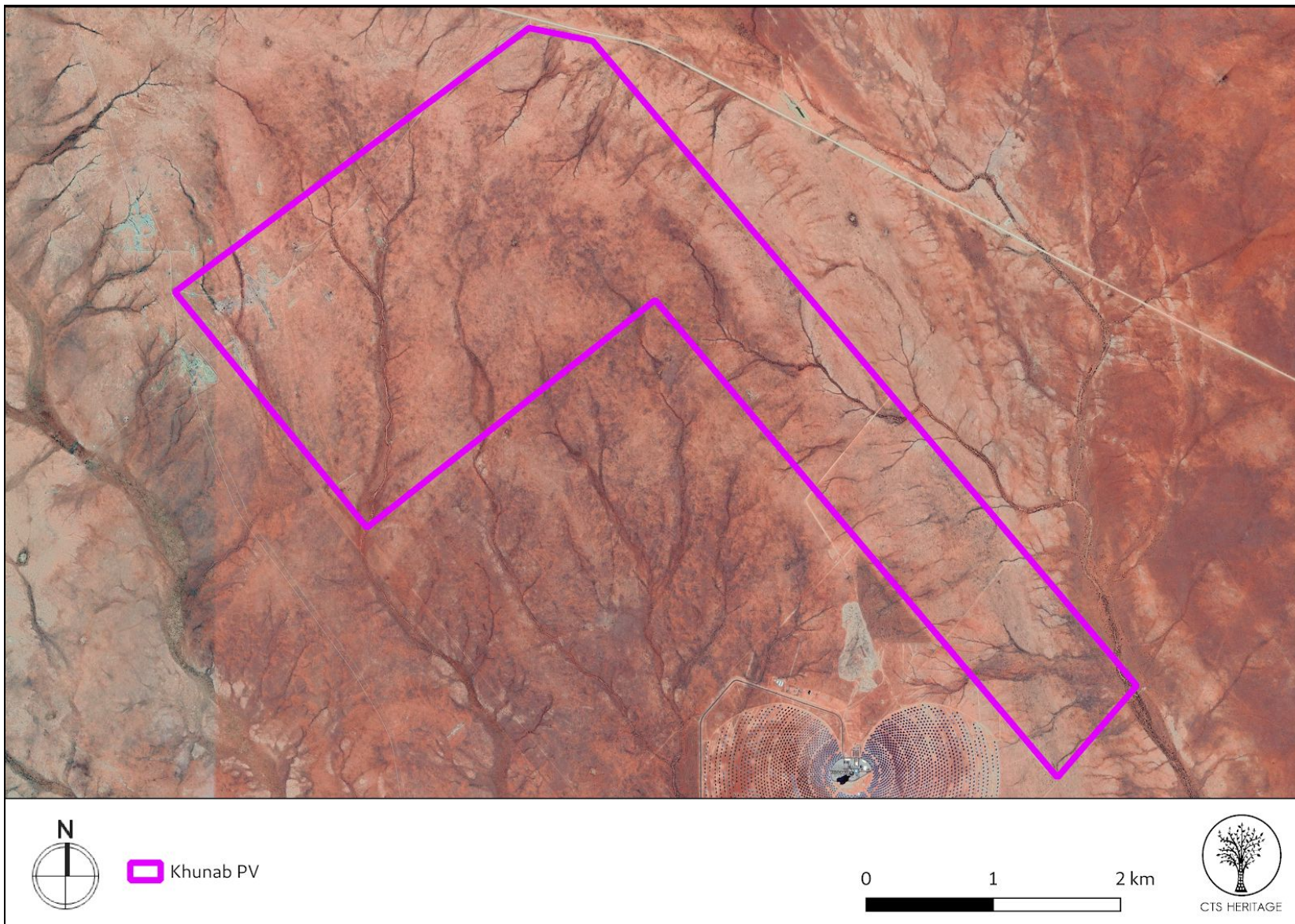
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**Figure 1c. Overview Map.** Satellite image (2017) indicating the proposed development area at closer range.

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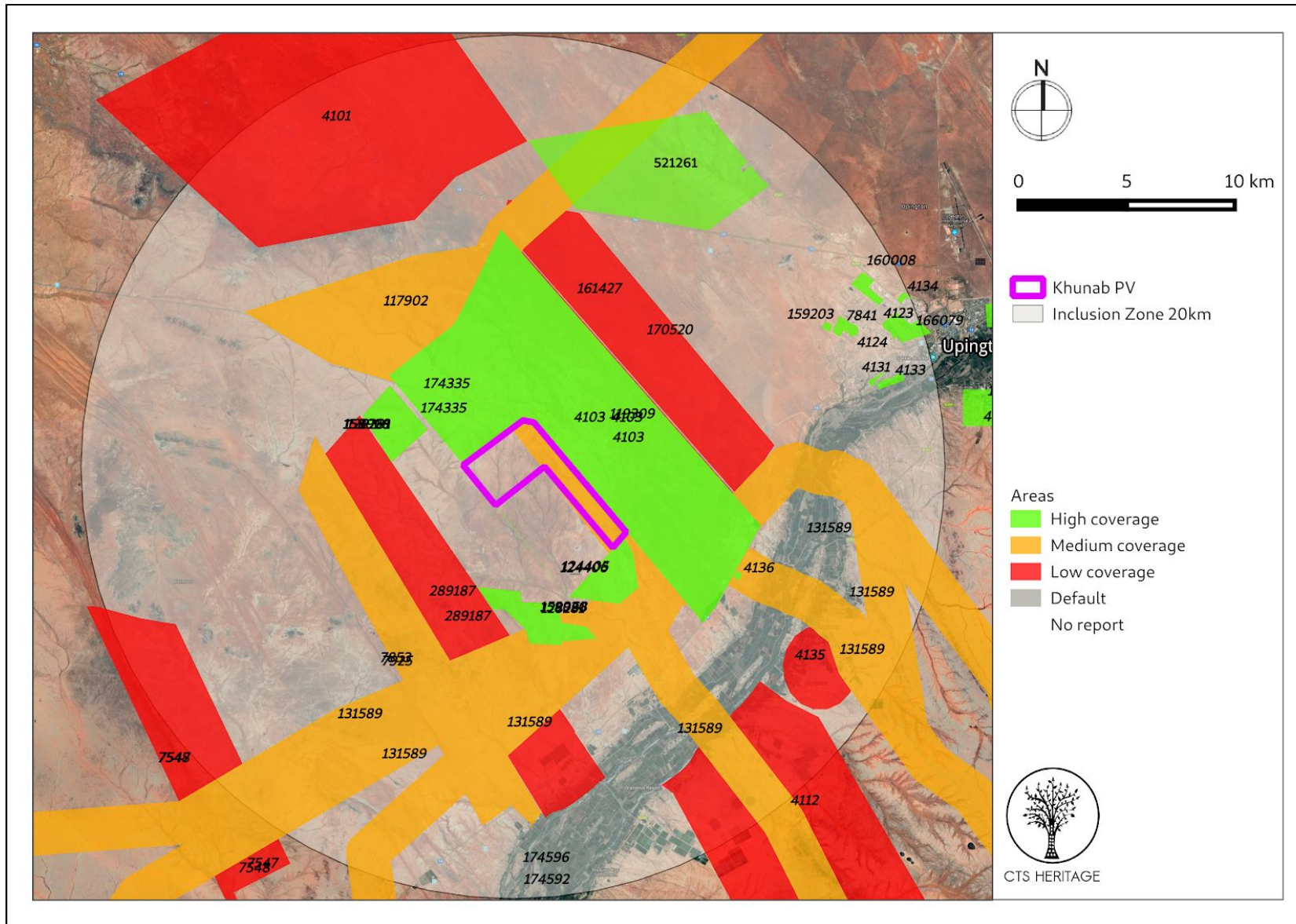
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**Figure 2. Previous HIAs Map.** Previous Heritage Impact Assessments surrounding the proposed development area within 20km, with SAHRIS NIDS indicated. Please see Appendix 2 for full reference list.

