

---

## **HERITAGE IMPACT ASSESSMENT REPORT**

---

Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province

Prepared By:



Prepared For:



**Credit Sheet**

Project Director

STEPHAN GAIGHER (BA Hons, Archaeology, UP)

Principal Investigator for G&A Heritage

Member of ASAPA(Site Director Status)

SAHRA Accredited Heritage Practitioner

Tel.: (015) 516 1561

Cell.: 073 752 6583

E-mail: stephan@gaheritage.co.za

Website: www.gaheritage.co.za

**Report Author**

STEPHAN GAIGHER

**Disclaimer;** Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

**Statement of Independence**

As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

Signed off by S. Gaigher

A handwritten signature in black ink, appearing to read 'S. Gaigher', with a stylized flourish at the end.

**Site name and location:** Proposed establishment of the several electricity distribution lines near Upington, Northern Cape Province.

**MunicipalArea:** Siyanda District Municipality.

**Developer:** Eskom Distribution(Pty) Ltd

**Consultant:** G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa. 38A Vorster Str. Louis Trichardt, 0920

**Date of Report:** 10Oktober 2012

## **Management Summary**

Eskom Holdings (Pty) Ltd (Eskom) is investigating the potential environmental impacts that the construction of several 400kV power lines between the newly approved Solar Park near Upington, and the Ferrum, Aries and Nieuwehoop substations could have, in the Northern Cape.

Eskom is proposing to construct one 400kV power line approximately 200km in length (depending on the alternative) from the Solar Park to the Ferrum Substation (Kathu). A 70km second line will run from the Solar Park to the Nieuwehoop Substation (NE of Kenhardt) and two 100km lines will run from the Solar Park to the Aries Substation (SW of Kenhardt).

This study encompasses the Environmental Impact Assessment (EIA) phase of the heritage investigation.

The purpose of the scoping phase of the study is to determine the possible occurrence of sites with cultural heritage significance within the study area and the evaluation of the heritage significance of these sites as well as the possible impacts on such sites by the proposed developments.

## **Findings**

Artefacts associated with the Stone Age as well as historic age was identified in some of the areas investigated. None of these were however located in the proposed corridors themselves. They do however indicate the possibility of unidentified sites being found in the area.

## **Recommendations**

Due to the extent of the power lines it is recommended that the chosen alternative be subjected to a walk-down investigation before construction commences.

## **Fatal Flaws**

No fatal flaws were identified.

**Contents**

**Management Summary ..... vi**

Introduction ..... 11

Legislation and methodology ..... 11

**Background Information..... 13**

Proposed Eskom Solar Integration Project..... 13

Project Description..... 13

Site Location ..... 14

Orientation of the Alternatives ..... 15

**Methodology..... 15**

Evaluating Heritage Impacts ..... 16

Assessing Visual Impact ..... 16

Reporting format ..... 17

**Heritage Indicators within the Receiving Environment (Applicable to all Power line alternatives under investigation) ..... 17**

**Regional Cultural Context ..... 17**

Stone Age..... 17

The Historic Era ..... 18

Cultural Landscape ..... 18

Previous studies ..... 20

**Impacts Anticipated ..... 20**

TYPE OF RESOURCE..... 20

TYPE OF SIGNIFICANCE ..... 21

DEGREES OF SIGNIFICANCE ..... 22

Impact Statement ..... 22

Assessment of Impacts ..... 22

**Sites Identified in Specific Corridors ..... 24**

Solar Park, Arries Lines & Nieuwehoop Lines ..... 24

Solar Park..... 24

Nieuwehoop Line Option 1..... 25

Aries Line Option 1 .....	26
Aries Line Option 2 .....	26
Ferrum Line .....	27
<b>Heritage Significance Evaluation .....</b>	<b>29</b>
Solar Park.....	29
Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)....	29
Mitigation.....	30
Niewehoop Option 1.....	31
Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)....	31
Mitigation.....	32
<b>Arries Option 1 .....</b>	<b>32</b>
Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)....	32
Archaeological Sites - Post-Contact Heritage (Burial Sites).....	33
Mitigation.....	34
Built Environment - Post-Contact Heritage .....	34
<b>Arries Option 2 .....</b>	<b>35</b>
Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)....	35
Archaeological Sites - Post-Contact Heritage (Burial Sites).....	35
Mitigation.....	36
Built Environment - Post-Contact Heritage .....	37
<b>Heritage Management Plan.....</b>	<b>37</b>
Minimising the Impact on Archaeological Sites (as per the NHRA)	37
Minimising the Impact on Paleontological Sites (as per the NHRA)	37
Minimising the impact on the cultural landscape (as per the NHRA)	38
Minimising the impact on Unidentified Sites (as per the NHRA)...	38
Minimising the impact on Burial and Grave Sites (as per the NHRA)	38
<b>Selection of Alternative.....</b>	<b>39</b>
Niewehoop Power Line .....	39
<b>Arries Power Line.....</b>	<b>39</b>

Ferrum Power Line..... 39

**Conclusion..... 39**

**References Cited ..... 40**

## List of Abbreviations

Bp	Before Present
EIA	Early Iron Age
ESA	Early Stone Age
GPS	Geographic Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Late Stone Age
MYA	Million Years Ago
MSA	Middle Stone Age
NHRA	National Heritage Resources Act no 22 of 1999
SAHRA	South African Heritage Resource Agency
S&EIR	Scoping & Environmental Impact Reporting
Um	Micrometre ( $10^{-6}$ m)
WGS 84	World Geodetic System for 1984



# Heritage Impact Assessment Report for the Proposed Solar Integration Project

## Introduction

### Legislation and methodology

G&A Heritage was appointed by Zitholele Consulting Pty (Ltd) to undertake a heritage impact assessment for the proposed Eskom Solar Integration Project. Section 27(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

- (a) construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- (b) construction of a bridge or similar structure exceeding 50 m in length; and
- (c) any development, or other activity which will change the character of an area of land, or water –
  - (1) exceeding 10 000 m<sup>2</sup> in extent;
  - (2) involving three or more existing erven or subdivisions thereof; or
  - (3) involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
  - (d) the costs of which will exceed a sum set in terms of regulations; or
  - (e) any other category of development provided for in regulations.

A heritage impact assessment is not limited to archaeological artefacts, historical buildings and graves. It is far more encompassing and includes intangible and invisible resources such as places, oral traditions and rituals. A heritage resource is defined as any place or object of cultural significance i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This includes the following:

- (a) places, buildings, structures and equipment;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and paleontological sites;
- (g) graves and burial grounds, including –
  - (1) ancestral graves,
  - (2) royal graves and graves of traditional leaders,
  - (3) graves of victims of conflict
  - (iv) graves of important individuals,
  - (4) historical graves and cemeteries older than 60 years, and
  - (5) other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
- (h) movable objects, including ;
  - (1) objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
  - (2) ethnographic art and objects;
  - (3) military objects;
  - (4) objects of decorative art;
  - (5) objects of fine art;
  - (6) objects of scientific or technological interest;
  - (7) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
  - (8) any other prescribed categories, but excluding any object made by a living person;
- (i) battlefields;
- (j) traditional building techniques.

A **'place'** is defined as:

- (a) A site, area or region;
- (b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- (c) a group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures);
- and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

**'Structures'** means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

**'Archaeological'** means:

- (a) material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- (b) rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- (c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- (d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

**'Paleontological'** means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

**'Grave'** means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this scoping study are as follows;

- Field investigations were limited due to time constraints. Not all the corridors could be investigated completely.
- Sites were evaluated by means of description of the cultural landscape and analysis of written sources and available databases.

- It was assumed that the power line alignments as provided by Zitholele Consulting were accurate.
- We assumed that the public participation process performed as part of the Scoping and Environmental Impact Reporting (S&EIR) process will be sufficiently encompassing not to be repeated in the Heritage Scoping Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	Possible Impact	HIA
	36	Graves and burial sites	Possible Impact	HIA
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	Yes	Various distribution power lines.
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m <sup>2</sup>	Yes	Solar Park
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m <sup>2</sup>	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

## Background Information Proposed Eskom Solar Integration Project

### Project Description

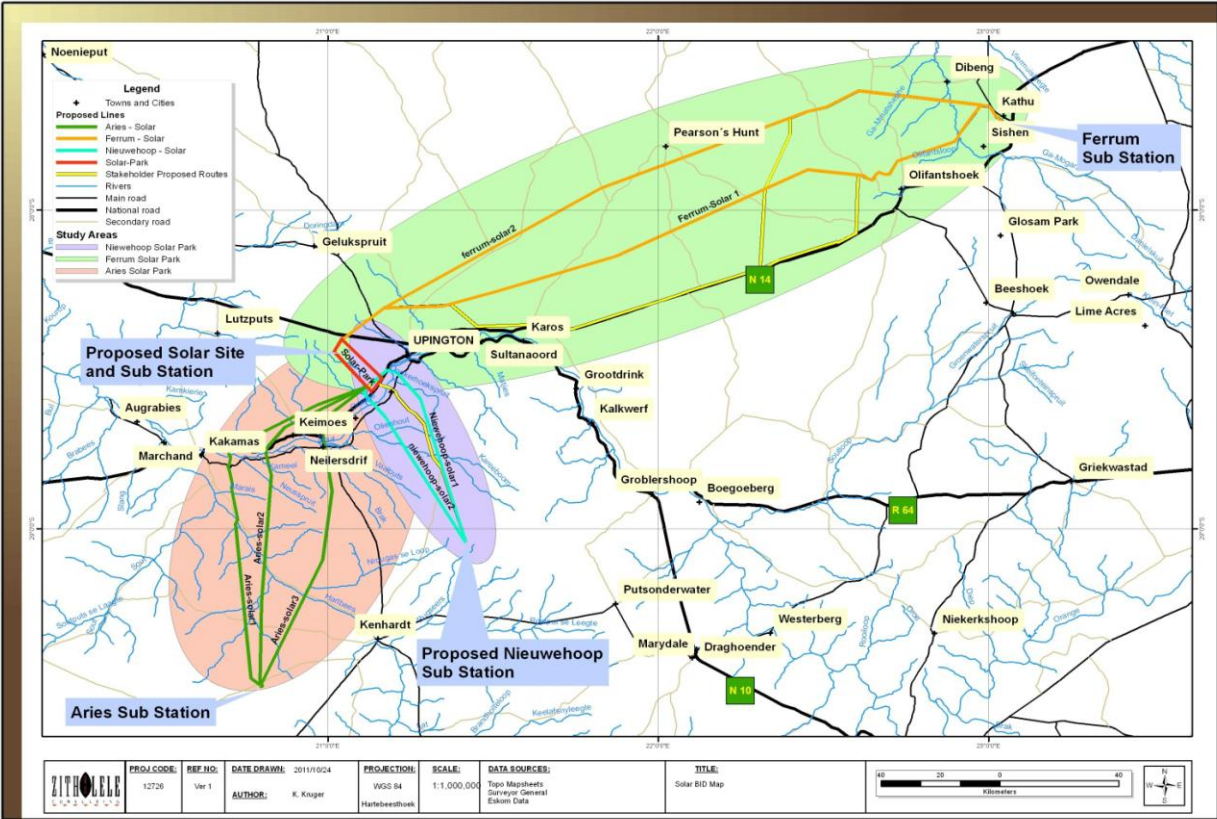
Eskom is proposing to construct one 400kV power line approximately 200km in length (depending on the alternative) from the Solar Park to the Ferrum Substation (Kathu). A 70km second line will run from the Solar Park to the Nieuwehoop Substation (NE of Kenhardt) and two 100km lines will run from the Solar Park to the Aries Substation (SW of Kenhardt).

