

**ARCHAEOLOGICAL IMPACT ASSESSMENT  
THE PROPOSED KEREN ENERGY KAKAMAS  
SOLAR FARM ON ERF 1654  
KAKAMAS  
NORTHERN CAPE PROVINCE**

Prepared for:

**ENVIROAFRICA**

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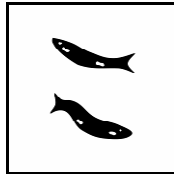
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## Executive summary

The Agency for Cultural Resource Management was commissioned to conduct an Archaeological Impact Assessment (AIA) for the proposed construction and operation of a 10 Mega Watt (MW) commercial Concentrated Photovoltaic (CPV) Energy Generation Facility on Erf 1654 in Kakamas in the Northern Cape.

Kakamas is situated alongside the Orange River, about 80 kms west of Upington. The site for the proposed solar farm is located south of the town and just to the west of the Waste Water Treatment Works. The land is owned by the Kai Garib local municipality and is currently zoned for Agriculture use. The proposed 20 ha footprint area is fairly flat and slopes gently north toward the town. It is surrounded by hill slopes in the east. Several drainage channels intersect the site, draining south toward the town. The proposed footprint area is quite severely degraded. There is very little natural vegetation on the site. It is overgrazed, heavily sheet washed and covered in quartz gravel.

In terms of Section 38 (1) (c) (iii) of the National Heritage Resources Act 1999 (Act 25 of 1999), an Archaeological Impact Assessment of the proposed project is required if the footprint area of the proposed development is more than 5000 m<sup>2</sup>.

The AIA forms part of the Environmental Basic Assessment process that is being conducted by EnviroAfrica cc.

The aim of the study is to locate and map archaeological sites/remains that may be impacted by the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate the impacts.

A 1-day, foot survey of the proposed 20 ha footprint area, and a proposed  $\pm$  1 km long overhead powerline was undertaken by the archaeologist on 1 March 2012.

The following observations were made:

- 41 single, isolated archaeological occurrences were documented and mapped with a hand held GPS unit. The tools are spread very thinly and unevenly over the surrounding landscape. Most of the lithics (about 70%) are assigned to the Later Stone Age and the remainder to the Middle Stone Age. No Early Stone Age implements were found. The majority (78%) of the tools are in banded ironstone, with the remainder in indurated shale, quartzite, silcrete and quartz. Quartz gravel is prolific over the site making it difficult to detect such tools. No evidence of any factory or workshop site, or the result of any human settlement was identified. No organic remains such as bone, pottery, or ostrich eggshell were found.

Most of the tools comprise flakes and chunks which are utilised and/or retouched. Several flake blades in banded ironstone and indurated shale were also found. At least 10 cores/minimal cores and chunks (with one or more flake scars) were counted. This amounts to 24% of the stone artefact assemblage, indicating a relatively high level of stone fabrication on the site. One large quartzite hammerstone was also found.

## Archaeological study proposed solar energy farm near Kakamas

Frequencies of formal retouched tools are very low; one MRP/convex scraper, one flat convex quartz scraper and one side scraper were found. Six miscellaneous retouched pieces were found, including one MSA pointed flake with a retouched tip.

There are no graves on the affected property.

In terms of the built environment, no old buildings, structures, or features, old equipment, public memorial or monuments occur in or beyond the footprint area.

As archaeological sites are concerned, the occurrences are lacking in context and no organic remains such as bone, pottery or ostrich eggshell was found. There is no spatial patterning to the distribution of finds. The fairly small numbers and isolated and disturbed context in which they were found means that the archaeological remains on Erf 1654 have been rated as having low archaeological (Grade 3C) significance.

The results of the study indicate that the proposed development of the Keren Energy Kakamas Solar Farm will not have an impact of great significance on these and potentially other archaeological remains.

Indications are that in terms of archaeological heritage, the proposed activity (i. e. the construction of a solar energy farm) is viable and no fatal flaws have been identified.

With regard to the proposed development of the Keren Energy Kakamas Solar Farm on Erf 1654, the following recommendations are made:

1. No further archaeological mitigation is required.
2. Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency (SAHRA) (Att Ms Mariagrazia Galimberti 021 462 4502). Burials, etc must not be removed or disturbed until inspected by the archaeologist.

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## **1. INTRODUCTION**

### **1.1 Background and brief**

Keren Energy Kakamas (Pty) Ltd, commissioned the Agency for Cultural Resource Management to conduct an Archaeological Impact Assessment (AIA) for the proposed construction and operation of a 10 MW Concentrated Photovoltaic (CPV) Energy Generation Facility on Erf 1654 in Kakamas in the Northern Cape (Figures 1 & 2). The proposed development is situated within the Kai Garib municipality. Erf 1654 is zoned for Agriculture and is owned by the local authority.

The Northern Cape has the highest levels of Solar Irradiance in South Africa, which makes the location of the proposed development ideal for solar energy generation. The renewable energy industry is currently experiencing an explosive growth worldwide. In South Africa, while such energy sources are not expected to replace the country's traditional reliance and dependency on coal-generated power, the National Energy Regulator of South Africa (NERSA) has published a favourable feed-in tariff structure for renewable energy that allows for independent clean energy producers to invest in renewable energy resources. The growing alternative energy industry is considered to be of national importance in anticipation of its contribution to electricity supply and reduced reliance of non-renewable energy sources.