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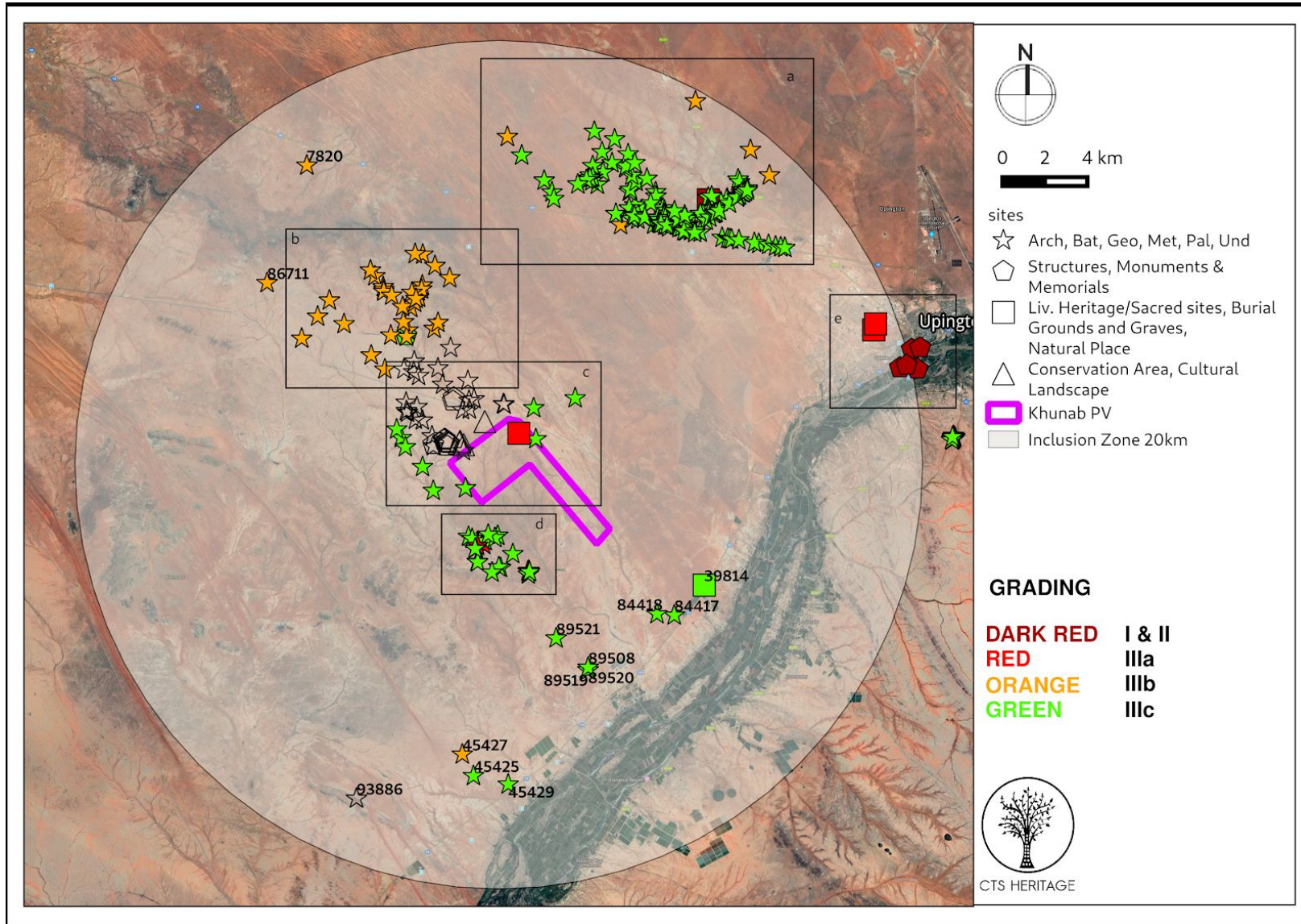
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**Figure 3. Heritage Resources Map.** Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Figure 3a to 3e for inset). Please See Appendix 4 for full description of heritage resource types.

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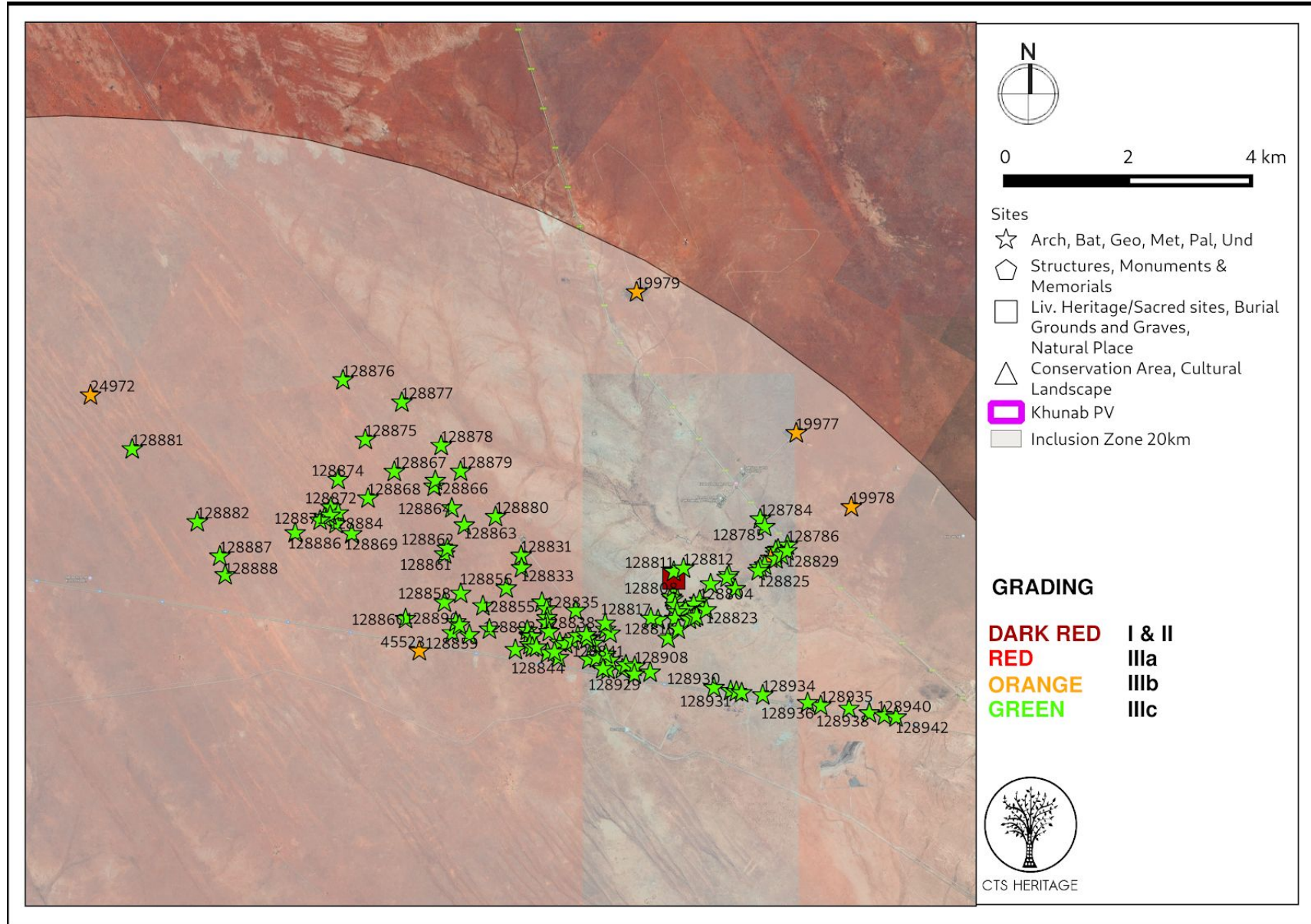
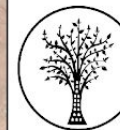


Figure 3a. Heritage Resources Map.

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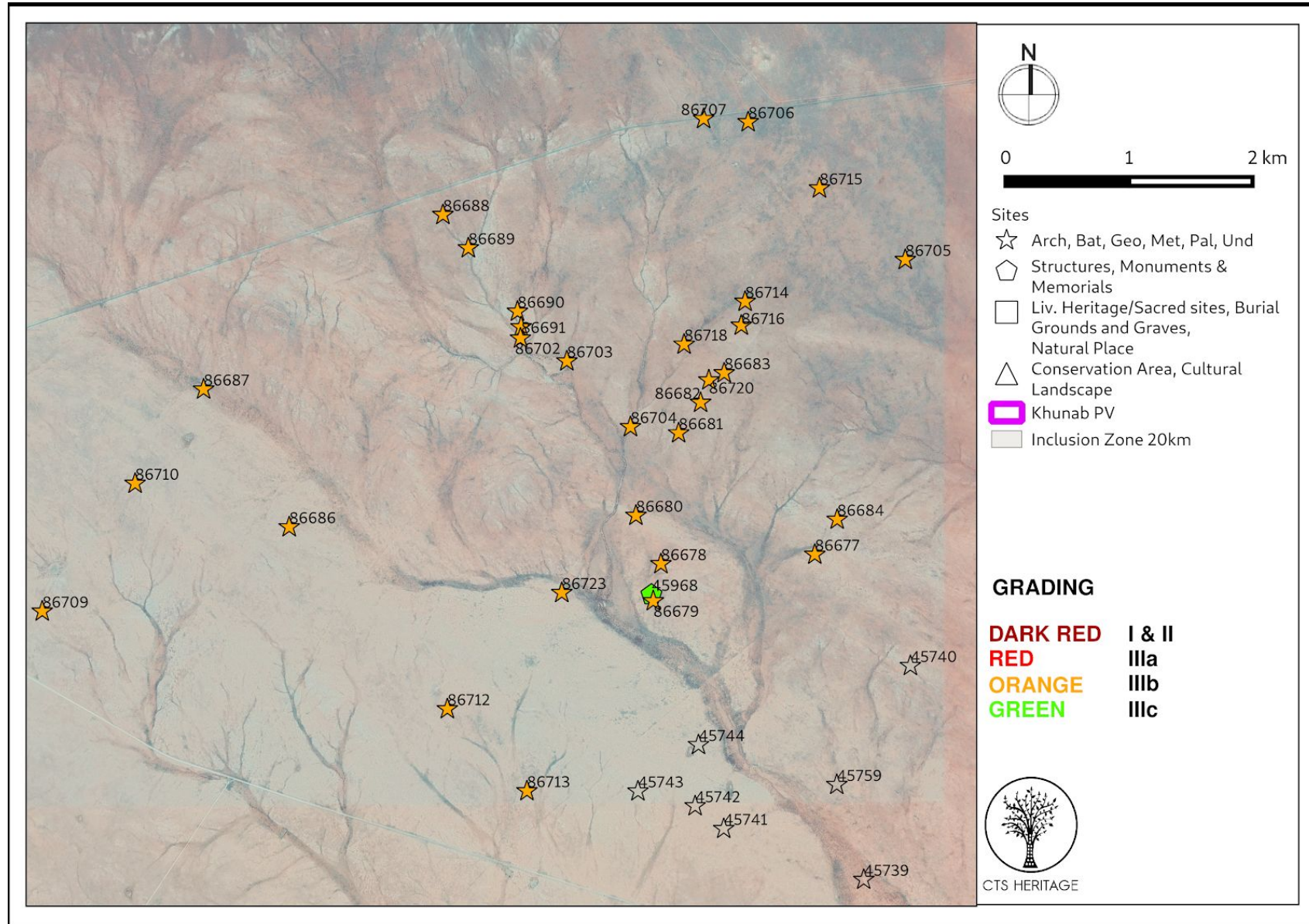


Figure 3b. Heritage Resources Map.