A 400kV power line requires a 55 meter wide servitude. The pylons / towers associated with 400kV power lines are on average 33 metres in height depending on the bend / angle at which the line runs and topography.

Additionally in order to link the new proposed 400kV power lines into the existing grid, certain upgrades or supporting infrastructure are required at the finishing points (Aries, Ferrum and Nieuwehoop substations). These infrastructure requirements are included in the EIAs.

The corridors being assessed for the proposed 400kV power lines are 2 km wide. The reason why a 2km wide corridor is being assessed for a 55 metre wide servitude is to ensure that the power line can be deviated around any potential social and environmental sensitivities identified. Also during the negotiation process with affected land owners Eskom will have the ability to deviate the line within the approved corridor should the land owner have certain requirements in terms of their existing or planned infrastructure. (Draft Scoping Report)

**Site Location**



The location map above shows all the proposed electricity line corridors as well as the alternative alignments for each.



Figure 2. General Landscape

## **Orientation of the Alternatives**

The alternatives for the proposed EIA comprise of several loop-in and loop-out corridors in an interconnected grid. The reason for these loop in and loop out alternatives is to avoid sensitivities and technical constraints that were identified in the high-level assessment mentioned above. The alternatives are discussed by means of alphabetic representation for each alternative intersection.

### **Solar Aries Alternative 1**

Alternative 1 commences at the CSP outside of Upington traverses south-westward along the Orange River and N14 Highway next to an existing 132 kV distribution line to just before Kakamas (about 60 km). There the line turns south, crosses over the Orange River and heads south for the 75 km to the Aries substation, crossing over the Hartbees River.

### **Solar Aries Alternative 2**

Alternative 2 commences at the CSP outside of Upington traverses south-westward along the Orange River and N14 Highway next to an existing 132 kV distribution line to 10 km before Kakamas (about 50 km). There the line turns south, crosses over the Orange River and heads south for the 75 km to the Aries substation, crossing over the Hartbees River.

### **Solar Aries Alternative 3**

Alternative 3 commences at the CSP outside of Upington traverses southwestward along the Orange River and N14 Highway next to an existing 132 kV distribution line up to 10 km after Loxtonvale (about 40 km). There the line turns south, crosses over the Orange River and heads south for the 75 km to the Aries substation, crossing over the Hartbees River.

### **Solar Nieuwehoop Alternative 1**

Alternative 1 commences at the CSP outside of Upington traverses northeastward along the Orange River for 5 km. After Louisvale the line turn southeast, crosses over the Orange River and travels the approx. 60 km to the Nieuwehoop Substation, crossing over the Kareeboom River.

### **Solar Nieuwehoop Alternative 2**

Alternative 2 commences at the CSP outside of Upington traverses south-westward for a very short distance (<2km) before turning southeast, crossing over the Orange River and travelling the approx. 60 km to the Nieuwehoop Substation, crossing over the Kareeboom River.

### **Stakeholder suggested Alternative:**

In addition to the Nieuwehoop alternatives mentioned above the stakeholders at the public meeting requested that that an additional alternative be investigated during the EIA phase that is aligned along the local dirt road rather than traversing through farming land.

### **Methodology**

This study defines the heritage component of the Environmental Impact Assessment process being undertaken for the Proposed Eskom Solar Integration Project. It is

described as a Heritage Impact Assessment. This report attempts to evaluate the accumulated heritage knowledge of the area as well as the heritage sensitivity of proposed development areas.

### **Evaluating Heritage Impacts**

This Heritage Impact Assessment (HIA) relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRA Database of Heritage Studies
- Uppington Museum Information
- Internet Search
- Historic Maps
- 1936 and 1952 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2011 & 2003 imagery
- Published articles and books
- JSTOR Article Archive

### **Assessing Visual Impact**

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV (Architects) and DEAP (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalized. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimize the visual impact.

Similar studies have determined that power lines 132 kV and above are visible but not intrusive in daylight from 5km away. Power lines are however not seen as intrusive until they are 450m or closer to the observer. This aspect will vary especially in cases of cultural landscapes rather than cultural sites. In the case of cultural landscapes the sense of thoroughfare created by the power lines can be seen as detrimental to the landscape character and can significantly influence the "sense of place". The solar generation plant itself, due to its high levels of reflectivity could be visually intrusive to larger distances.



Figure 3. Reflective solar plants (parabolic troughs) proposed for Sites 1.3, 1.4, 4 and 5

## **Reporting format**

The report will discuss the heritage impact of each proposed alignment separately. The alignments will be divided into the identified alternatives and each of these will be discussed separately. At the end of the discussion the heritage impact of each alternative will be measured against the other alternatives and a recommendation will then be given on the option with the least impact on heritage resources in the area.

## **Heritage Indicators within the Receiving Environment (Applicable to all Power line alternatives under investigation)**

### **Regional Cultural Context**

#### **Stone Age**

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

Beaumont et al. (1995:240-1) note a widespread low-density stone artefact scatter of Pleistocene age across areas of Bushmanland to the south where raw materials, mainly quartzite cobbles, were derived from the Dwyka till. Systematic collections of this material made at Olyvenkolk, south west of Kenhardt and MaansPannen, and east of Gamoep, could be separated out by abrasion state into a fresh component of Middle Stone Age (MSA) with prepared cores, blades and points, and a large aggregate of moderately to heavily weathered Earlier Stone Age (ESA).

Beaumont et al. have shown that "substantial MSA sites are uncommon in "Bushmanland" (1995:241): and those that have been documented thus far have generally yielded only small samples (Morris & Beaumont 1991; Smith 1995). The ESA included Victoria West cores on dolerite, long blades, and a very low incidence of handaxes and cleavers. The Middle (and perhaps in some instances Lower) Pleistocene occupation of the region that these artefacts reflect must have occurred at times when the environment was more hospitable than today.

Any linear, primary and secondary, disturbance of surfaces in the development area could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be such that potential impacts could be mitigated by documentation following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by NgwaoBošwayaKapaBokone (the Northern Cape Heritage Authority).

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and KhoiKhoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades especially associated with the town of Upington.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites. Some of the power line alignments do however pass over undulating geographic features that could be conducive to sheltering Stone Age peoples.

### The Historic Era

Although the town which today is Upington only officially came to be named in 1884, its tempestuous prior history cannot be ignored. Long before white settlers reached the area, Korana Hottentots had settled at the ford in the Great River they called Gariep, the northern border of the Cape Colony. They had been ousted from their ancestral lands in the south and found a last refuge here, on the lush banks of the river. When, inevitably, eventually the white man followed, war broke out between them and the Korana, who had nowhere else to go. They were defeated and the few remaining tribespeople dispersed.

Earlier, a Dutch Reformed Mission had been established under the guidance of the Reverend C. Schreuder at Olijvenhouts Drift, as the ford was called by hunters and traders because of the many wild olivewood trees growing there.

In 1879, after the second and last Korana War, Sir Thomas Upington, Attorney-General of the Cape Colony, sent 80 policemen to the Drift to maintain law and order along the river. Commanded by Captain Dyason they set up camp under the trees, but by 1885 already barracks had been built where later the police station was erected. Dyason's police was very unpopular as they impounded loose animals and generally tried to keep order, while Schreuder only wanted to run a Mission. He venomously referred to the police as "'idle ne'erdo wells'" and said of Dyason, "'we beseech to be delivered from such tyranny'."

Schreuder wanted the Mission to be moved elsewhere and in a letter dated the 11th of February 1884 writes, "'It is my wish that Olyvendrift or Upington not become a town but remain a Mission Station.'"

This was the first time the name Upington was officially written to denote the place known as Olijvenhouts Drift and then only out of resentment against the police sent by Thomas Upington (taken from the Upington Tourism Board website).

Much of the areas between Kathu and Upington and further south have seen little development during the historic and modern era. These areas have mostly small villages or are entirely devoted to agriculture or game farming activities. The areas around the Orange River are more prominently developed and some areas are also protected, such as KanonEiland.

### Cultural Landscape

The following landscape types could possibly be present in the study areas.