It is in this context that the applicant proposes to construct and operate a commercial solar energy facility in Kakamas. The proposed activity entails the construction of about 140 CPV solar panels covering a footprint area of about 20 ha (Figure 3). The CPV panels will be mounted on pedestals drilled and set into the ground. Extensive bedrock excavations are not envisaged, but some vegetation may need to be cleared from the site. Associated infrastructure includes single track internal access roads, trenches for underground cables, transformer pads, a switching station, a maintenance shed, and a temporary construction camp. The electricity generated from the project will be fed directly into the national grid via a proposed  $\pm 1$  km overhead powerline linking to the Eskom Kakamas substation which is situated northwest of the proposed facility.

The AIA forms part of the Environmental Basic Assessment process that is being conducted by EnviroAfrica cc.

The aim of the study is to locate and map archaeological sites/remains that may be impacted by the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate the impacts.

## **2. HERITAGE LEGISLATION**

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m<sup>2</sup> is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))

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- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

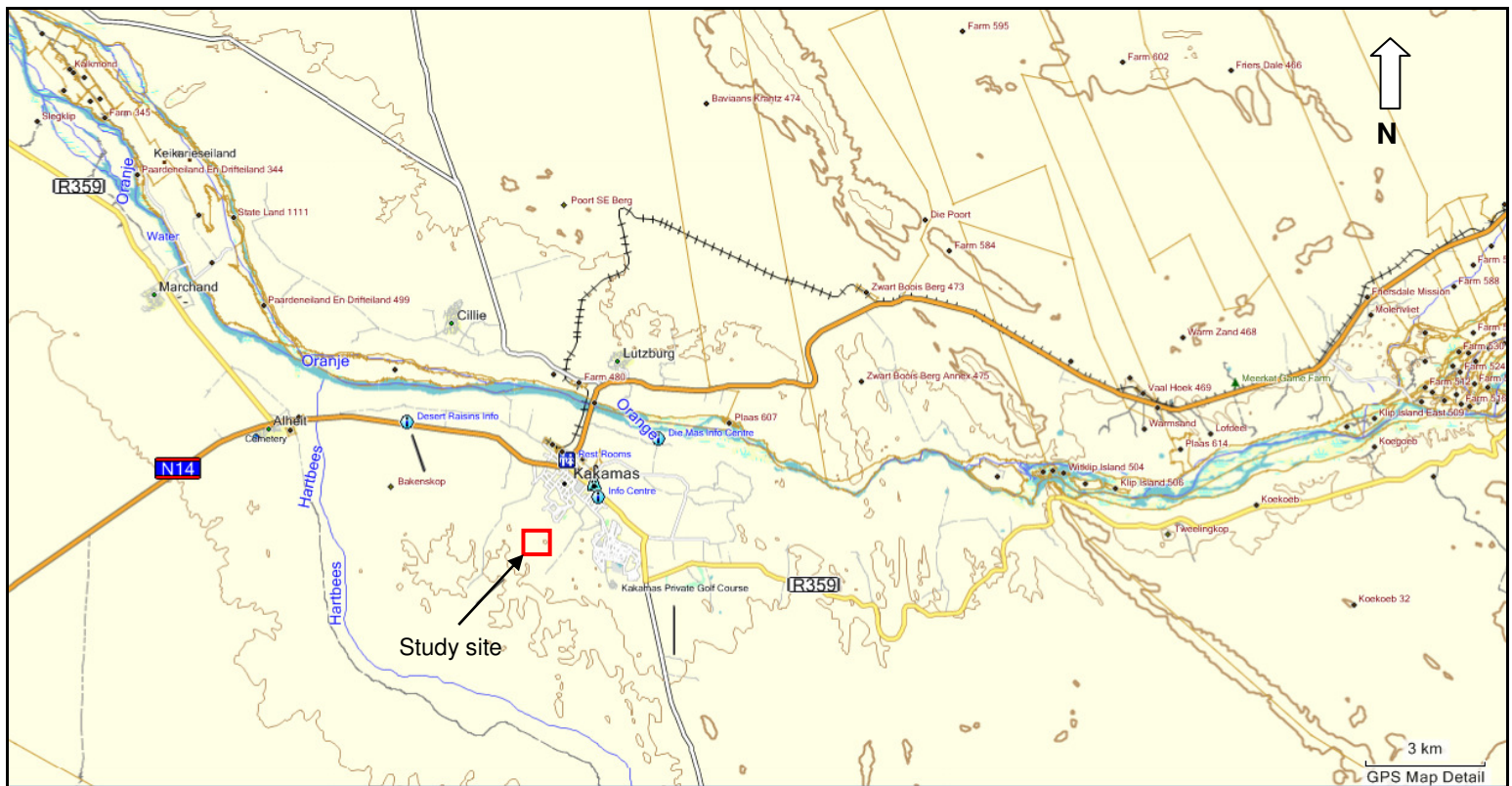


Figure 1. Locality Map

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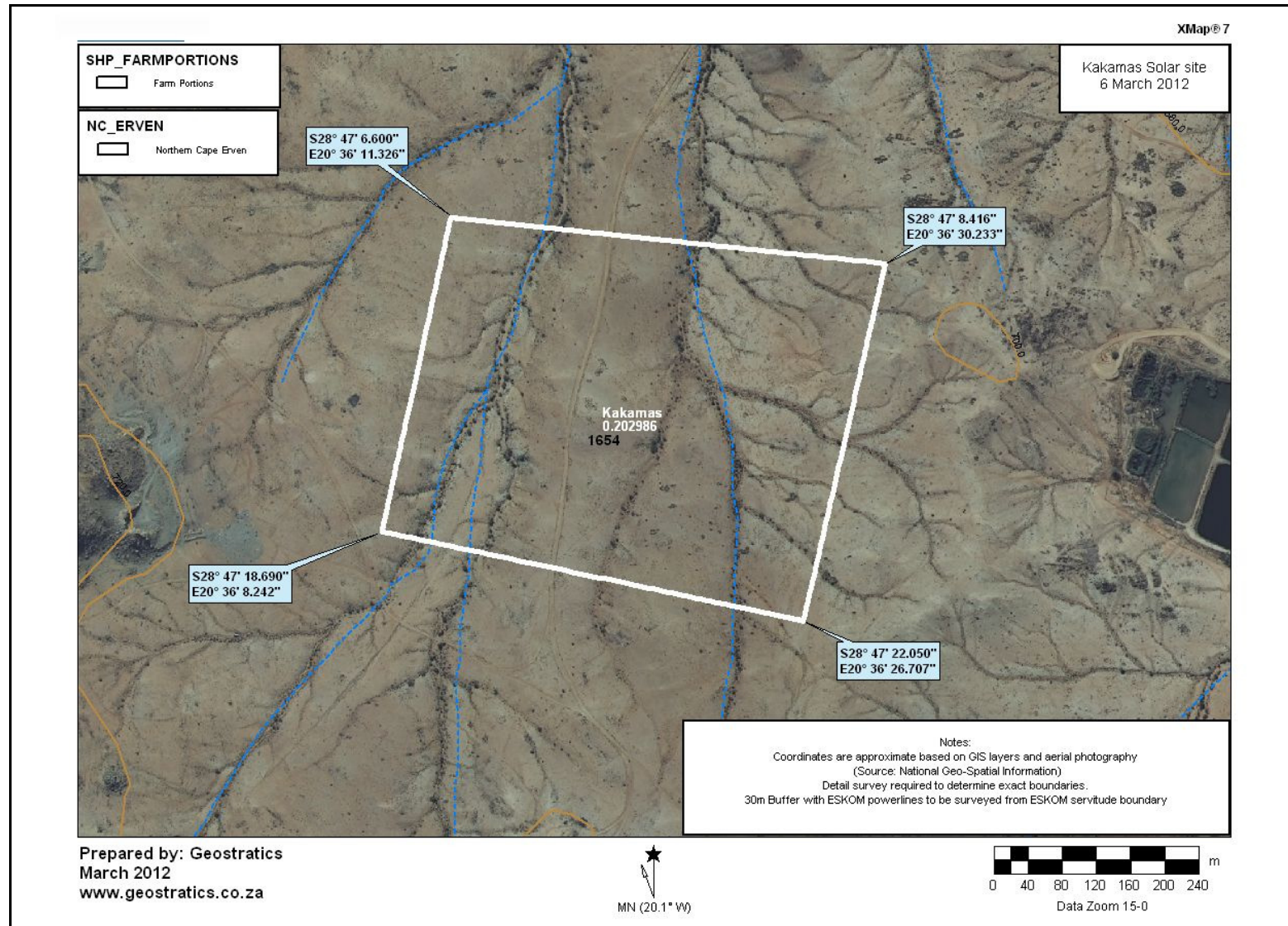


Figure 2. Aerial photograph of the footprint area for the proposed Kakamas solar energy farm