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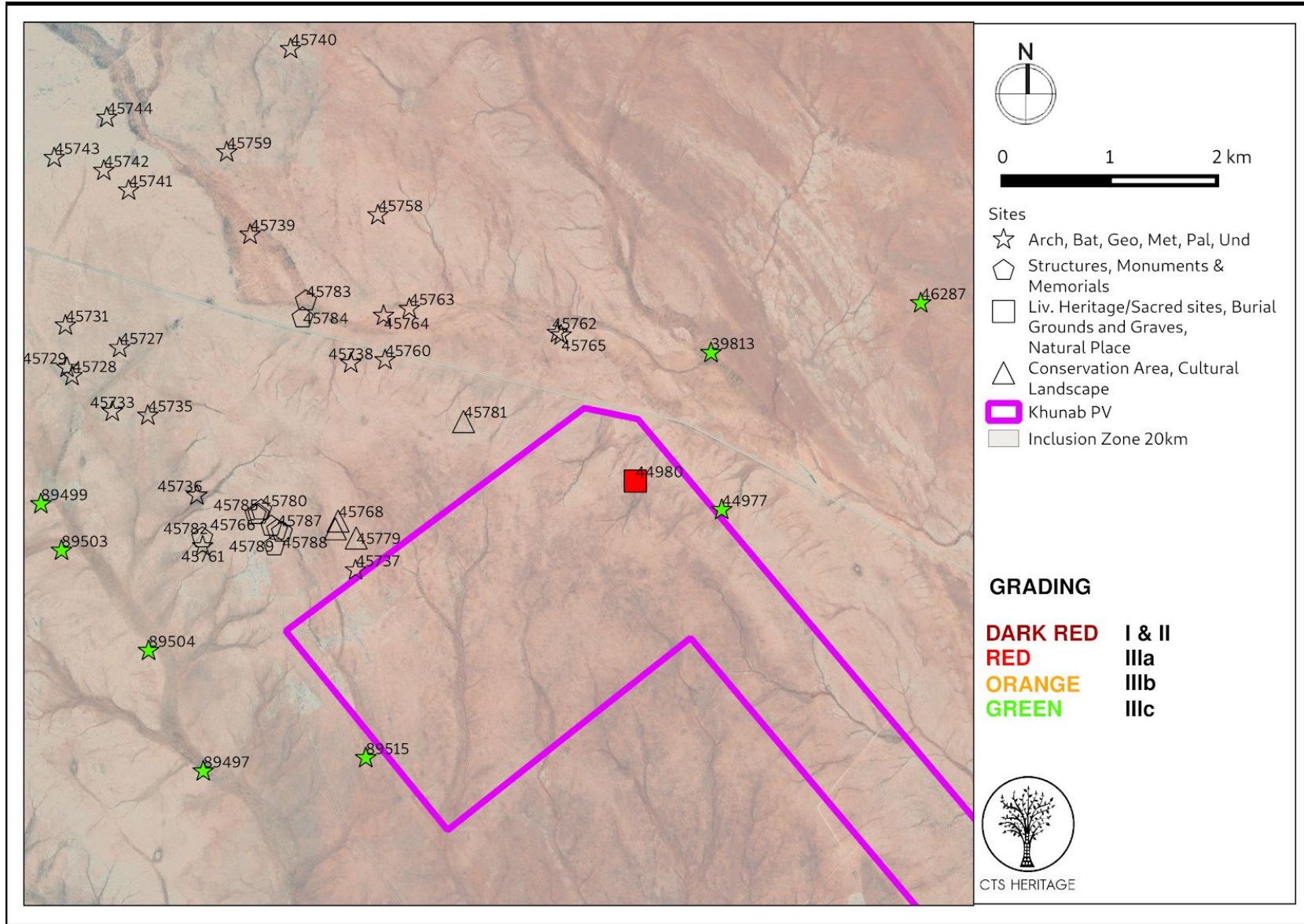


Figure 3c. Heritage Resources Map.

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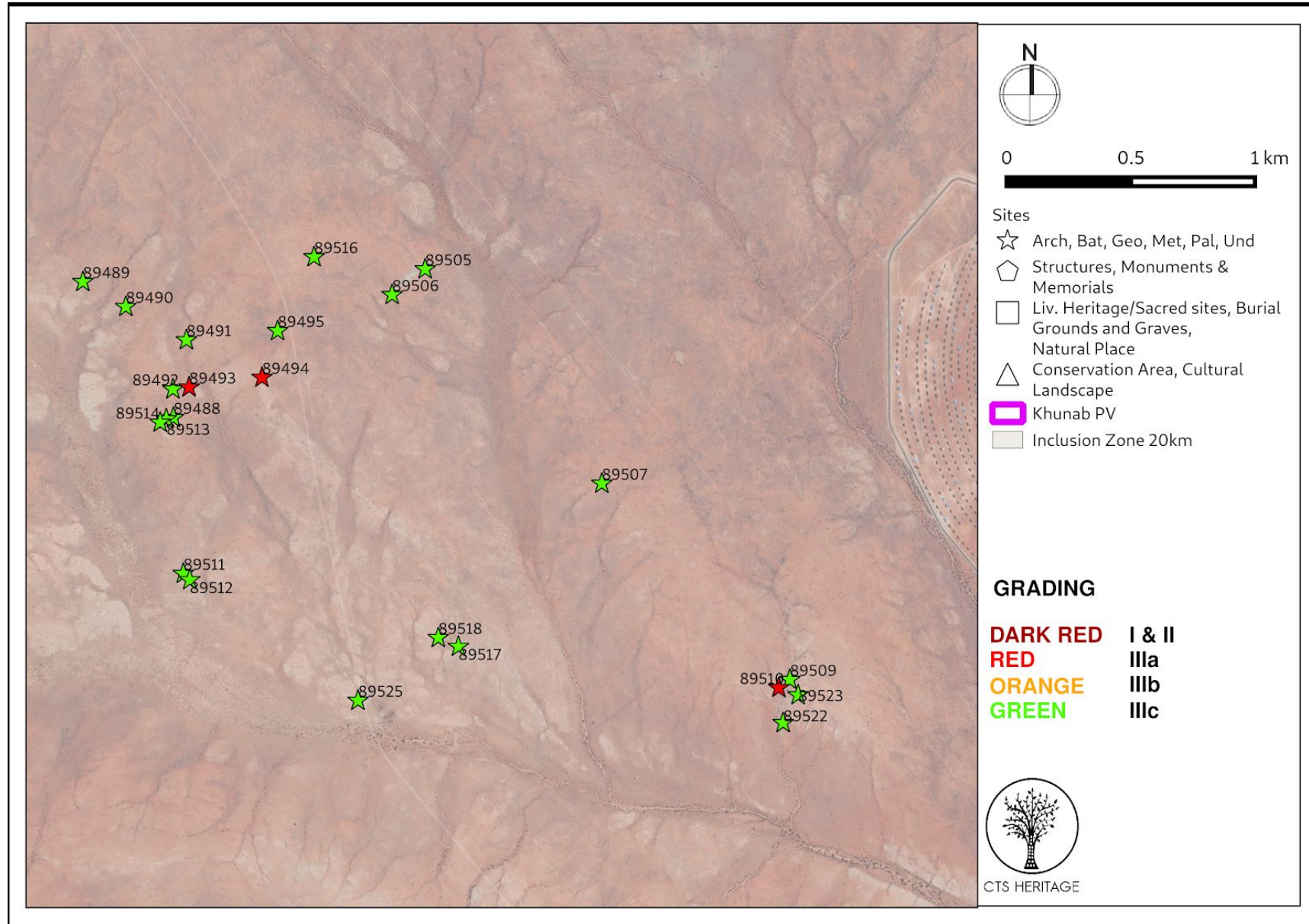


Figure 3d. Heritage Resources Map.