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Unlikely
3 Historic Built Environment	<ul style="list-style-type: none"> <li>- Historical townscapes/streetscapes</li> <li>- Historical structures; i.e. older than 60 years</li> <li>- Formal public spaces</li> <li>- Formally declared urban conservation</li> </ul>	No	No



	<ul style="list-style-type: none"> <li>- areas</li> <li>- Places associated with social identity/displacement</li> </ul>		
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> <li>- Historical farm yards</li> <li>- Historical farm workers villages/settlements</li> <li>- Irrigation furrows</li> <li>- Tree alignments and groupings</li> <li>- Historical routes and pathways</li> <li>- Distinctive types of planting</li> <li>- Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.</li> </ul>	Yes	Likely
5 Historic rural town	<ul style="list-style-type: none"> <li>- Historic mission settlements</li> <li>- Historic townscapes</li> </ul>	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> <li>- Historical patterns of access to a natural amenity</li> <li>- Formally proclaimed nature reserves</li> <li>- Evidence of pre-colonial occupation</li> <li>- Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages</li> <li>- Historical structures/settlements older than 60 years</li> <li>- Pre-colonial or historical burial sites</li> <li>- Geological sites of cultural significance.</li> </ul>	Yes	Likely
7 Relic Landscape	<ul style="list-style-type: none"> <li>- Past farming settlements</li> <li>- Past industrial sites</li> <li>- Places of isolation related to attitudes to medical treatment</li> <li>- Battle sites</li> <li>- Sites of displacement,</li> </ul>	No	Unlikely
8 Burial grounds and grave sites	<ul style="list-style-type: none"> <li>- Pre-colonial burials (marked or unmarked, known or unknown)</li> <li>- Historical graves (marked or unmarked, known or unknown)</li> <li>- Graves of victims of conflict</li> <li>- Human remains (older than 100 years)</li> <li>- Associated burial goods (older than 100 years)</li> <li>- Burial architecture (older than 60 years)</li> </ul>	Yes,	Unlikely
9 Associated Landscapes	<ul style="list-style-type: none"> <li>- Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes</li> <li>- Sites associated with displacement &amp; contestation</li> <li>- Sites of political conflict/struggle</li> <li>- Sites associated with an historic event/person</li> <li>- Sites associated with public memory</li> </ul>	No	No
10 Historical Farmyard	<ul style="list-style-type: none"> <li>- Setting of the yard and its context</li> <li>- Composition of structures</li> <li>- Historical/architectural value of</li> </ul>	Yes	Irrigation farming within the

	individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology		Orange River Valley.
11 Historic institutions	- Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases	No	Unlikely
12 Scenic visual	- Scenic routes	No	No
13 Amenity landscape	- View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors	No	No

### Previous studies

Due to the escalated development of alternative power projects in the Northern Cape, and especially in the Upington area, there have been several heritage studies undertaken in the last two years to determine the heritage sensitivity of the area.

The following reports were accessed as part of this study;

- Karoshoek Solar Basic Assessment HIA
- Karoshoek Infrastructure EIA Phase HIA
- HIA for the Proposed Southern Cross Solar Facility
- HIA for the Proposed Tutwa Solar Facility
- Draft heritage impact assessment report: proposed land use change to provide for a medicinal waste incinerator on Erf 12943, Upington, Kai! Garib Municipality, Northern Cape Province

All the reports indicated a distinct lack of heritage sites within the study area. The most common sites were Stone Age scatters, although actual manufacturing and occupational sites were not common.

### Impacts Anticipated

In 2003 the SAHRA compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

#### TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

## **TYPE OF SIGNIFICANCE**

### **1. HISTORIC VALUE**

It is important in the community, or pattern of history

- Important in the evolution of cultural landscapes and settlement patterns
- Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organisation of importance in history

- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

### **2. AESTHETIC VALUE**

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

- Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

### **3. SCIENTIFIC VALUE**

It has potential to yield information that will contribute to an understanding of natural or cultural heritage

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

### **4. SOCIAL VALUE**

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

## DEGREES OF SIGNIFICANCE

### 1. RARITY

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

### 2. REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

What other similar sites may be compared to this site?

## Impact Statement

### Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase are 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; or

- permanent - assigned a score of 5;
- The 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; and
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

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

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

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

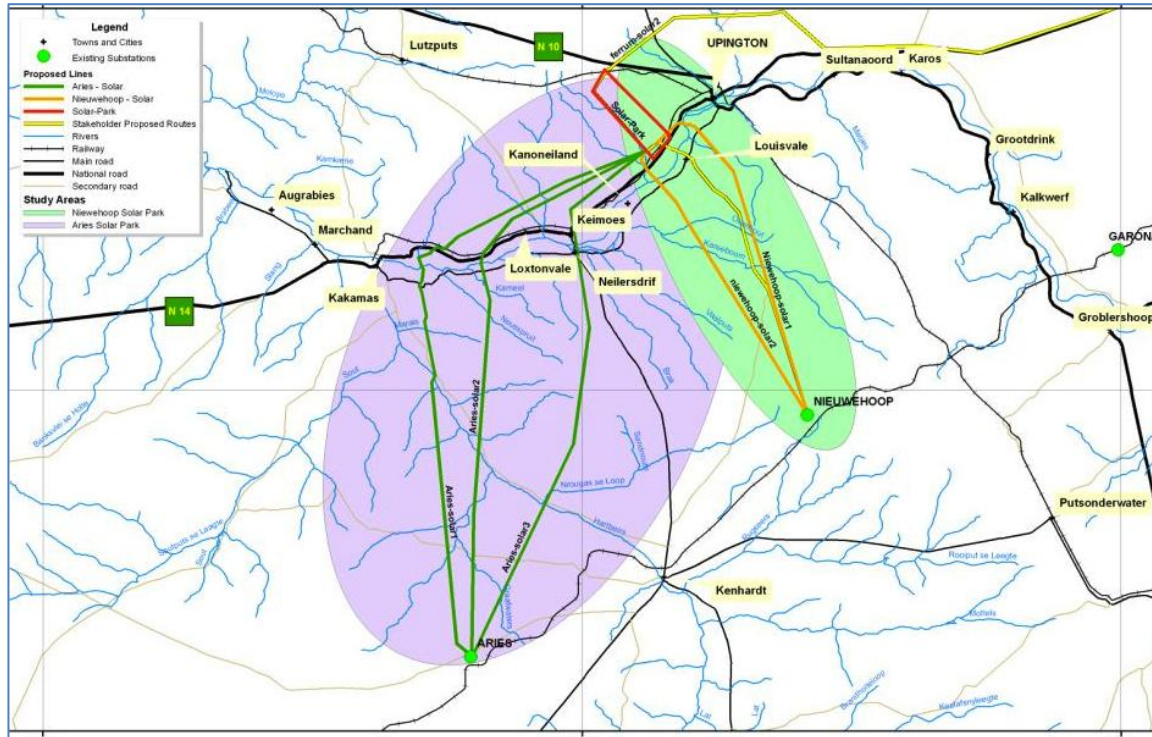
P = Probability

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).

## Sites Identified in Specific Corridors

### Solar Park, Arries Lines & Nieuwehoop Lines



### Solar Park

Site name	Description	Location
SISP 001	Late Stone Age scatter (Pre-Contact)	28° 28' 47"S 21° 03' 50" E
SISP 002	Farming activity (Living Heritage)	28° 33' 17"S 21° 08' 46" E

### Discussion

At site SISP 001 two tool fragments were observed. These were not associated with any further deposit and is not indicative of a site. The area is however geographically suited to occupation (two small river converge here), however it is thought that the tools were deposited by the flowing stream from another site further upstream.



The area around the eastern corners of the study area show some signs of agricultural activity. This is of recent origin and not of any heritage significance.

### Niewehoop Line Option 1

Site name	Description	Location
SIA1 001	Late Stone Age tool (Pre-Contact)	28° 40' 10"S 21° 17' 44" E
SIA1 002	Late Stone Age tool (Pre-Contact)	28° 52' 22"S 21° 20' 54" E

### Discussion

The alignment for both these options follows a large eroded area with deep dongas. At two points stone quartz tools were observed although isolated and most probably displaced. Both these finds were made within the Niewehoop Option 1 corridor. No sites were identified in the Niewehoop Line Option 2 corridor.



### Aries Line Option 1

Once again three isolated stone tools were found on this alignment, though no sites with any significant deposit could be found. It is the opinion of the researcher that all these were displaced during water erosion. Photographs of these finds were inadvertently erased.

### Aries Line Option 2

Site name	Description	Location
SIA2 001	Late Stone Age tool (Pre-Contact)	29° 06' 57"S 20° 49' 23" E
SIA2 002	Possible grave site (Post-Contact)	28° 49' 53"S 20° 48' 32" E
SIA2 003	Built environment	28° 45' 33"S 20° 49' 03" E

### Discussion

Here again a Late Stone Age tool was noted close to an eroded donga. No further finds were noted in the area. The tool does not constitute an archaeological site.

Further to the east a possible grave cairn was noted. This site is of potential heritage significance and can easily be avoided should it be indicated on the design layout.

Further farming structures of recent nature was noted in the Orange River Valley. These are not of heritage value.



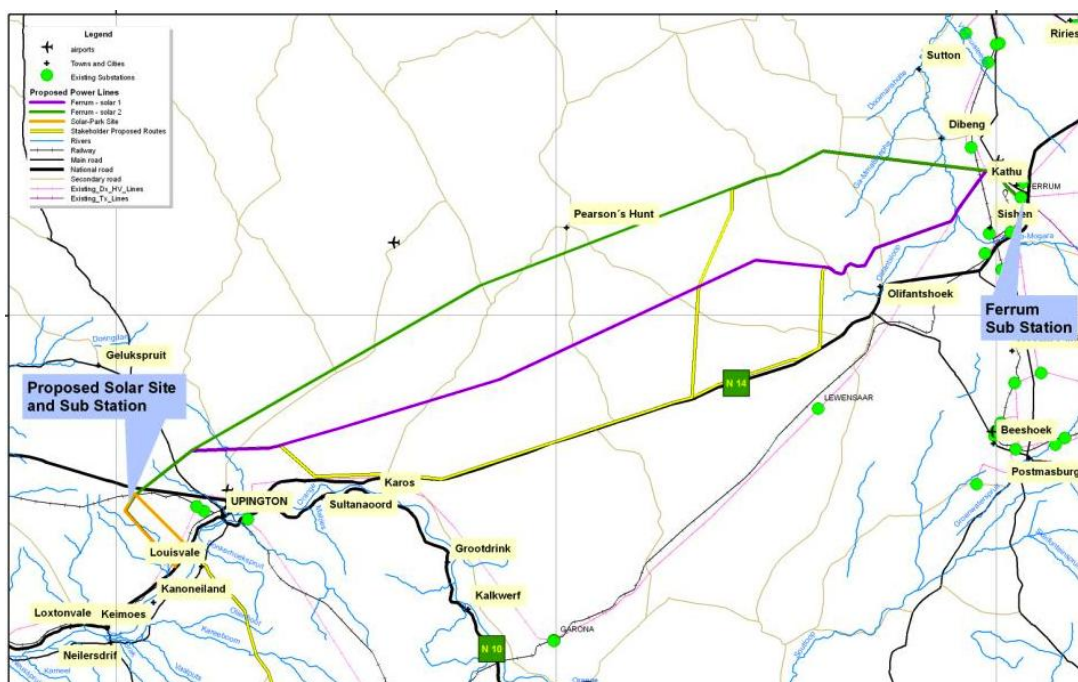




### Aries Line Option 3

Two possible stone tools were recovered from this alignment corridor, however on evaluation of the photographs by an outside stone age expert they were found not to be of Stone Age origin.