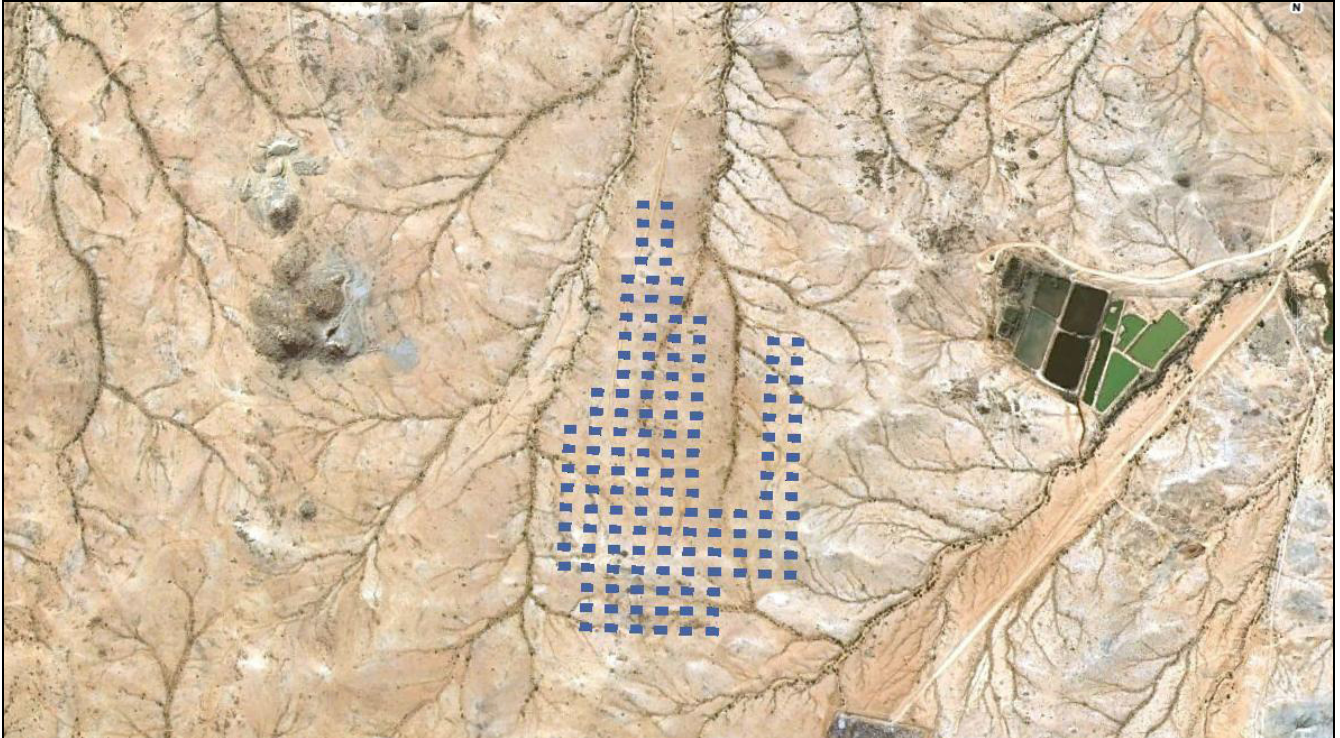


Figure 3. Proposed layout of the Kakamas solar modules on Erf 1654.

### 3. TERMS OF REFERENCE

The terms of reference for the study were to.

- Determine whether there are likely to be any important archaeological resources that may potentially be impacted by the proposed project, including the erection of the solar panels, internal access roads, trenches for underground cables, and any other associated infrastructure;
- Indicate any constraints that would need to be taken into account in considering the development proposal;
- Identify potentially sensitive archaeological areas, and
- Recommend any further mitigation action.

### 4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

An aerial photograph indicating the location site of the proposed Keren Energy Kakamas Solar Energy Farm is illustrated in Figure 4.

Kakamas is located alongside the Orange River, about 80 kms west of Upington on the N14. The site (Erf 1654) for the proposed solar farm is located south of the town and just to the west of the Waste Water Treatment Works. The proposed 20 ha footprint area is fairly flat and slopes gently north toward the town. It is surrounded by hill slopes in the



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east. Several drainage channels intersect the site, draining south toward the town. The proposed footprint area is quite severely degraded. Apart from fairly dense vegetation alongside the drainage channels, there is very little natural vegetation occurring on the proposed site. It is overgrazed, heavily sheet washed and covered in quartz gravel (Figures 5-8).

The route for the proposed  $\pm 1$  km long overhead powerline has not yet been established but it would cross several drainage channels and an undulating landscape, and could be aligned alongside a gravel road that leads all the way to the existing Kakamas sub station. The receiving environment is quite severely degraded.

There are no old buildings, structures or features or any old equipment on the proposed site.

There are no public memorials or monuments on the site.

There are no visible graves on the proposed site, or within the proposed footprint area of the proposed solar farm.