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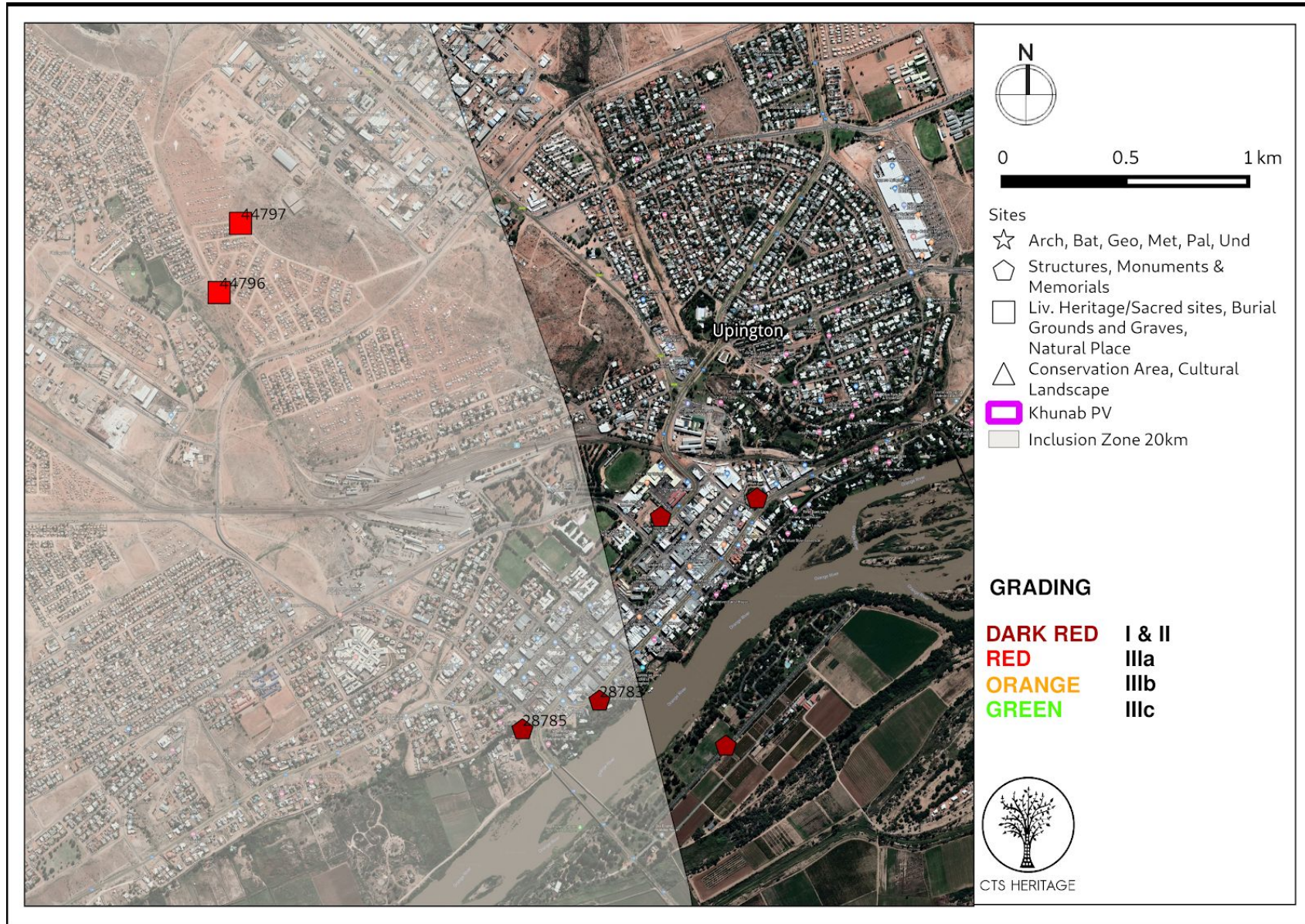


Figure 3e. Heritage Resources Map.

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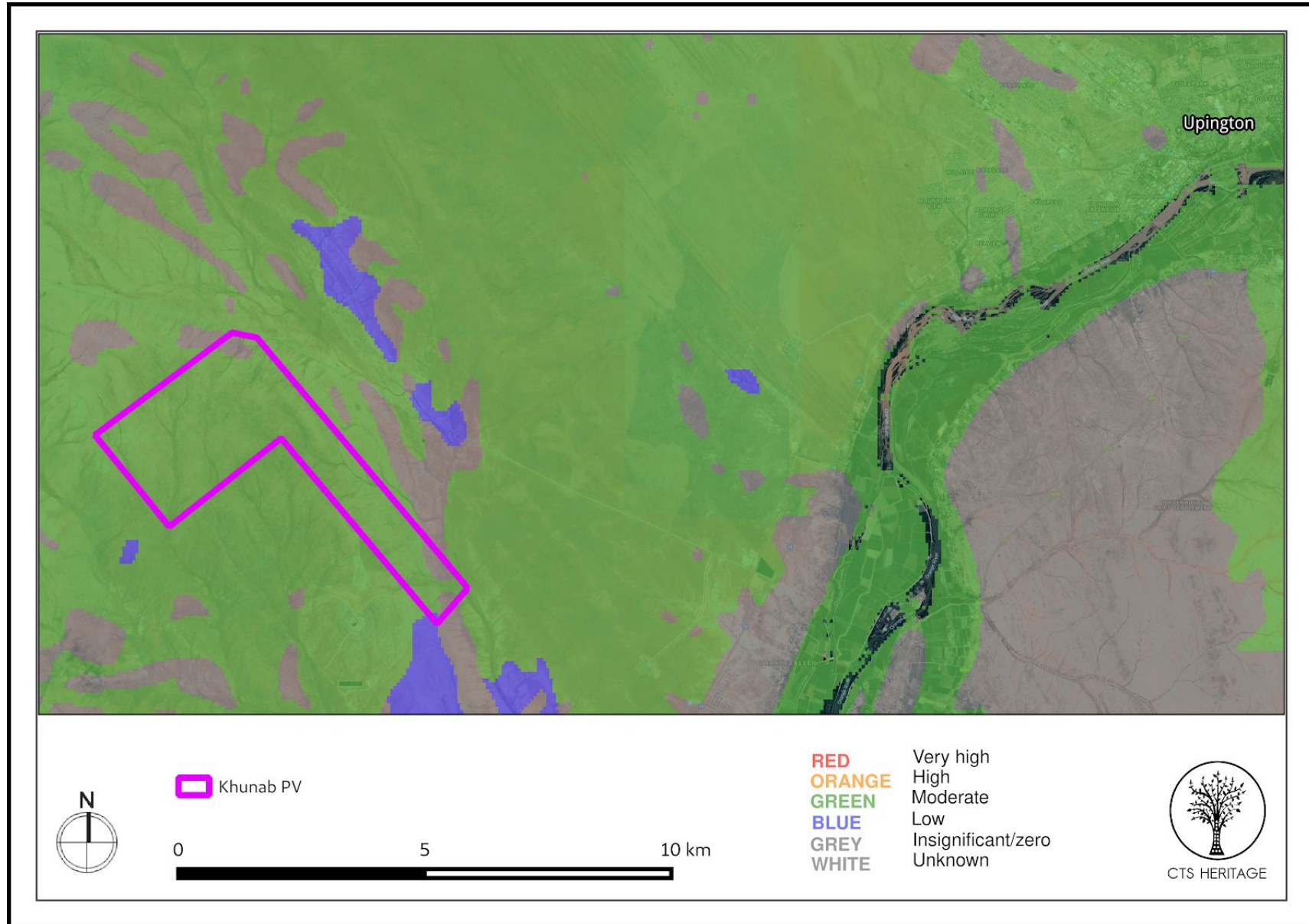
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**Figure 4. Palaeosensitivity Map.** Indicating varied fossil sensitivity underlying the study area. Please See Appendix 3 for full guide to the legend.

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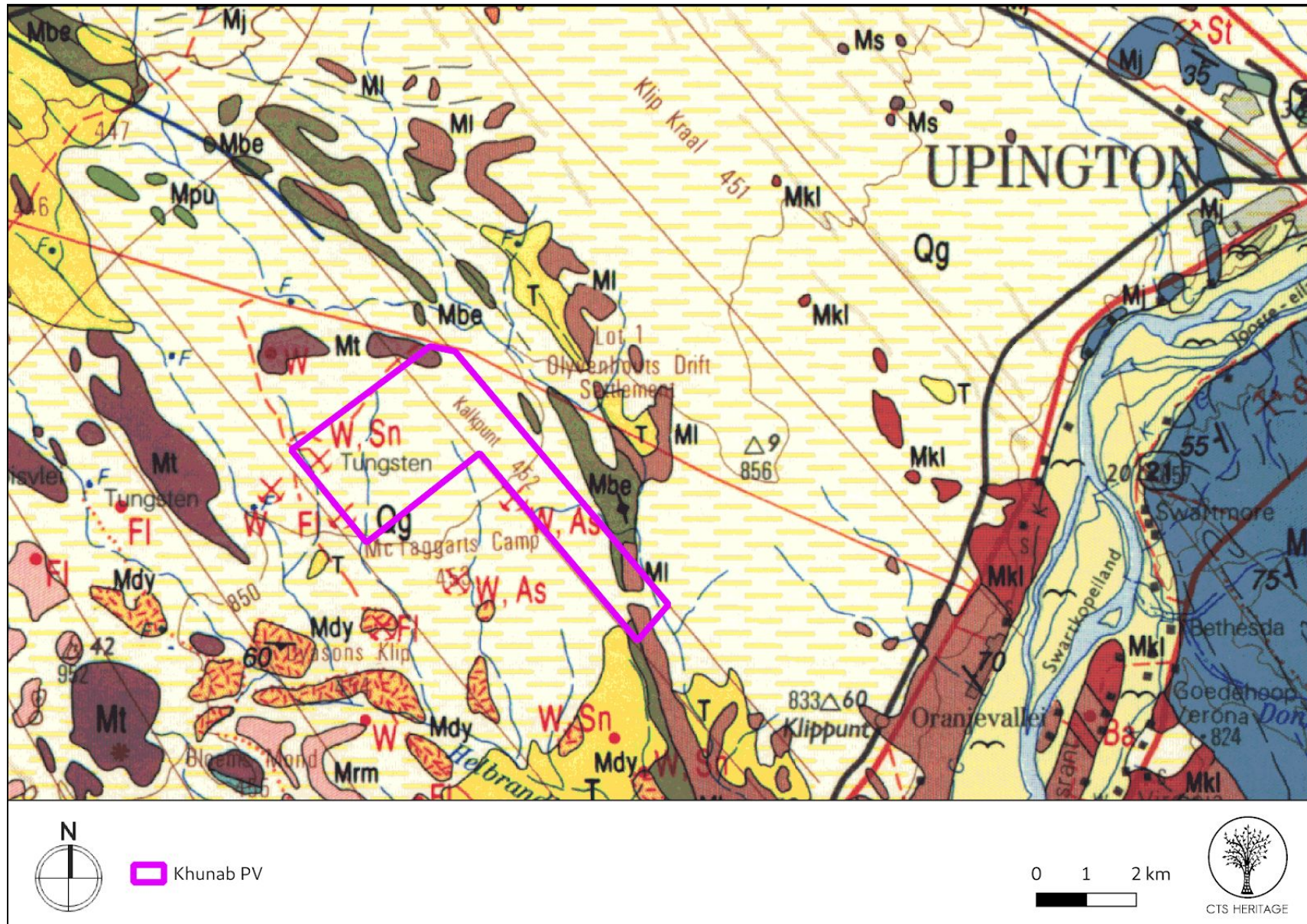