### Ferrum Line



## Ferrum Option 1

Site name	Description	Location
SIF1 001	Late Stone Age tool (Pre-Contact)	28° 11' 42"S 21° 43' 51" E
SIF1 002	Possible grave site (Post-Contact)	28° 11' 02"S 21° 46' 07" E

### Discussion

For the most part this corridor option runs through low lying semi-desert areas consisting of red Kalahari sand and scattered plantgrowth. This kind of area is not conducive to long-term occupation. Another Late Stone Age tool was recovered close to a dirt road within the proposed corridor. No other tools, flakes or cores could be found. The tool does not constitute a heritage site of any significance.



A single possible grave cairn was identified within the corridor.



## Ferrum Option 2 & 3

No sites of heritage significance were identified on either of these two options. It should be noted that not all areas were accessed and sites could still occur in the craggy areas just west of Kathu.

### Heritage Significance Evaluation

#### Solar Park

#### Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)

*Nature of Impacts:* Placement of the solar power plant could negatively affect sites associated with the Middle to Late Stone Age.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Subject final placement of solar infrastructure to a walk-down investigation</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information</b>	

#### Paleontological sites

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the generation facility and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the array foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction should</b>	

	<b>bedrock be disturbed</b>
Cumulative impacts	<b>None</b>
Residual impacts	<b>None</b>

### Mitigation

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

### Cultural Landscape

Several possible cultural landscape components were identified within this study corridor.

*Nature of Impacts:* The construction of the solar power plants could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### Mitigation

None.

### Built Environment

The area has some agricultural features such as fences, roads and concrete dams.

*Nature of Impacts:* The built environment could be affected by the placement of the solar site.

*Extent of Impact:* Localised damage to sites identified.

Nature of Impact: Impact on the Built Environment due to the construction of CSP plants		
	Without Mitigation	With Mitigation
Extent	<b>Local (1)</b>	<b>Local (1)</b>
Duration	<b>Short term (1)</b>	<b>Long term (1)</b>
Magnitude	<b>Low (3)</b>	<b>Low (3)</b>
Probability	<b>Improbable (1)</b>	<b>Improbable (1)</b>
Significance	<b>Low (5)</b>	<b>Low (5)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>None</b>	

Cumulative impacts	<b>None</b>
Residual impacts	<b>None</b>

### **Mitigation**

None.

### **Niewehoop Option 1**

#### **Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)**

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect sites associated with the Middle to Late Stone Age.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Subject final alignment choice to a walk-down investigation one pylon positions have been determined.</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information from unidentified sites.</b>	

#### **Paleontological sites**

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the placement of pylons and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>

Mitigation	<b>Paleontological monitoring during construction should bedrock be disturbed</b>
Cumulative impacts	<b>None</b>
Residual impacts	<b>None</b>

### Mitigation

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

### Cultural Landscape

Several possible cultural landscape components were identified within this study corridor.

*Nature of Impacts:* The construction of the power line could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### Arries Option 1

#### Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect sites associated with the Middle to Late Stone Age.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Subject final alignment choice to a walk-down investigation one pylon positions have been</b>	

	<b>determined.</b>
Cumulative impacts	<b>None</b>
Residual impacts	<b>Loss of heritage related information from unidentified sites.</b>

### Archaeological Sites - Post-Contact Heritage (Burial Sites)

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect burial sites.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible post-contact burial site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (1)</b>
Duration	<b>Long term (5)</b>	<b>Short term (1)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Re-alignment of power line to avoid grave site by at least 50m</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information from unidentified burial sites.</b>	

### Paleontological sites

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the placement of pylons and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction should bedrock be disturbed</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Mitigation

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

## Cultural Landscape

Several possible cultural landscape components were identified within this study corridor.

*Nature of Impacts:* The construction of the power line could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Built Environment - Post-Contact Heritage

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect built environment sites of an agricultural character.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible post-contact burial site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (1)</b>	<b>Local (1)</b>
Duration	<b>Short term (1)</b>	<b>Short term (1)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (1)</b>	<b>Improbable (1)</b>
Significance	<b>Low (6)</b>	<b>Low (6)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Owners of these buildings should be involved in the public participation process.</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	



## Arries Option 2

### Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect sites associated with the Middle to Late Stone Age.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Subject final alignment choice to a walk-down investigation one pylon positions have been determined.</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information from unidentified sites.</b>	

### Archaeological Sites - Post-Contact Heritage (Burial Sites)

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect burial sites.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible post-contact burial site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (1)</b>
Duration	<b>Long term (5)</b>	<b>Short term (1)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Low (8)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Re-alignment of power line to avoid grave site by at least 50m</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information from unidentified burial sites.</b>	

## Paleontological sites

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the placement of pylons and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction should bedrock be disturbed</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Mitigation

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

## Cultural Landscape

Several possible cultural landscape components were identified within this study corridor.

*Nature of Impacts:* The construction of the power line could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Built Environment - Post-Contact Heritage

*Nature of Impacts:* The alignment of the power lines and placement of the pylons could negatively affect built environment sites of an agricultural character.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible post-contact burial site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (1)</b>	<b>Local (1)</b>
Duration	<b>Short term (1)</b>	<b>Short term (1)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (1)</b>	<b>Improbable (1)</b>
Significance	<b>Low (6)</b>	<b>Low (6)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Owners of these buildings should be involved in the public participation process.</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Heritage Management Plan

### Minimising the Impact on Archaeological Sites (as per the NHRA)

Objective 1: Minimising the impact on archaeological sites

The development of solar power plants and associated power distribution lines could impact on unidentified sites of archaeological importance.

Project Component	Solar Array, roads, power lines and construction camps
Potential Impact	Destruction of archaeological sites
Activity/Risk source	Solar array foundations, power lines and roads
Mitigation Target	Conserve archaeological sites

Mitigation: Action	Responsibility	Time Frame
Placement of infrastructure should avoid potential sites of high archaeological sensitivity such as pans, rocky ridges and river beds.	Contracted heritage specialist	Before initiation of construction

Performance Indicator	No destruction of archaeological sites
Monitoring	Provided final investigation is performed no monitoring is needed

### Minimising the Impact on Paleontological Sites (as per the NHRA)

Objective 1: Minimising the impact on Paleontological sites

The development of solar power plants and associated distribution power lines could impact on unidentified sites of paleontological importance if bedrock was to be disturbed.

Project Component	Solar Array, roads, power lines and construction camps
-------------------	--

Potential Impact	Destruction of paleontological sites
Activity/Risk source	Solar array foundations, power lines and roads
Mitigation Target	Conserve paleontological sites

Mitigation: Action	Responsibility	Time Frame
Paleontological monitoring in areas where bedrock is expected to be disturbed.	Contracted palaeontologist	During construction phase

Performance Indicator	No destruction of paleontological sites
Monitoring	Paleontological monitoring during the construction phase where bedrock is to be affected.

### **Minimising the impact on the cultural landscape (as per the NHRA)**

Objective 1: Minimising the impact on the cultural landscape
Although areas with components of important cultural landscapes were identified, no areas with significance high enough for alteration of the proposed project layout could be defined.

Project Component	Solar array, power lines, roads and construction camps
Potential Impact	Negative impacts on the cultural landscape
Activity/Risk source	Placement of infrastructure
Mitigation Target	Preservation of cultural landscape components

Mitigation: Action	Responsibility	Time Frame
No further action is required	None	None

Performance Indicator	No alteration to the cultural landscape
Monitoring	No monitoring is required

### **Minimising the impact on Unidentified Sites (as per the NHRA)**

Objective 1: Minimising the impact on unidentified sites
Unidentified or sub-surface sites could still be encountered during the construction phase

Project Component	Solar arrays, roads, power lines and construction camps
Potential Impact	Destruction of unidentified sites
Activity/Risk source	Placement of Solar Array infrastructure and distribution power lines
Mitigation Target	Minimize impact on unidentified sites

Mitigation: Action	Responsibility	Time Frame
Unidentified sites that are uncovered should be reported to SAHRA or the relevant provincial authority	Environmental officer	As soon as possible

Performance Indicator	No destruction of archaeological sites
Monitoring	Monitoring during construction phase

### **Minimising the impact on Burial and Grave Sites (as per the NHRA)**

Objective 1: Minimising the impact on burial and grave sites
--

The placement of solar sites and associated distribution power lines could impact on unidentified burial or grave sites

Project Component	Solar array, power lines, roads and construction camps
Potential Impact	Destruction of grave and burial sites
Activity/Risk source	Solar array and associated distribution power lines
Mitigation Target	Mitigate impacts on burial or grave sites

Mitigation: Action	Responsibility	Time Frame
On uncovering a possible grave or burial site it is imperative that construction be ceased immediately. The area should be marked and a heritage practitioner should be informed immediately.	Environmental control officer	During construction phase

Performance Indicator	Mitigation of burial and grave sites
Monitoring	No monitoring is required

## Selection of Alternative

### Niewehoop Power Line

Although very little evidence of heritage sites were identified within either of these two corridors, there were still more signs of heritage sites within corridor Option 1. From a heritage impact point of view the preferred alternative would be Option 2 for the Niewehoop Power Line.

### Arries Power Line

Three alternatives were investigated for this line. Options 1 and 2 have the same level of heritage sensitivity, however Option 3 showed no signs of heritage sites. It is therefore recommended that Option 3 be used from a heritage management point of view. It should still be noted that none of the sites within the other corridors were of such high significance that the power line could not follow that route.

### Ferrum Power Line

Three alternative alignments were also investigated for the Ferrum Power Line. Of these two showed no signs of any heritage sites and therefore Options 2 & 3 are equally suitable for the placement of the power line. Once again, none of the sites are of such high heritage significance that it would prohibit the use of the other corridors.

## Conclusion

The study area was investigated for sites of heritage significance that might be affected by the construction of the proposed solar power generation infrastructure. The only sign of sites of heritage potential were single Middle to Late Stone Age tools found in various areas. These finds in themselves do not constitute sites but do indicate the possible occurrence of such sites.

The area could still contain the remains of nomadic hunter/gatherer camps and some areas with suitable substrates could have been used as quarries for material to produce Stone Age tools. No such sites were however identified during the site visit. We should however in this case apply the rule of *Absence of Evidence is not Evidence of Absence*.