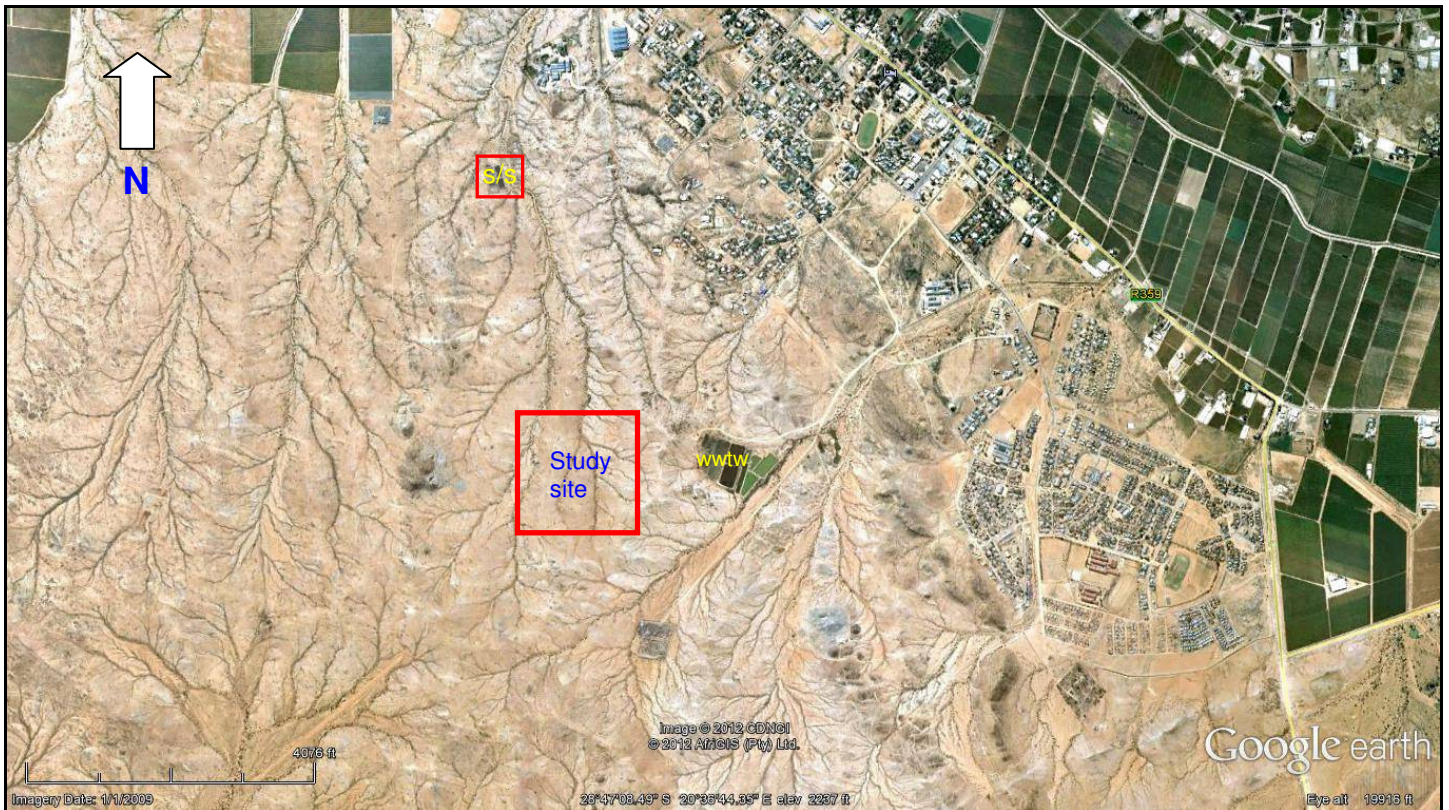


Figure 4. Aerial photograph of the proposed site for Kakamas Solar Energy Farm. Note the Kakamas substation (s/s) north west of the study site.

Archaeological study proposed solar energy farm near Kakamas



Figure 5. View overlooking the study site facing west



Figure 6. View of the proposed site facing north west

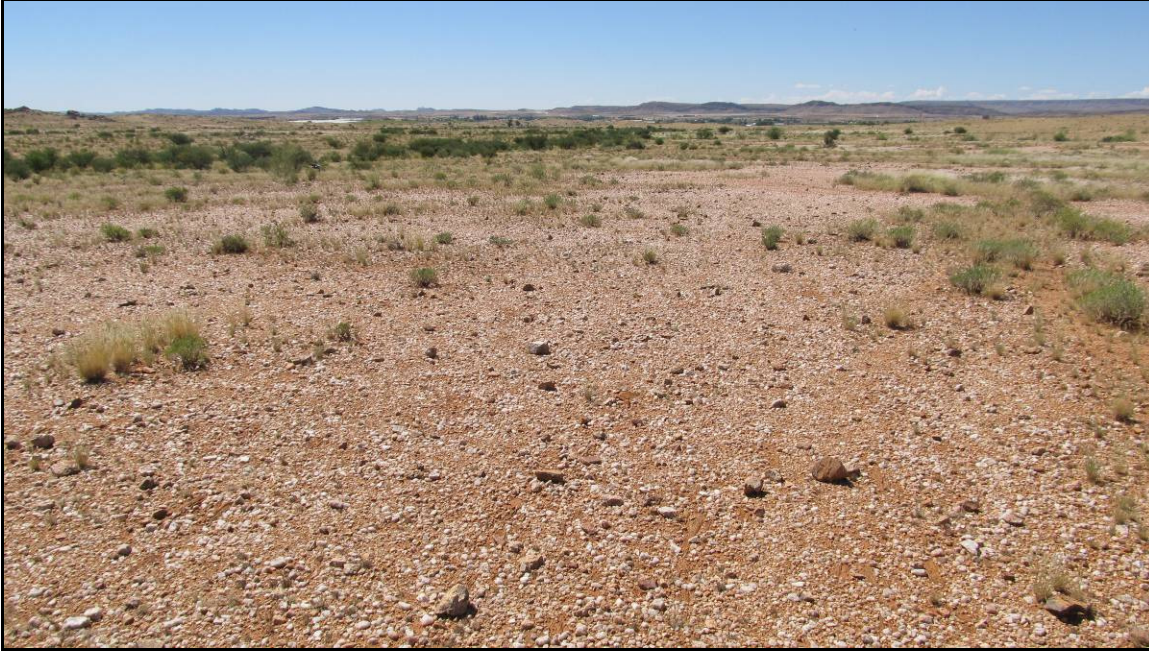


Figure 7. View of the proposed site facing north west. Not the heavy sheet wash and quartz stone