Figure 5.1 Extract from the 1:250 000 Geological Map of South Africa: Council of GeoScience Map 2820

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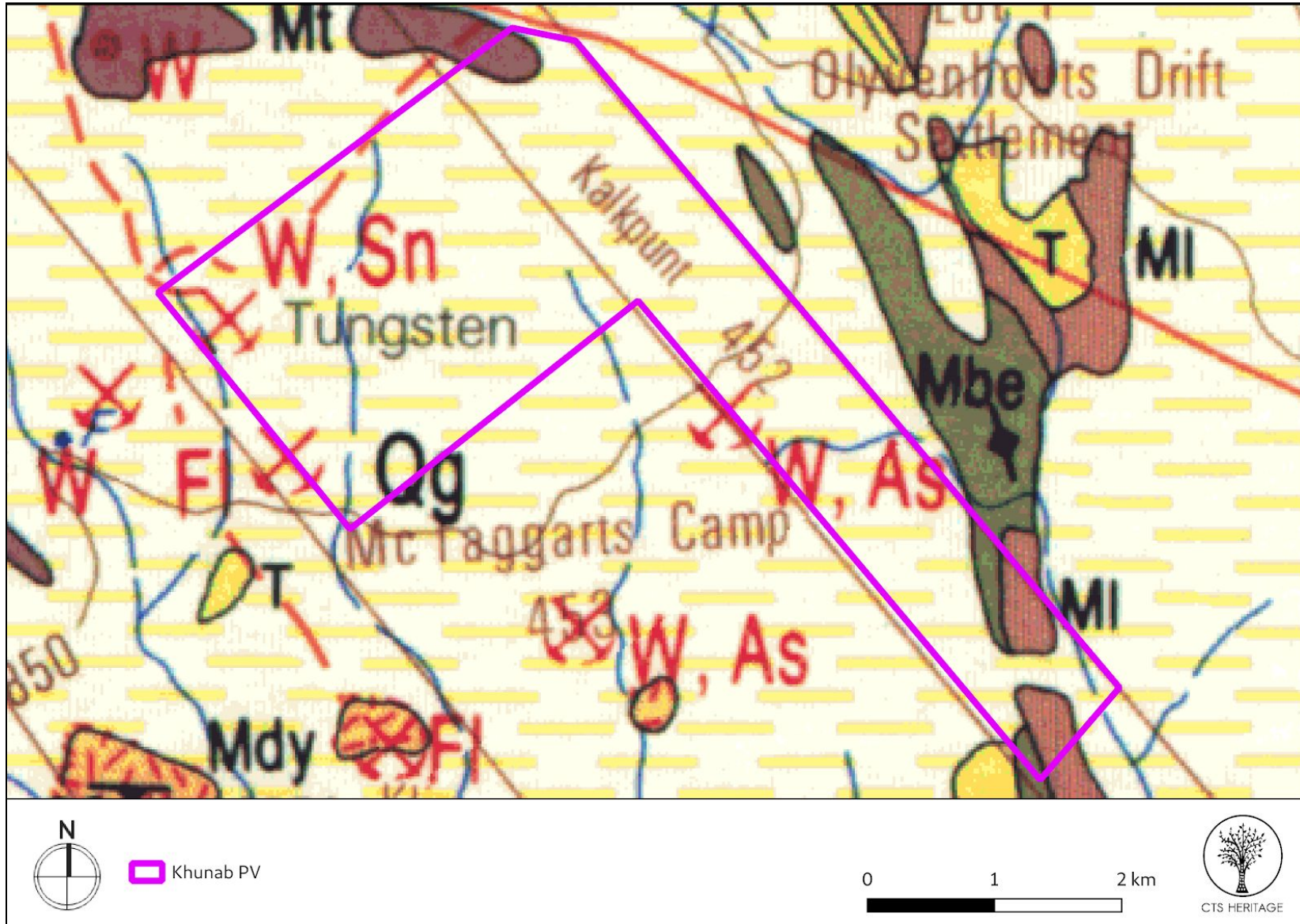
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**Figure 5.2 Extract from the 1:250 000 Geological Map of South Africa: Council of GeoScience Map 2820 Zoomed in. [Qg: Gordonia Formation (Quarternary coversands) Mbe: Bethesda Formation Mt: Toeslaan Formation MI: Louisvale Granite Mdy: Dyasons Klip Gneiss T: Tertiary]**

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## 8. Heritage statement and character of the area

### *Information about project required*

#### **Cultural Landscape**

According to Van Schalkwyk (2014 SAHRIS NID 170520), “The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (stone age) component and a later colonial (farmer) component. This rural landscape has always been sparsely populated. The second component is an urban one, consisting of a number of smaller towns, most of which developed during the last 150 years or less.” According to Von Vollenhoven (2012 SAHRIS NID 117902), “the environment of the area is mostly undisturbed although it is being used for sheep farming... The natural topography... is reasonably flat, but in the north-west a hill dominates the area resulting in an even slope up to the crest. This area also is very rocky. The stones here are dark in colour and may be of a basaltic origin. However in the flat areas adjacent to the hill the rocks are white coloured and most likely are soft calcrete, which would not have been suitable for the manufacture of stone tools. Different non-perennial streams run through the area...” According to Fourie’s assessment of the impacts of similar infrastructure in this area (2014), due to the landscape’s topography the solar park infrastructure will be prominent in the landscape and alter the rural appearance. Due to the remoteness of the area the impact on the experience of the cultural landscape is not foreseen to be significant. In addition, there is an existing solar park located in very close proximity to the proposed development area (Figure 1c), setting a precedent for this kind of infrastructure in this area.

#### **Archaeology and the Built Environment**

Many farm portions in the immediate vicinity of the area proposed for development have been assessed in terms of impacts to heritage resources (Figure 2). It has been found that the area surrounding Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335). Based on the outcomes of these assessments, it is noted that most of the heritage resources identified are stone age artefact scatters of varying significance. In Fourie’s assessment (2014), the field work identified numerous areas where low density scatters of Middle and Later Stone Age lithics were found. As no context and *in situ* preservation were identified these sites were graded as having low heritage significance. In addition, one possible herder site was identified during the survey. No other material or deposits were identified but does not exclude the possibility of subsurface material. The ruins of old mining infrastructure were also identified. In Von Vollenhoven’s assessment (2012 SAHRIS NID 117902), he identified a number of very interesting and significant rock art engravings depicting various animals including giraffes and an armadillo. In addition, he identified a significant historical site known as the “Rebellion Tree” as well as graves associated with farmers in this area.

Numerous heritage resources have been identified within the immediate vicinity of the area proposed for development (Figure 3 and insets b, c and d). The vast majority of these are archaeological artefacts with little or no contextual information associated with them, resulting in their low heritage significance assessment. Dreyer (2006, SAHRIS NID 4103) identified a number of stone flakes and flaked stone cores on the surface of a neighbouring site (Figure 2). He determined that the raw material originated from the local geological horizon and is broadly described as chalcedony, meta-quartzite and banded ironstone from the Griquastad Layer. He also identified a heavily soldered food tin resembling British rations from the Anglo-Boer War (1899-1902). Dreyer (2006) anticipated that there could have been a British camp in the vicinity during the War, but nothing else to confirm this expectation was discovered. Fourie (2014, SAHRIS NID 174335) identified a number of heritage resources in his assessment of Farm Rooipunt 617 including stone age tools and sites, possible herder sites and historical structures associated with mining and prospecting.

Based on the available information, it is likely that the proposed development will impact on 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. (see impact tables below).