In three areas scatterings of surface stone artifacts were noticed, however one of these were concentrated enough to be classified as Stone Age Sites. Their presence does indicate that such sites could still be found sub-surface. It is also important to remember that sites such as these do not offer silhouette, profiles such as Irons Age and Historic sites and they are therefore difficult to identify unless the observer is on top of the site or very close to it. Some such sites might therefore have been missed. For this reason it is recommended that the final alignment choice for the distribution power lines be subjected to a walk-down investigation once final pylon placements have been done.

### References Cited and Consulted

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.,

Beaumont, P.B. 2006d. *On a Planned Extension of the Lambrechtsdrift Township, Siyanda District Municipality, Northern Cape.*

Beaumont, P.B. 1995. Vegetation and seasonality shifts during the Late. Quaternary deduced from 13C/12C rations of grazers at Equus Cave.

Clark J. D. 1959. The prehistory of southern Africa. Harmondsworth: Penguin Books.

Deacon, J. 1984. Later Stone Age people and their descendants in southern Africa. In: Klein, R. G. (ed.)

De Jong, R.C. 2010. *Draft heritage impact assessment report: proposed land use change to provide for a medicinal waste incinerator on Erf 12943, Upington, Kai! Garib Municipality, Northern Cape Province.* Unpublished report 2010/36. Pretoria.

Engelbrecht, J. A. 1936. The Korana: an account of their customs and their history. Cape Town: Maskew Miller.

Gaigher, S. 2012. Heritage Impact Assessment for the Proposed Tutwa Solar Facility. Northern Cape. Unpublished report.

Gaigher, S. 2012. Heritage Impact Assessment for the Proposed Karoshoek Solar Infrastructure, Northern Cape. Unpublished report.

Gaigher, S. 2012. EIA Phase Heritage Impact Assessment for the Proposed Karoshoek Solar Project, Northern Cape. Unpublished report.

Gaigher, S. 2012. Heritage Impact Assessment for the proposed Southern Cross Solar Facility, Northern Cape. Unpublished report.

Morris, A.G. 1995. The Einiqua: an analysis of the Kakamas skeletons. In Smith, A.B. (ed) 1995, *Einiqualand: studies of the Orange River frontier.* Cape Town: University of Cape Town Press.

Parsons, I. 2003. Lithic expressions of Later Stone Age lifeways in the Northern Cape. *South African Archaeological Bulletin* 58(177): 33-37.

Phillipson, D. W. 1977. The later prehistory of eastern and southern Africa. London: Heinemann.

Rudner, J. n.d. Non-Bantu pottery from the inland areas of South and South West Africa. Unpublished manuscript: National Monuments Council.

Rudner, J. 1971. Ostrich egg-shell flasks and soapstone objects from the Gordonia District, north-western Cape. *South African Archaeological Bulletin* 26:139-142.

*Southern African prehistory and palaeoenvironments*: 221-328. Rotterdam: Balkema.

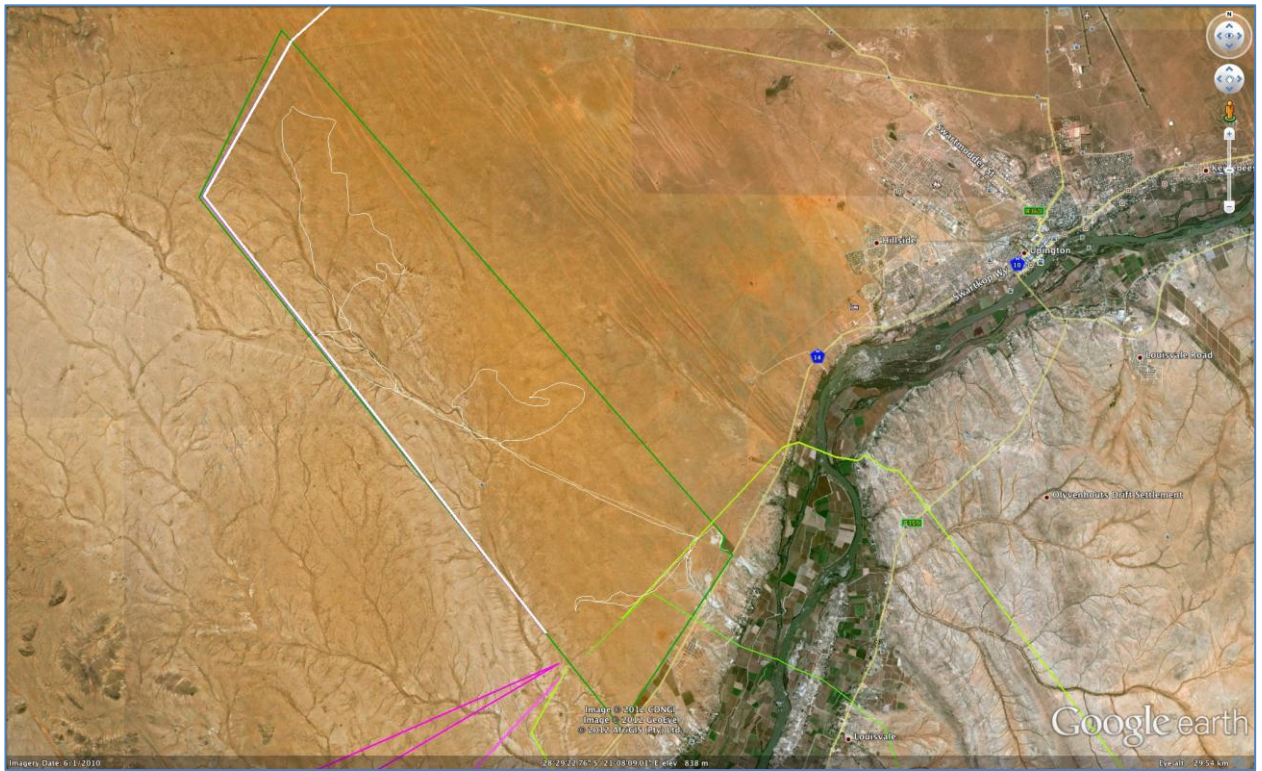
Viereck, A. 1959. Some relics from South West Africa. *South African Archaeological Bulletin* 14:90.

## APPENDIX A

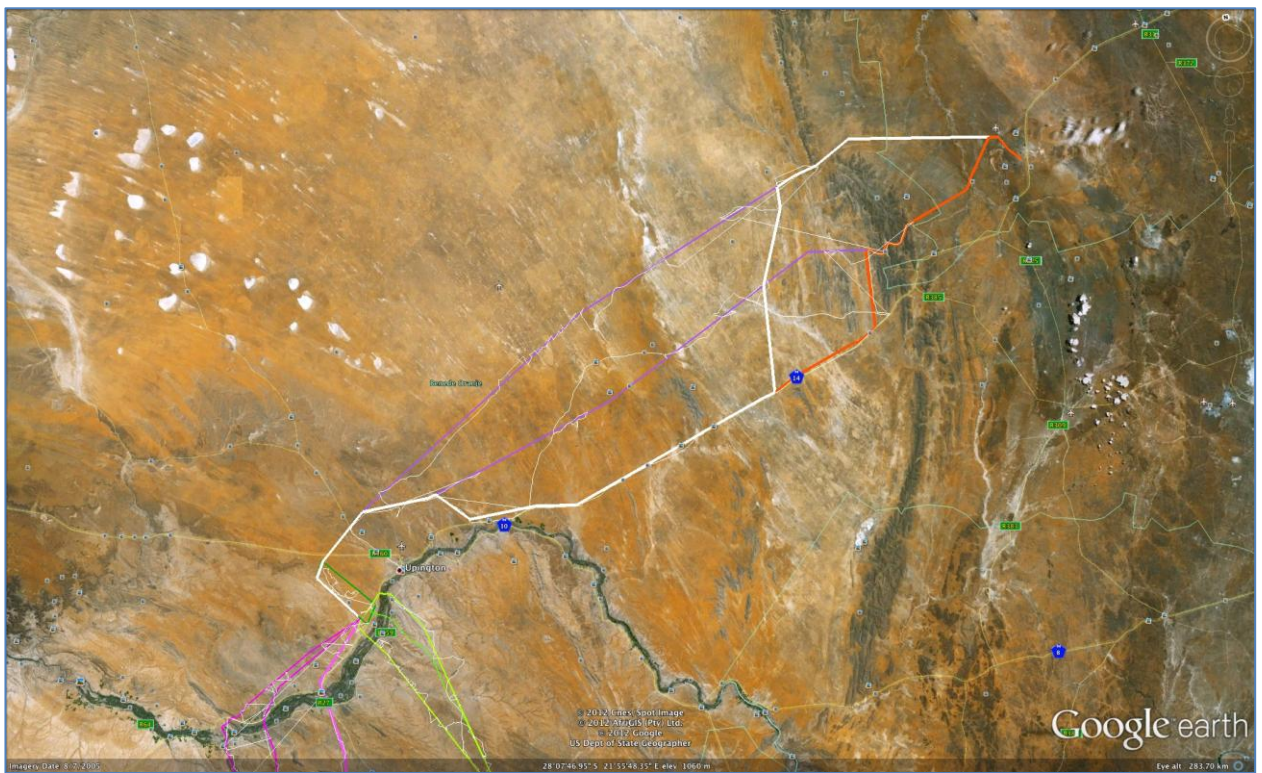
GPS Track Paths (Shown in white on Google Earth Image)