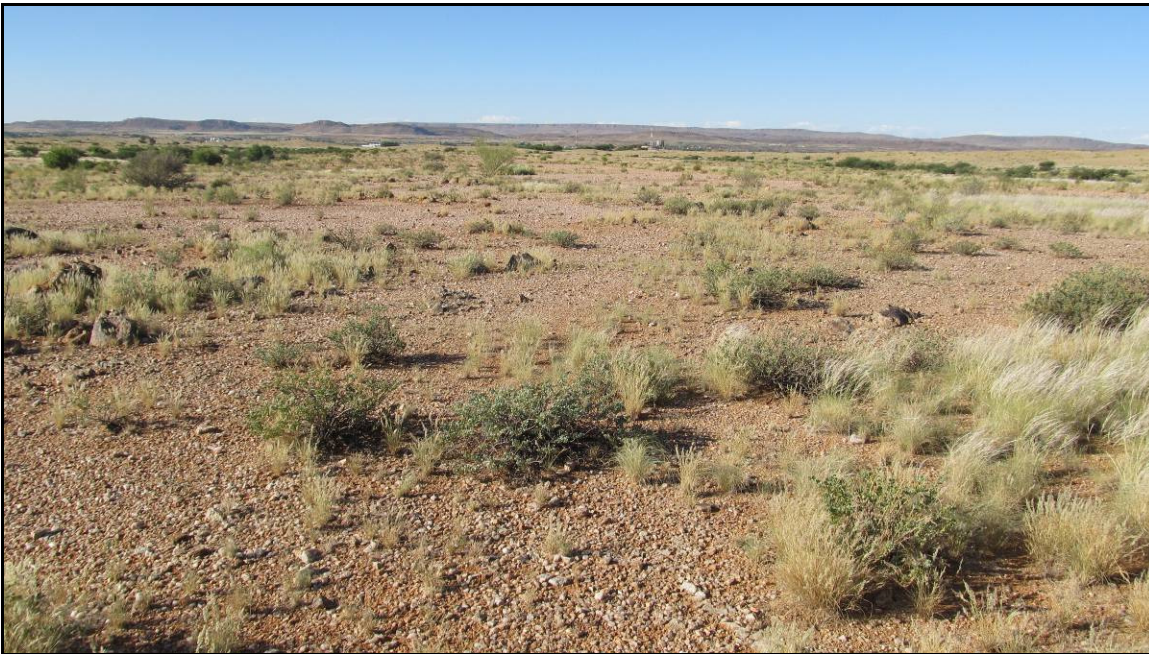


Figure 8. View of the proposed site facing north. Note the heavy sheet wash

## **5. STUDY APPROACH**

### **5.1 Method of survey**

A detailed and controlled survey of the proposed footprint area, and the proposed  $\pm 1$  km long overhead powerline was undertaken by J Kaplan on 1 March, 2012. The survey was undertaken on foot. Unfortunately, a GPS track path was not logged. All archaeological occurrences documented during the study were mapped in-situ using a hand-held Garmin Oregon 300 GPS unit set on the map datum WGS 84 (refer to Figure 12 & 13 in Appendix I). A collection of tools were also photographed. A desk top study was done.

### **5.2 Constraints and limitations**

There were no constraints or limitations associated with the study. Overall, archaeological visibility was very good.

### **5.3 Identification of potential risks**

Pre-colonial archaeological heritage (i. e. stone implements) will be impacted by the proposed development, but the numbers are very small and they occur in a severely disturbed and degraded context.

Apart from trenches for underground cabling, limited bedrock excavations are envisaged. The solar panels will be raised about 2 m above ground and mounted on small footings drilled and set into the ground. The excavations for the footings are about 1-1.5 m in diameter and so the actual ground disturbance will be quite limited and contained. Much of the top soils have already been washed away due to heavy sheet wash and erosion.

### **5.4 Results of the desk top study**

The archaeology of the Northern Cape is rich and varied covering long spans of human history. According to Beaumont et al (1995:240) “thousands of square kilometres of Bushmanland are covered by a low density lithic scatter”. Very little archaeological work has been done in Kakamas. Stone artefacts in banded ironstone and indurated shale were documented in the road reserve during a survey for a water pipeline between Kakamas and Kenhardt (Kaplan 2008). Orton (2012) recently recorded very low density scatters of LSA and MSA tools in quartz, indurated shale and banded ironstone during a survey for a proposed solar farm near the Augrabies Falls National Park. Orton (2012) also describes an archaeological sequence in the Augrabies Falls region based on the work of others which spans the Early, Middle and Later Stone Age pre-colonial history in the region. Much of the information has been generated by excavations of open scatters of stone artefacts, pottery and ostrich eggshell, as well as excavations of several small shelters near the Augrabies Falls and the town of Augrabies.

Orton (2012) also notes that many skeletons, most dating to the 18<sup>th</sup> and 19<sup>th</sup> Centuries have been exhumed from the area between Augrabies and Upington in the late 1930s. Historical sites and remains (such as forts) relating to events such as the Anglo Boer War are also well preserved in the region, including the presence of war graves in Kakamas, Pofadder and Keimoes. Orton (2012) also notes that the water related infrastructure in the Kakamas area was important for agricultural development and

several water wheels and excavated tunnels and leiwaters/furrows in Kakamas have been declared Provincial Heritage Sites.

## **6. FINDINGS**

Forty-one single, isolated archaeological occurrences were documented and mapped with a hand held GPS unit. A description of the archaeological finds located during the study is presented in Table A in Appendix I.

All the tools documented during the study are spread very thinly and unevenly over the surrounding landscape. There is no spatial integrity to any of the finds. Most of the lithics (about 70%) are assigned to the Later Stone Age and the remainder to the Middle Stone Age. No Early Stone Age implements were found. The majority (78%) of the tools are in banded ironstone, with the remainder in indurated shale, quartzite, silcrete and quartz. Banded ironstone is known to have been a favoured raw material for making stone artefacts and occurs on a number of sites that have been documented by the archaeologist and others throughout the Northern Cape. Quartz gravel is prolific over the site making it difficult to detect such tools. No evidence of any factory or workshop site, or the result of any human settlement was identified. No organic remains such as bone, pottery, or ostrich eggshell were found.

Most of the tools comprise flakes and chunks which are utilised and/or retouched. Several flake blades in banded ironstone and indurated shale were also counted. At least 10 cores/minimal cores and flaked chunks (with one or more flake scars) were counted. This amounts to 24% of the stone artefact assemblage, indicating a relatively high level of stone fabrication on the site. One quartzite hammerstone (005) was found.

Frequencies of formal retouched tools are very low; one MRP/convex scraper (008), one flat convex quartz scraper (012) and one side scraper (026) were found. Six miscellaneous retouched pieces were found, including one MSA pointed flake with a retouched tip (040).

There are no graves on the affected property.

No old buildings, structures, or features, old equipment, public memorial or monuments occur in the footprint area.