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### **Palaeontology**

According to the SAHRIS Palaeosensitivity Map (Figure 4), the extract from the CGS Sheet 2820 Figure 5.1 and 5.2), this area is underlain by the Gordonia Formation (Quaternary coversands of moderate palaeontological sensitivity). Nearby geology includes the Bethesda Formation, the Toeslaan Formation, the Louisvale Granite and Dyasons Klip Gneiss, all of which have zero palaeontological sensitivity. The primary risk associated with impacts to palaeontological heritage is related to impacting fossils preserved within the Quaternary coversands of the Gordonia Formation (wind-blown alluvial sands). According to Almond's assessment for similar infrastructure development in this area (2011 SAHRIS NID 174335), "overall impact significance of the proposed solar park development is likely to be LOW because: Most of the study area is underlain by unfossiliferous igneous and metamorphic basement rocks (granites, gneisses etc.) or mantled by superficial sediments (wind-blown sands, alluvium etc.) of low palaeontological sensitivity; Extensive, deep excavations are unlikely to be involved in this sort of solar park project."

As such, and for the same reasons, it is anticipated that the proposed development will not impact on significant palaeontological heritage and therefore no further assessment of impacts to palaeontological heritage is recommended.

### **Cumulative Impacts**

Of the 34 Heritage Assessments conducted within 20km of the proposed development area (Appendix 2), 14 are for Solar Energy/PV Facilities and 3 are for electrical infrastructure. The remaining assessments relate to mining infrastructure and residential township developments. At this stage, 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 the impact on the experience of the cultural landscape is not foreseen to be significant. In addition, there is an existing solar park located in very close proximity to the proposed development area (Figure 1c).

### **RECOMMENDATION:**

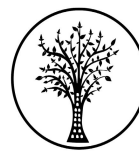
**The heritage resources in the area proposed for development are not sufficiently recorded.**

**Based on the available information, including the scale and nature of the proposed development, it is likely that significant heritage resources will be impacted by the proposed development and as such it is recommended that an archaeological field assessment and a desktop palaeontological assessment be conducted to inform a full Heritage Impact Assessment.**

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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.
- 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 the impact on the experience of the cultural landscape is not foreseen to be significant.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
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.	Destruction of significant archaeological and other heritage resources resources	Local scale with broader impacts to scientific knowledge	To be identified through the field assessment.

### Gaps in knowledge & recommendations for further study

**The heritage resources in the area proposed for development are not sufficiently recorded.**

Based on the available information, including the scale and nature of the proposed development, it is likely that significant heritage resources will be impacted by the proposed development and as such it is recommended that an **archaeological field assessment** be conducted to inform a full Heritage Impact Assessment. This field assessment will identify all heritage resources of significance within the development footprint, map them and grade them in terms of their significance. This will inform the Heritage Impact Assessment which will clarify the impacts anticipated and provide mitigation measures, recommendations and possible no-go zones, as well as an assessment of the proposed alternatives.





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## APPENDIX 1

### List of heritage resources within the 20km Inclusion Zone

Site ID	Site no	Full Site Name	Site Type	Grading
128787	ALP4	Allepad 4	Artefacts	Grade IIIc
128788	ALP5	Allepad 5	Artefacts	Grade IIIc
89513	DYA022	DYASON'S KLIP 454/022	Artefacts	Grade IIIc
89521	DYA030	DYASON'S KLIP 454/030	Artefacts	Grade IIIc
89523	DYA032	DYASON'S KLIP 454/032	Artefacts	Grade IIIc
128784	ALP1	ALP1	Artefacts	Grade IIIc
86683	SASOL008	SASOL CSP 008	Artefacts	Grade IIIb
86684	SASOL009	SASOL CSP 009	Artefacts	Grade IIIb
93886	Zoovoorbij	Zoovoorbij	Archaeological	
45425	GEELKOP02	Geelkop 456 02	Artefacts	Grade IIIc
86680	SASOL005	SASOL CSP 005	Artefacts	Grade IIIb
44980	UP09	Uppington 09	Burial Grounds & Graves	Grade IIIa
86681	SASOL006	SASOL CSP 006	Artefacts	Grade IIIb
86682	SASOL007	SASOL CSP 007	Artefacts	Grade IIIb
44796	DAKOTA01	Dakota Drive, Uppington 01	Artefacts, Burial Grounds & Graves	Grade IIIa
44797	DAKOTA02	Dakota Drive, Uppington 02	Burial Grounds & Graves	Grade IIIa
86688	SASOL013	SASOL CSP 013	Artefacts	Grade IIIb
89525	DYA033	DYASON'S KLIP 454/033	Artefacts	Grade IIIc
45427	GEELKOP01	Geelkop 456 01	Archaeological	Grade IIIb
39813	SOA001	Solar-Aries 001	Artefacts	Grade IIIc
45429	GEELKOP03	Geelkop 456 03	Archaeological	Grade IIIc

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39814	SOA002	Solar-Aries 002	Living Heritage/Sacred sites	Grade IIIc
19978	SPITZ2	Spitzkop 2	Artefacts	Grade IIIb
86686	SASOL011	SASOL CSP 011	Artefacts	Grade IIIb
86687	SASOL012	SASOL CSP 012	Artefacts	Grade IIIb
7820	2830BD 317		Ruin > 100 years	Grade IIIb
86689	SASOL014	SASOL CSP 014	Artefacts	Grade IIIb
86690	SASOL015	SASOL CSP 015	Artefacts	Grade IIIb
86691	SASOL016	SASOL CSP 016	Artefacts	Grade IIIb
19977	SPITZ1	Spitzkop 1	Artefacts	Grade IIIb
89492	DYA005	DYASON'S KLIP 454/005	Artefacts	Grade IIIc
89494	DYA007	DYASON'S KLIP 454/007	Artefacts	Grade IIIa
89495	DYA008	DYASON'S KLIP 454/008	Artefacts	Grade IIIc
89499	DYA010	DYASON'S KLIP 454/010	Artefacts	Grade IIIc
86702	SASOL017	SASOL CSP 017	Artefacts	Grade IIIb
86703	SASOL018	SASOL CSP 018	Artefacts	Grade IIIb
24972	Van Roois Vley	Van Roois Vlei Stone Age sites	Artefacts	Grade IIIb
89491	DYA004	DYASON'S KLIP 454/004	Artefacts	Grade IIIc
45762	ROOI020	Rooipunt 020	Artefacts	Grade IV
45523	VRV01	Van Rooy's Vlei 01	Artefacts	Grade IIIb
45763	ROOI021	Rooipunt 021	Artefacts	Grade IV
45764	ROOI022	Rooipunt 022	Artefacts	Grade IV
45758	ROOI016	Rooipunt 016	Artefacts	Grade IV
45759	ROOI017	Rooipunt 017	Artefacts	Grade IV
45760	ROOI018	Rooipunt 018	Artefacts	Grade IV

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45761	ROOI019	Rooipunt 019	Artefacts	Grade IV
84417	SSF001	Sirius Solar Facilities 001	Artefacts	Grade IIIc
84418	SSF002	Sirius Solar Facilities 002	Artefacts	Grade IIIc
45779	ROOI027	Rooipunt 027	Conservation Area	Grade IV
45780	ROOI028	Rooipunt 028	Structures	Grade IV
45765	ROOI023	Rooipunt 023	Stone walling	Grade IV
45766	ROOI024	Rooipunt 024	Structures	Grade IV
45767	ROOI025	Rooipunt 025	Conservation Area	Grade IV
45768	ROOI026	Rooipunt 026	Conservation Area	Grade IV
45785	ROOI033	Rooipunt 033	Structures	Grade IV
45786	ROOI034	Rooipunt 034	Structures	Grade IV
45787	ROOI035	Rooipunt 035	Structures	Grade IV
45788	ROOI036	Rooipunt 036	Structures	Grade IV
45781	ROOI029	Rooipunt 029	Conservation Area	Grade IV
45782	ROOI030	Rooipunt 030	Structures	Grade IV
45783	ROOI031	Rooipunt 031	Structures	Grade IV
45784	ROOI032	Rooipunt 032	Structures	Grade IV
86677	SASOL002	SASOL CSP 002	Artefacts	Grade IIIb
86678	SASOL003	SASOL CSP 003	Artefacts	Grade IIIb
44977	UP08	Upington 08	Artefacts	Grade IIIc
86679	SASOL004	SASOL CSP 004	Artefacts	Grade IIIb
45789	ROOI037	Rooipunt 037	Structures	Grade IV
19979	SPITZ3	Spitzkop 3	Artefacts	Grade IIIb
46287	OLYV01	OLYVENHOUTS DRIFT 01	Artefacts	Grade IIIc
45968	SASOL001	SASOL CSP 001	Structures	Grade IIIc