GPX Track Files available from G&A Heritage





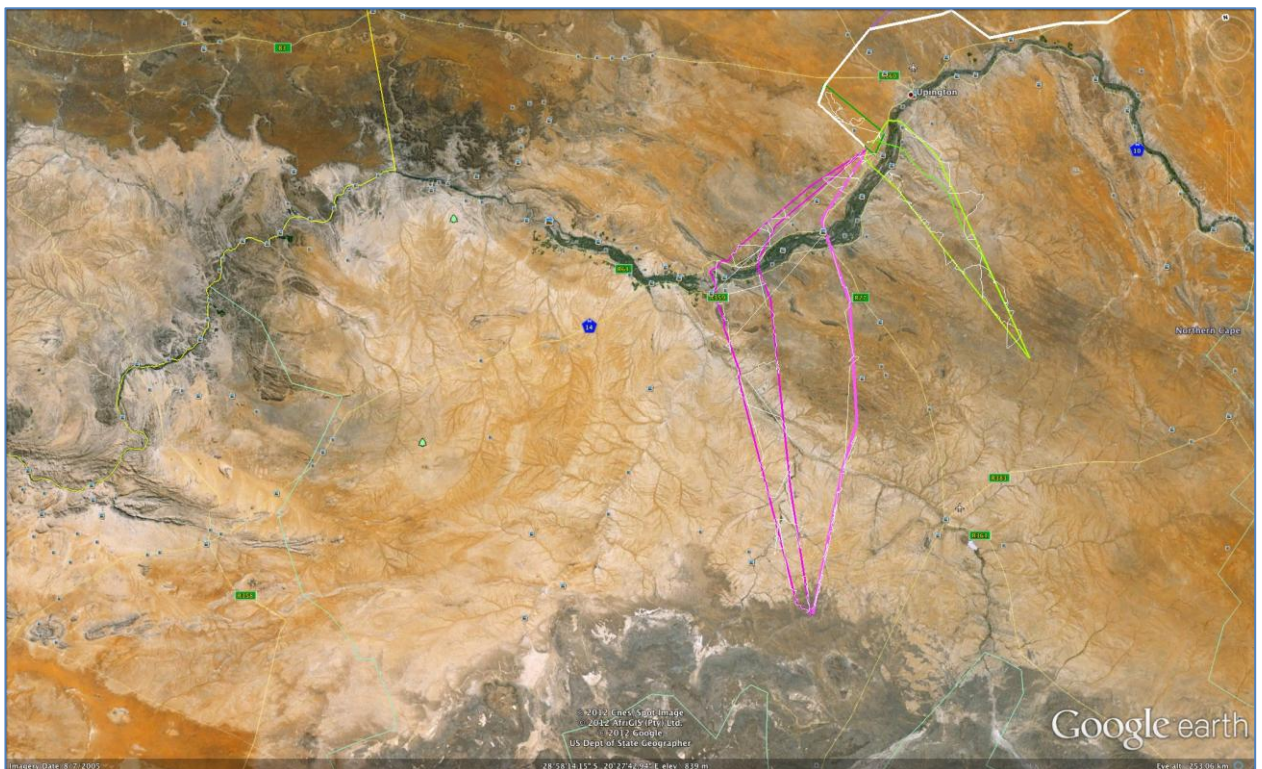
Solar Park GPS Track Path



Ferrum GPS Track Paths

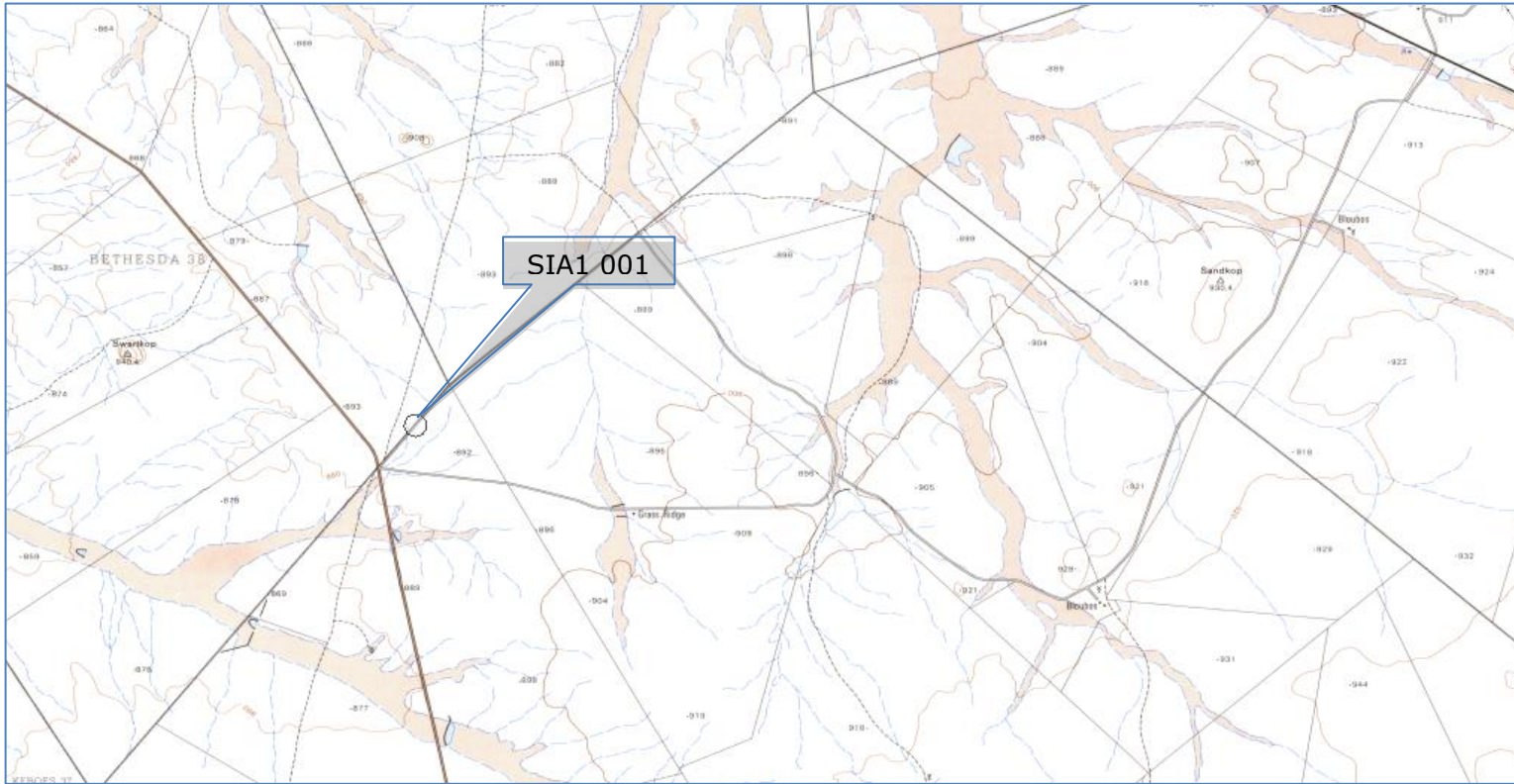


Niewelust GPS Track Paths