No other colonial heritage resources were noted during the study.

A collection of tools documented during the study are illustrated in Figures 9-11.

### **6.1 Significance of the archaeological remains**

All of the lithics documented during the study comprise isolated occurrences that are spread thinly and unevenly over the surrounding landscape. No evidence of any factory or workshop site, or the result of any human settlement was identified. As archaeological sites are concerned, the occurrences are lacking in context as no organic remains such as bone, pottery or ostrich eggshell was found. The receiving environment is also degraded.

The relatively small numbers isolated and disturbed context in which they were found means that the archaeological remains have been rated as having low archaeological (Grade 3C) significance.



Figure 9. Quartzite hammerstone (005). Note the pecking on the tip of the cobble



Figure 10. Collection of tools from Erf 1654. Scale is in cm



Figure 11. Collection of tools from Erf 1654. Scale is in cm

## 7. ASSESSMENT OF IMPACTS

In the case of the proposed Keren Energy Kakamas Solar Energy Farm it is expected that the overall impact on important archaeological resources will be low (Table 1).

<b>Potential impacts on archaeological heritage</b>	
Extent of impact:	Site specific
Duration of impact;	Permanent
Intensity	Low
Probability of occurrence:	Probable
Significance without mitigation	Low
Significance with mitigation	Negative
Confidence:	High

Table 1. Assessment of archaeological impacts.

## 8. CONCLUSION

Development of the proposed Keren Energy Kakamas solar energy facility on Erf 1654 will have a very limited impact on archaeological heritage resources.

The study has identified no significant impacts to pre-colonial archaeological material that will need to be mitigated prior to development activities commencing.

Indications are that in terms of archaeological heritage, the proposed activity is viable and no fatal flaws have been identified.

## 9. RECOMMENDATIONS

With regard to the proposed construction and operation of a 10 MW solar energy facility on Erf 1654 in Kakamas, the following recommendations are made:

1. No further archaeological mitigation is required.
2. Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency (SAHRA) (Att Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by the archaeologist.

## 10. REFERENCES

Beaumont, P.B. & Vogel, J.C. 1984. Spatial patterning of the ceramic Later Stone Age in the Northern Cape Province, South Africa. In: Hall, M., Avery, G., Avery, D.M., Wilson, M.L. & Humphreys, A.J.B. (Eds) *Frontiers: southern African archaeology today: 80-95*. Oxford: British Archaeological Reports International Series 207.

Kaplan, J. 2012. Agency for Cultural Resource Management, the proposed Keren Energy Keimoes Solar Plant on Erf 1654, Kakamas. Report prepared for EnviroAfrica. Agency for Cultural Resource Management.

Kaplan, J. 2008. Phase 1 Archaeological Impact Assessment proposed construction of a water treatment plant and supply pipeline from Keimoes to Kenhardt, Western Cape Province. Report prepared for EnviroAfrica. Agency for Cultural Resource Management.

Orton, J. 2012. Heritage Impact Assessment for the proposed Augrabies Solar Energy Facility, Kenhardt Magisterial District, Northern Cape. Report prepared for Rosenthal Environmental. Archaeology Contracts Office, University of Cape Town.



Appendix I

Archaeological study proposed solar energy farm near Kakamas

Name of Site	Name of Farm	Lat/Long	Finds
	Erf 1654 Kakamas		
001		S28 47.127 E20 36.484	Round quartz <b>core</b>
002		S28 47.094 E20 36.437	Indurated shale blade ( <b>MSA</b> )
003		S28 47.025 E20 36.437	Pink quartz chunk
004		S28 47.095 E20 36.428	Snapped/broken utilized chunk, & weathered flake
005		S28 47.101 E20 36.438	Large round quartzite <b>hammerstone</b>
006		S28 47.123 E20 36.436	Weathered retouched and utilized <b>MSA</b> flake blade
007		S28 47.131 E20 36.423	Utilized, retouched cortex chunk/ <b>min core</b>
008		S28 47.159 E20 36.430	MRP/? <b>scraper</b>
009		S28 47.172 E20 36.426	Quartz chunk
010		S28 47.160 E20 36.436	Weathered indurated shale chunk
011		S28 47.397 E20 36.425	Round <b>core</b>
012		S28 47.240 E20 36.431	Flat pink quartz ? <b>convex scraper</b>
013		S28 47.311 E20 36.424	Butt end of broken flake
014		S28 47.314 E20 36.426	Weathered flaked chunk
015		S28 47.404 E20 36.426	Weathered cobble chunk/cortex
016		S28 47.441 E20 36.427	Cobble <b>core</b>
017		S28 47.251 E20 36.402	Large flake & weathered indurated shale <b>core</b>
018		S28 47.179 E20 36.371	Utilised & misc retouched flake
019		S28 47.233 E20 36.388	<b>MSA</b> flake
020		S28 47.295 E20 36.411	Snapped quartzite flake blade (? <b>MSA</b> )
021		S28 47.300 E20 36.419	Parallel flaked chunk/ <b>core</b>
022		S28 47.318 E20 36.410	Pink quartz ? <b>core</b>
023		S28 47.360 E20 36.405	Chunk
024		S28 47.405 E20 36.413	Chunky <b>silcrete MSA</b> flake
025		S28 47.383 E20 36.360	Weathered cobble/chunk
026		S28 47.335 E20 36.346	Burnished <b>side scraper</b>
027		S28 47.334 E20 36.342	Large quartz chunk
028		S28 47.333 E20 36.318	Weathered cobble
029		S28 47.348 E20 36.312	Pointed side retouched <b>MSA</b> flake
030		S28 47.427 E20 36.336	Flat retouched/utilized flake
031		S28 47.404 E20 36.304	Retouched flake & chunk/ <b>min core</b>
032		S28 47.324 E20 36.316	Snapped <b>MSA</b> double sided retouched quartzite flake
033		S28 47.242 E20 36.364	Chunky <b>silcrete MSA</b> flake
034		S28 47.307 E20 36.361	Large round quartz <b>core</b>
035		S28 47.326 E20 36.298	Large chunky <b>MSA</b> quartzite flake/blade
036		S28 47.385 E20 36.292	Large <b>silcrete</b> chunk
037		S28 47.327 E20 36.290	Weathered and chunky quartzite <b>MSA</b> flake
038		S28 47.318 E20 36.270	? <b>MSA</b> flake
039		S28 47.344 E20 36.218	Split quartzite cobble flake
040		S28 47.283 E20 36.251	Triangular shaped <b>MSA</b> pointed flake with retouched tip
041		S28 47.232 E20 36.425	Cobble <b>core</b>