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86709	SASOL024	SASOL CSP 024	Artefacts	Grade IIIb
86710	SASOL025	SASOL CSP 025	Artefacts	Grade IIIb
86711	SASOL026	SASOL CSP 026	Artefacts	Grade IIIb
86712	SASOL027	SASOL CSP 027	Artefacts	Grade IIIb
86704	SASOL019	SASOL CSP 019	Artefacts	Grade IIIb
86705	SASOL020	SASOL CSP 020	Artefacts	Grade IIIb
86706	SASOL021	SASOL CSP 021	Artefacts	Grade IIIb
86707	SASOL022	SASOL CSP 022	Artefacts	Grade IIIb
86715	SASOL030	SASOL CSP 030	Artefacts	Grade IIIb
86716	SASOL031	SASOL CSP 031	Artefacts	Grade IIIb
86718	SASOL032	SASOL CSP 032	Artefacts	Grade IIIb
86720	SASOL033	SASOL CSP 033	Artefacts	Grade IIIb
28785	9/2/032/0016	Old Watermill, Upington	Building	Grade II
28783	9/2/032/0018	Museum Complex, 4 Schroder Street, Upington	Building	Grade II
86713	SASOL028	SASOL CSP 028	Artefacts	Grade IIIb
86714	SASOL029	SASOL CSP 029	Artefacts	Grade IIIb
45733	ROOI005	Rooipunt 005	Artefacts	Grade IV
45735	ROOI006	Rooipunt 006	Artefacts	Grade IV
45736	ROOI007	Rooipunt 007	Artefacts	Grade IV
45737	ROOI008	Rooipunt 008	Artefacts	Grade IV
45727	ROOI001	Rooipunt 001	Artefacts	Grade IV
45728	ROOI002	Rooipunt 002	Artefacts	Grade IV
45729	ROOI003	Rooipunt 003	Artefacts	Grade IV
45731	ROOI004	Rooipunt 004	Artefacts	Grade IV
45742	ROOI013	Rooipunt 013	Artefacts	Grade IV

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45743	ROOI014	Rooipunt 014	Artefacts	Grade IV
45744	ROOI015	Rooipunt 015	Artefacts	Grade IV
86723	SASOL034	SASOL CSP 034	Artefacts	Grade IIIb
45738	ROOI009	Rooipunt 009	Artefacts	Grade IV
45739	ROOI010	Rooipunt 010	Artefacts	Grade IV
45740	ROOI011	Rooipunt 011	Artefacts	Grade IV
45741	ROOI012	Rooipunt 012	Artefacts	Grade IV
128910	ALP105	Allepad 105	Artefacts	Grade IIIc
128911	ALP106	Allepad 106	Artefacts	Grade IIIc
128912	ALP107	Allepad 107	Artefacts	Grade IIIc
128914	ALP108	Allepad 108	Artefacts	Grade IIIc
128906	ALP101	Allepad 101	Artefacts	Grade IIIc
128907	ALP102	Allepad 102	Artefacts	Grade IIIc
128908	ALP103	Allepad 103	Artefacts	Grade IIIc
128909	ALP104	Allepad 104	Artefacts	Grade IIIc
128920	ALP113	Allepad 113	Artefacts	Grade IIIc
128922	ALP114	Allepad 114	Artefacts	Grade IIIc
128928	ALP115	Allepad 115	Artefacts	Grade IIIc
128929	ALP116	Allepad 116	Artefacts	Grade IIIc
128915	ALP109	Allepad 109	Artefacts	Grade IIIc
128916	ALP110	Allepad 110	Artefacts	Grade IIIc
128917	ALP111	Allepad 111	Artefacts	Grade IIIc
128919	ALP112	Allepad 112	Artefacts	Grade IIIc
128934	ALP121	Allepad 121	Artefacts	Grade IIIc
128935	ALP123	Allepad 123	Artefacts	Grade IIIc

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128936	ALP122	Allepad 122	Artefacts	Grade IIIc
128937	ALP124	Allepad 124	Artefacts	Grade IIIc
128930	ALP117	Allepad 117	Artefacts	Grade IIIc
128931	ALP118	Allepad 118	Artefacts	Grade IIIc
128932	ALP119	Allepad 119	Artefacts	Grade IIIc
128933	ALP120	Allepad 120	Artefacts	Grade IIIc
128942	ALP129	Allepad 129	Artefacts	Grade IIIc
128938	ALP125	Allepad 125	Artefacts	Grade IIIc
128939	ALP126	Allepad 126	Artefacts	Grade IIIc
128940	ALP127	Allepad 127	Artefacts	Grade IIIc
128941	ALP128	Allepad 128	Artefacts	Grade IIIc
128876	ALP73	Allepad 73	Artefacts	Grade IIIc
128877	ALP74	Allepad 74	Artefacts	Grade IIIc
128878	ALP75	Allepad 75	Artefacts	Grade IIIc
128879	ALP76	Allepad 76	Artefacts	Grade IIIc
128871	ALP69	Allepad 69	Artefacts	Grade IIIc
128872	ALP70	Allepad 70	Artefacts	Grade IIIc
128874	ALP71	Allepad 71	Artefacts	Grade IIIc
128875	ALP72	Allepad 72	Artefacts	Grade IIIc
128884	ALP81	Allepad 81	Artefacts	Grade IIIc
128885	ALP82	Allepad 82	Artefacts	Grade IIIc
128886	ALP83	Allepad 83	Artefacts	Grade IIIc
128887	ALP84	Allepad 84	Artefacts	Grade IIIc
128880	ALP77	Allepad 77	Artefacts	Grade IIIc
128881	ALP78	Allepad 78	Artefacts	Grade IIIc

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128882	ALP79	Allepad 79	Artefacts	Grade IIIc
128883	ALP80	Allepad 80	Artefacts	Grade IIIc
128892	ALP89	Allepad 89	Artefacts	Grade IIIc
128893	ALP90	Allepad 90	Artefacts	Grade IIIc
128895	ALP91	Allepad 91	Artefacts	Grade IIIc
128897	ALP92	Allepad 92	Artefacts	Grade IIIc
128888	ALP85	Allepad 85	Artefacts	Grade IIIc
128889	ALP86	Allepad 86	Artefacts	Grade IIIc
128890	ALP87	Allepad 87	Artefacts	Grade IIIc
128891	ALP88	Allepad 88	Artefacts	Grade IIIc
128902	ALP97	Allepad 97	Artefacts	Grade IIIc
128903	ALP98	Allepad 98	Artefacts	Grade IIIc
128904	ALP99	Allepad 99	Artefacts	Grade IIIc
128905	ALP100	Allepad 100	Artefacts	Grade IIIc
128898	ALP93	Allepad 93	Artefacts	Grade IIIc
128899	ALP94	Allepad 94	Artefacts	Grade IIIc
128900	ALP95	Allepad 95	Artefacts	Grade IIIc
128901	ALP96	Allepad 96	Artefacts	Grade IIIc
128836	ALP42	Allepad 42	Artefacts	Grade IIIc
128837	ALP43	Allepad 43	Artefacts	Grade IIIc
128838	ALP44	Allepad 44	Artefacts	Grade IIIc
128839	ALP45	Allepad 45	Artefacts	Grade IIIc
128831	ALP38	Allepad 38	Artefacts	Grade IIIc
128833	ALP39	Allepad 39	Artefacts	Grade IIIc
128834	ALP40	Allepad 40	Artefacts	Grade IIIc

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128835	ALP41	Allepad 41	Artefacts	Grade IIIc
128846	ALP50	Allepad 50	Artefacts	Grade IIIc
128852	ALP51	Allepad 51	Artefacts	Grade IIIc
128853	ALP51	Allepad 51	Artefacts	Grade IIIc
128854	ALP52	Allepad 52	Artefacts	Grade IIIc
128840	ALP46	Allepad 46	Artefacts	Grade IIIc
128841	ALP47	Allepad 47	Artefacts	Grade IIIc
128842	ALP48	Allepad 48	Artefacts	Grade IIIc
128844	ALP49	Allepad 49	Artefacts	Grade IIIc
128859	ALP57	Allepad 57	Artefacts	Grade IIIc
128860	ALP58	Allepad 58	Artefacts	Grade IIIc
128861	ALP59	Allepad 59	Artefacts	Grade IIIc
128862	ALP60	Allepad 60	Artefacts	Grade IIIc
128855	ALP53	Allepad 53	Artefacts	Grade IIIc
128856	ALP54	Allepad 54	Artefacts	Grade IIIc
128857	ALP55	Allepad 55	Artefacts	Grade IIIc
128858	ALP56	Allepad 56	Artefacts	Grade IIIc
128867	ALP65	Allepad 65	Artefacts	Grade IIIc
128868	ALP66	Allepad 66	Artefacts	Grade IIIc
128869	ALP67	Allepad 67	Artefacts	Grade IIIc
128870	ALP68	Allepad 68	Artefacts	Grade IIIc
128863	ALP61	Allepad 61	Artefacts	Grade IIIc
128864	ALP62	Allepad 62	Artefacts	Grade IIIc
128865	ALP63	Allepad 63	Artefacts	Grade IIIc
128866	ALP64	Allepad 64	Artefacts	Grade IIIc

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128800	ALP10	Allepad 10	Artefacts	Grade IIIc
128801	ALP11	Allepad 11	Artefacts	Grade IIIc
128802	ALP12	Allepad 12	Artefacts	Grade IIIc
128804	ALP13	Allepad 13	Artefacts	Grade IIIc
128789	ALP6	Allepad 6	Artefacts	Grade IIIc
128790	ALP7	Allepad 7	Artefacts	Grade IIIb
128798	ALP8	Allepad 8	Artefacts	Grade IIIc
128799	ALP9	Allepad 9	Artefacts	Grade IIIc
128809	ALP18	Allepad 18	Artefacts	Grade IIIc
128810	ALP19	Allepad 19	Burial Grounds & Graves	Grade II
128811	ALP20	Allepad 20	Artefacts	Grade IIIc
128812	ALP21	Allepad 21	Artefacts	Grade IIIc
128805	ALP14	Allepad 14	Artefacts	Grade IIIc
128806	ALP15	Allepad 15	Artefacts	Grade IIIc
128807	ALP16	Allepad 16	Artefacts	Grade IIIc
128808	ALP17	Allepad 17	Artefacts	Grade IIIc
128817	ALP26	Allepad 26	Artefacts	Grade IIIc
128818	ALP27	Allepad 27	Artefacts	Grade IIIc
128819	ALP28	Allepad 28	Artefacts	Grade IIIc
128820	ALP29	Allepad 29	Artefacts	Grade IIIc
128813	ALP22	Allepad 22	Artefacts	Grade IIIc
128814	ALP23	Allepad 23	Artefacts	Grade IIIc
128815	ALP24	Allepad 24	Artefacts	Grade IIIc
128816	ALP25	Allepad 25	Artefacts	Grade IIIc
128825	ALP34	Allepad 34	Artefacts	Grade IIIc