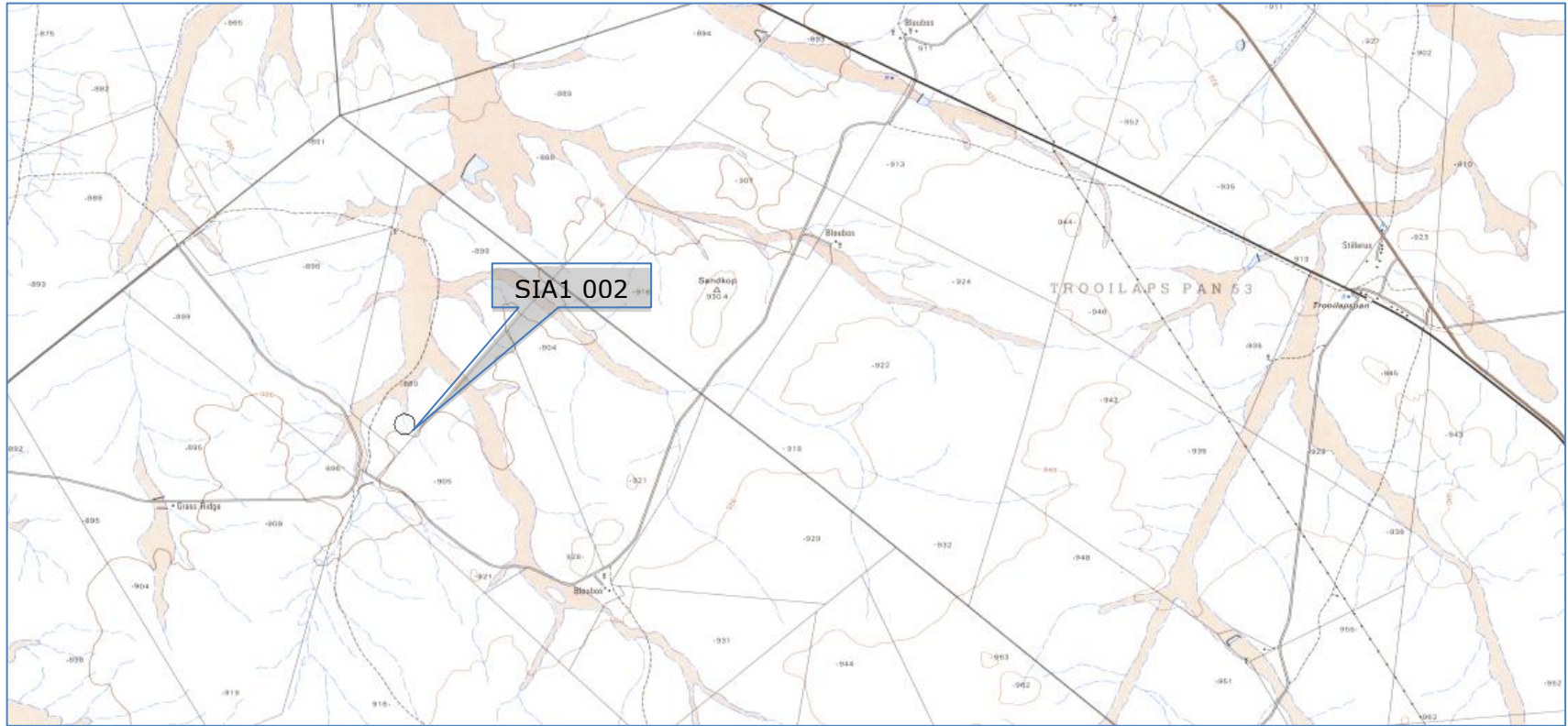


Arries GPS Track Paths

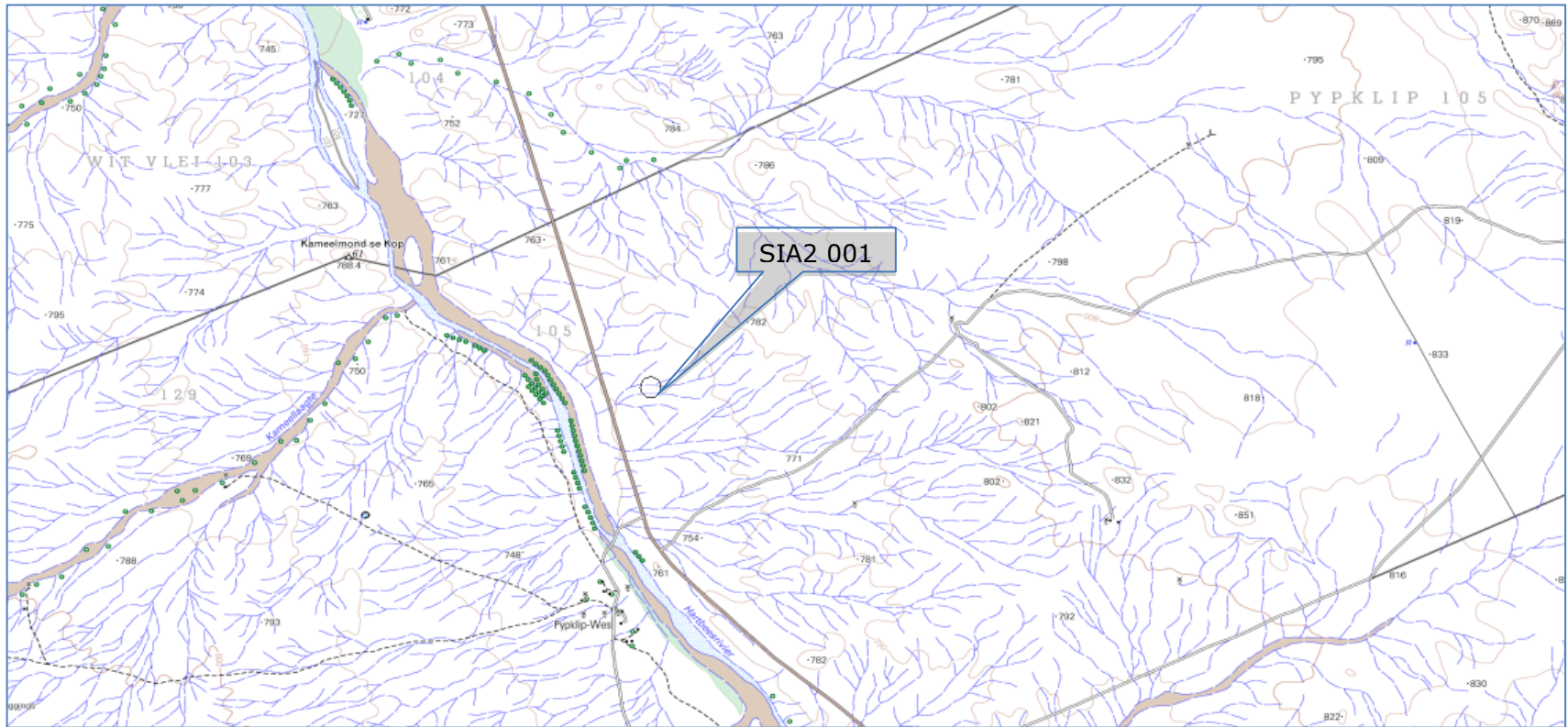
APPENDIX B  
Location Maps



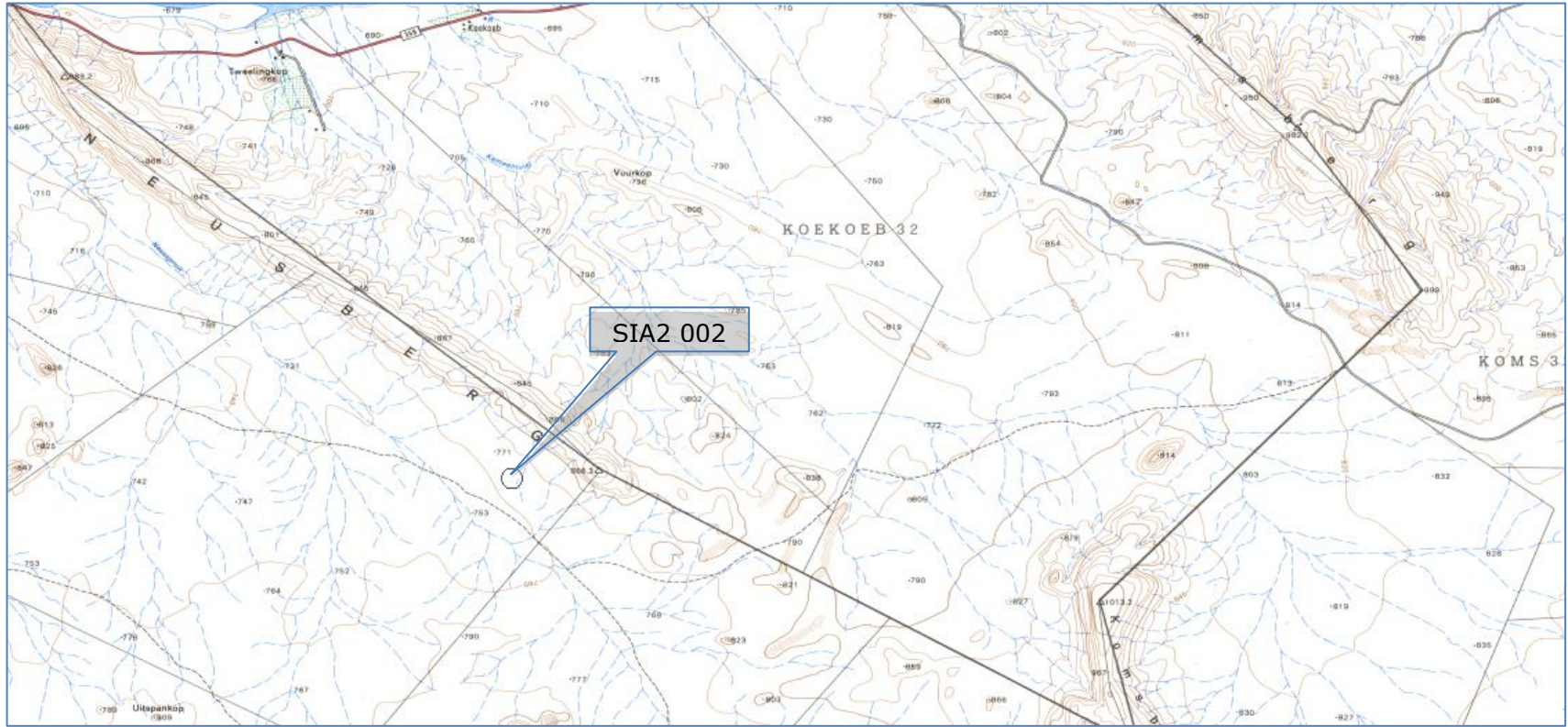
Site SIA1 001