Table A. Spreadsheet of waypoints and description of archaeological finds. Unless otherwise stated, all implements are in locally available banded iron stone

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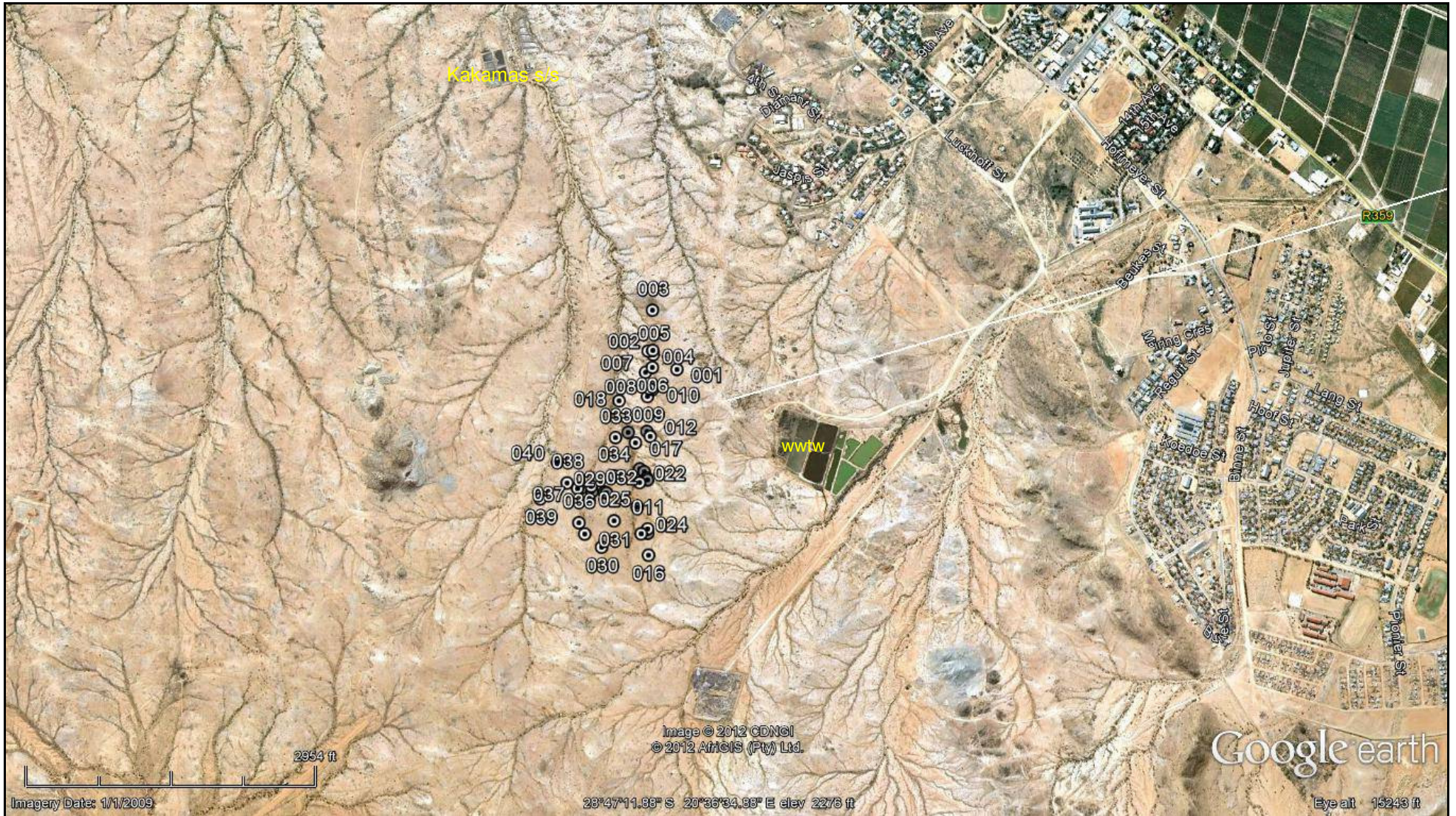


Figure 12. The proposed Keren Energy Kakamas solar energy farm: Waypoints of archaeological finds

Archaeological study proposed solar energy farm near Kakamas



Figure 13. The proposed Keren Energy Kakamas solar energy farm: Waypoints of archaeological finds