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128826	ALP35	Allepad 35	Artefacts	Grade IIIc
128827	ALP36	Allepad 36	Artefacts	Grade IIIc
128829	ALP37	Allepad 37	Artefacts	Grade IIIc
128821	ALP30	Allepad 30	Artefacts	Grade IIIc
128822	ALP31	Allepad 31	Artefacts	Grade IIIc
128823	ALP32	Allepad 32	Artefacts	Grade IIIc
128824	ALP33	Allepad 33	Artefacts	Grade IIIc
89506	DYA015	DYASON'S KLIP 454/015	Artefacts	Grade IIIc
89507	DYA016	DYASON'S KLIP 454/016	Artefacts	Grade IIIc
89509	DYA018	DYASON'S KLIP 454/018	Artefacts	Grade IIIc
89510	DYA019	DYASON'S KLIP 454/019	Artefacts	Grade IIIa
89502	DYA011	DYASON'S KLIP 454/011	Artefacts	Grade IIIc
89503	DYA012	DYASON'S KLIP 454/012	Artefacts	Grade IIIc
89504	DYA013	DYASON'S KLIP 454/013	Artefacts	Grade IIIc
89505	DYA014	DYASON'S KLIP 454/014	Artefacts	Grade IIIc
89516	DYA025	DYASON'S KLIP 454/025	Artefacts	Grade IIIc
89517	DYA026	DYASON'S KLIP 454/026	Artefacts	Grade IIIc
89518	DYA027	DYASON'S KLIP 454/027	Artefacts	Grade IIIc
89519	DYA028	DYASON'S KLIP 454/028	Artefacts	Grade IIIc
89511	DYA020	DYASON'S KLIP 454/020	Artefacts	Grade IIIc
89512	DYA021	DYASON'S KLIP 454/021	Artefacts	Grade IIIc
89514	DYA023	DYASON'S KLIP 454/023	Artefacts	Grade IIIc
89515	DYA024	DYASON'S KLIP 454/024	Artefacts	Grade IIIc
89490	DYA003	DYASON'S KLIP 454/003	Artefacts	Grade IIIc
89493	DYA006	DYASON'S KLIP 454/006	Artefacts	Grade IIIa

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89497	DYA009	DYASON'S KLIP 454/009	Artefacts	Grade IIIc
89508	DYA017	DYASON'S KLIP 454/017	Artefacts	Grade IIIc
89520	DYA029	DYASON'S KLIP 454/029	Artefacts	Grade IIIc
89522	DYA031	DYASON'S KLIP 454/031	Artefacts	Grade IIIc
89488	DYA001	DYASON'S KLIP 454/001	Artefacts	Grade IIIc
89489	DYA002	DYASON'S KLIP 454/002	Artefacts	Grade IIIc
128785	ALP2	ALP2	Artefacts	Grade IIIc
128786	ALP3	ALP3	Artefacts	Grade IIIc

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## APPENDIX 2 Reference List

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
4103	AIA	Cobus Dreyer	10/03/2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape
4112	AIA	Peter Beaumont	29/01/2008	Phase 1 Heritage Impact Assessment Report on a Portion of the Farm Keboes 37, near Kanoneiland, Siyanda District Municipality, Northern Cape Province
4123	AIA	Peter Beaumont	01/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Residential Development Flanking Dakota Drive in Upington, //Khara Hais Municipality, Northern Cape Province
4101	AIA	Peter Beaumont	22/10/2005	Archaeological Impact Assessment at and in the Vicinity of a Quartzite Quarry on Portion 4 of the Farm Droogehout 442 near Upington
4103	AIA	Cobus Dreyer	10/03/2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape
4135	AIA	Peter Beaumont	20/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Raaswater Township, Siyanda District Municipality, Northern Cape Province
4136	AIA	Peter Beaumont	22/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of Kalksloot Settlement, Siyanda District Municipality, Northern Cape
7547	AIA	Jaco van der Walt	30/10/2011	AIA for the proposed OfriZX Photovoltaic Plant, Keimoes, Northern Cape
7548	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed Ofir ZX Photovoltaic Plant near Keimoes, Northern Cape
4124	AIA	Peter Beaumont	24/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Settlement in Upington, //Khara Hais Municipality, Northern Cape Province
4131	AIA	Peter Beaumont	18/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Keimoesweg, //Khara Hais Municipality, Northern Cape Province
4133	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Township Extension Flanking Lemoendraai in Upington, //Khara Hais Municipality, Northern Cape Province
4134	AIA	Peter Beaumont	19/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Industrial Area Expansion at Laboria, //Khara Hais

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				Municipality, Northern Cape Province
119309	HIA	Stephan Gaigher	10/10/2012	HERITAGE IMPACT ASSESSMENT REPORT Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
124405	HIA	Stephan Gaigher	29/10/2013	Heritage Impact Assessment Report for the Proposed Sirius Solar Project near Upington in the Northern Cape Province
124406	PIA	JF Durand	02/04/2013	Palaeontology Scoping Report
128281	HIA	David Morris	30/07/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Scoping phase Heritage Input
7841	AIA	Peter Beaumont	17/08/2006	Phase 1 Heritage Impact Assessment Report on a Planned Extension of the Rosedale Township, //Khara Hais Municipality, Northern Cape Province
7853	AIA	Jaco van der Walt	31/07/2011	Heritage Scoping Report for the proposed S Kol Photovoltaic Plant near Keimoes, Northern Cape
7925	AIA	Jaco van der Walt	31/10/2011	AIA for the proposed S-Kol Photovoltaic Plant, Keimoes, Northern Cape
117902	HIA	Anton van Vollenhoven	25/05/2012	A REPORT ON A HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED SASOL CSP PROJECT NEAR UPINGTON IN THE NORTHERN CAPE PROVINCE
131589	AIA	Stephan Gaigher	22/02/2013	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
159203	HIA	Johnny Van Schalkwyk	11/03/2014	Cultural Heritage Impact Assessment Proposed Township development of Erf 1, UPINGTON, //KHARA HAIS MUNICIPALITY
160008	HIA	Johnny Van Schalkwyk	15/03/2014	Cultural Heritage Impact Assessment for the proposed township development, Paballelo, Upington, //Khara Hais Municipality
161427	HIA	Stephan Gaigher	15/04/2014	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province
166079	HIA	Johnny Van Schalkwyk	12/03/2014	Proposed extension of Dakota Road, Upington
158920	HIA	David Morris	01/02/2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Archaeological Impact Assessment proposed central development footprint
159068	PIA	John E Almond	07/03/2014	PALAEONTOLOGICAL HERITAGE BASIC ASSESSMENT: DESKTOP STUDY Proposed RE Capital 3 Solar Development on the property Dyason's Klip near Upington , Northern Cape
174596	PIA	John E Almond	05/08/2013	RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES: PROPOSED UPGRADE & REPAIR OF WATER SUPPLY INFRASTRUCTURE, EKSTEENSKUIL, SOVERBY & CURRIES CAMP NEAR KEIMOES, NORTHERN CAPE

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289187	HIA	Jaco van der Walt	01/06/2015	Heritage Scoping Report for the proposed Bloemsmond Solar 1 and Solar 2 PV Project, Keimoes, NC Province
170520	HIA	Johnny Van Schalkwyk	01/01/2014	Heritage Impact Assessment Report for the proposed 1GW Upington Solar Park within the // Khara Hais Municipality, Northern Cape Province
174335	HIA	Wouter Fourie	24/03/2014	Heritage Impact Assessment for the proposed Solar Power Park for SolarReserve SA (Pty) Ltd, Farm Rooipunt 617, Gordonia RD, Siyanda District Municipal Region, Northern Cape.
174592	HIA	Cobus Dreyer	05/09/2013	FIRST PHASE ARCHAEOLOGICAL & HERITAGE ASSESSMENT OF THE BORROW PITS FOR THE REPAIR & UPGRADE OF THE IRRIGATION INFRASTRUCTURE AT SOVERBY & CURRIES CAMP NEAR KEIMOOES, NORTHERN CAPE PROVINCE

## APPENDIX 3 - Keys/Guides

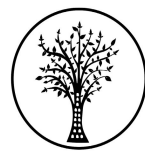
### Key/Guide to Acronyms

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

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### Full guide to Palaeosensitivity Map legend

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

## 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.

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### **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.

**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.**

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This recommendation is made when:

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

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

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

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

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

**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.

The compilation of the Heritage Screener will not include any field assessment. The Heritage Screener will be submitted to the applicant within 24 hours from receipt of full payment. **If the 24-hour deadline is not met by CTS, the applicant will be refunded in full.**

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## APPENDIX 4: Specialist CVs and Declaration of Independence