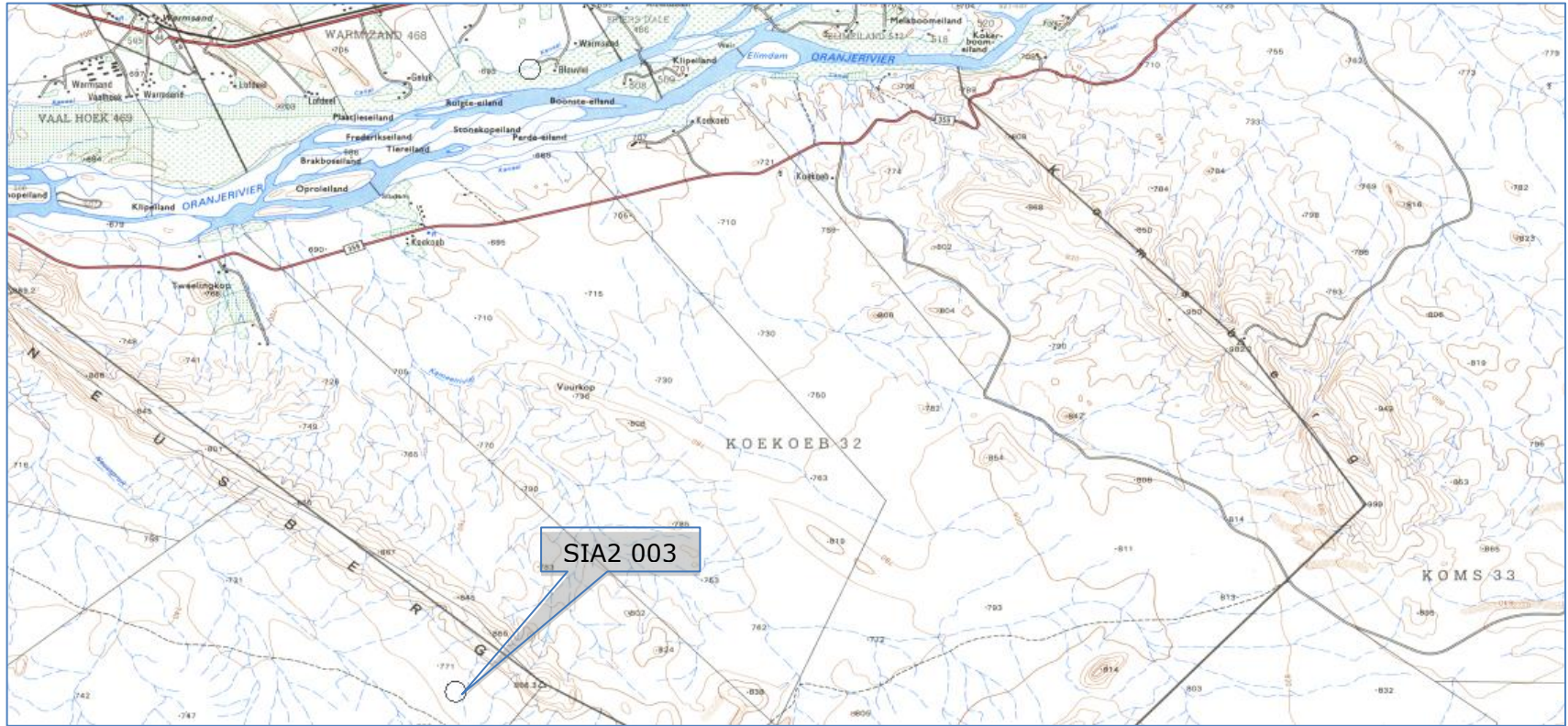
Site SIA1 002



Site SIA2 001

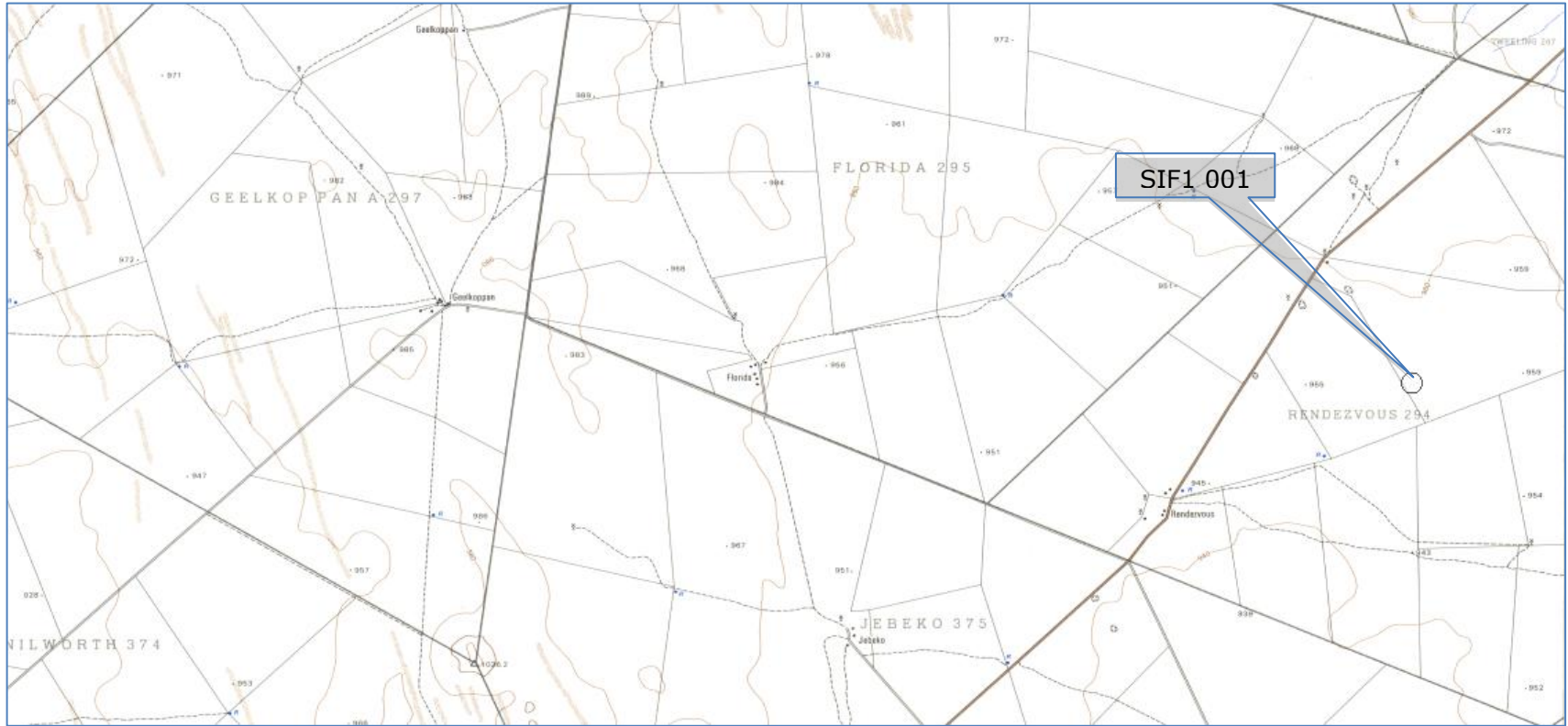


Site SIA2 002

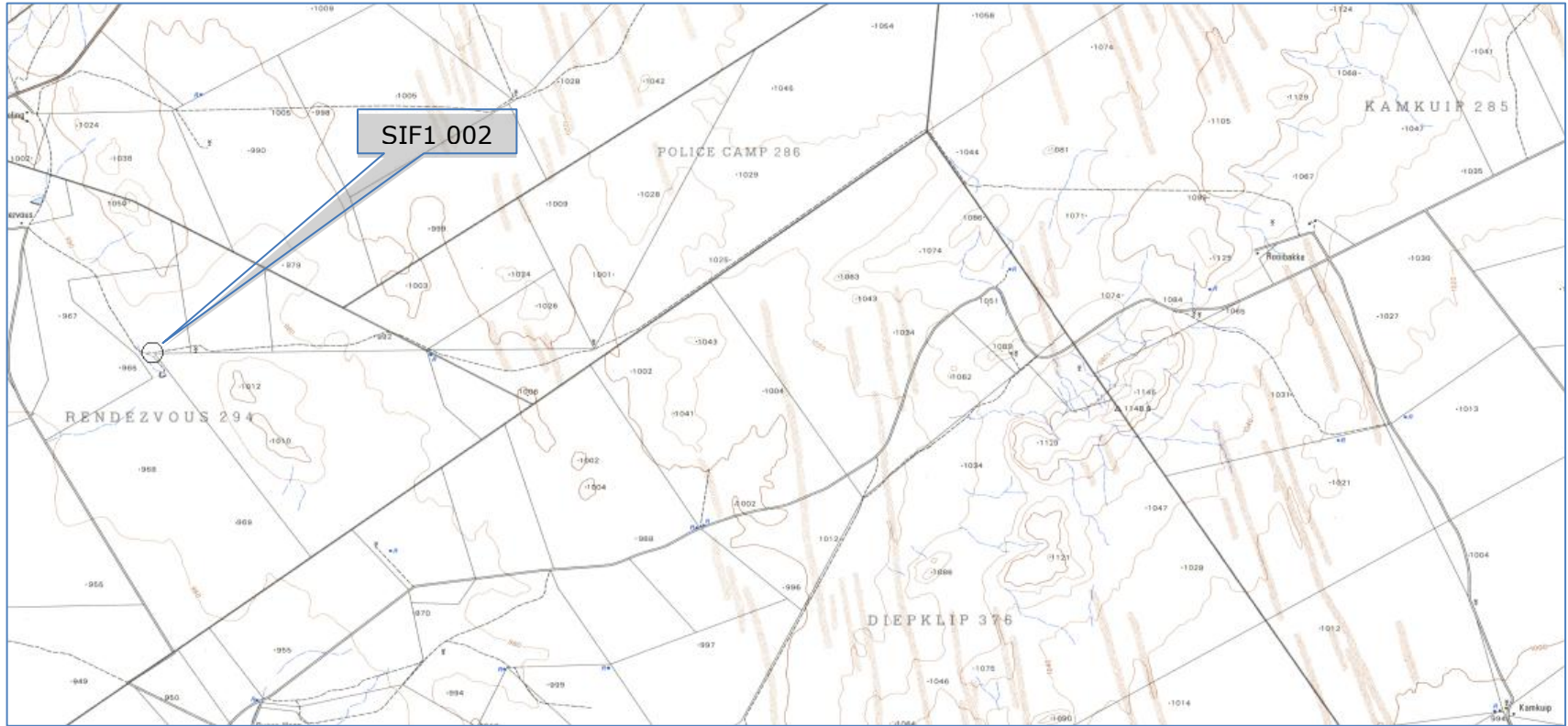


Site SIA2 003

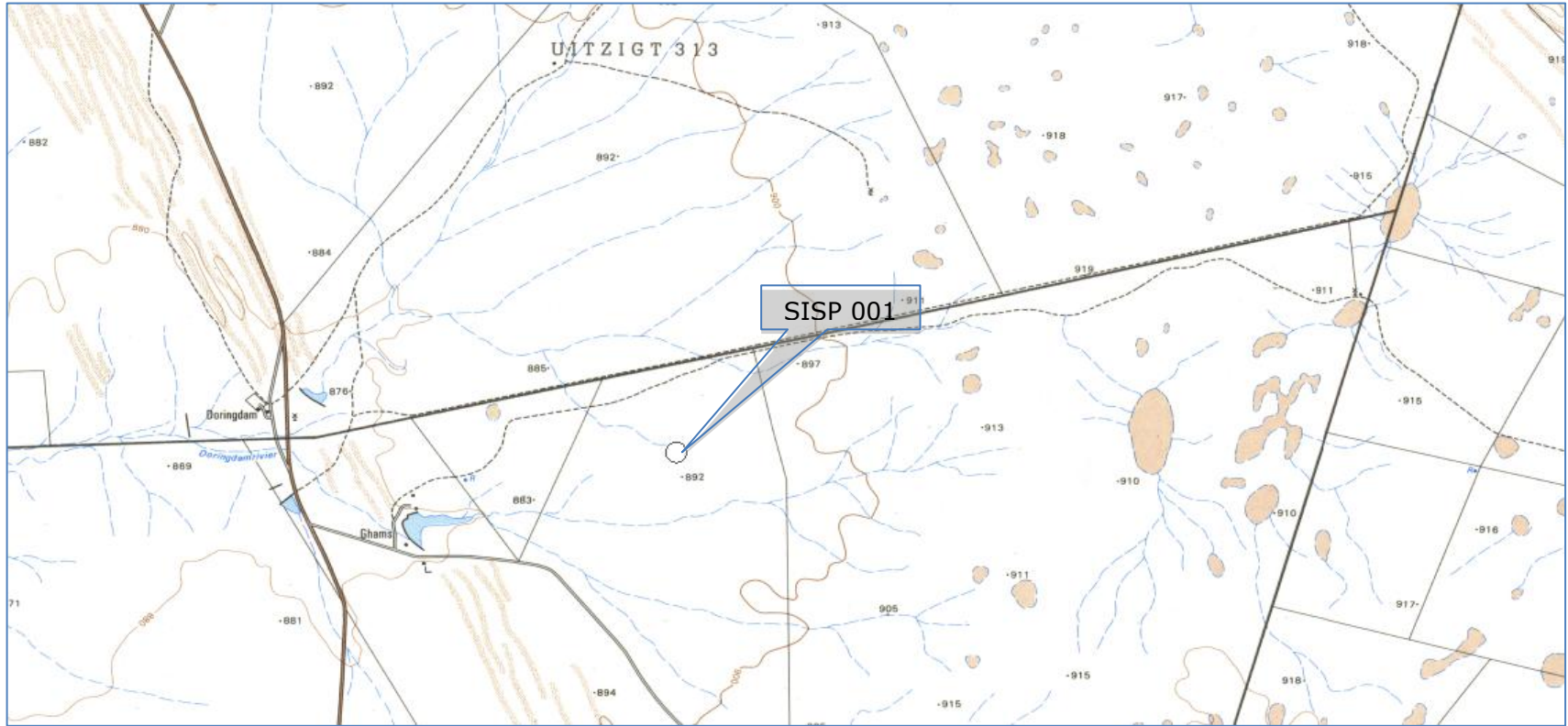




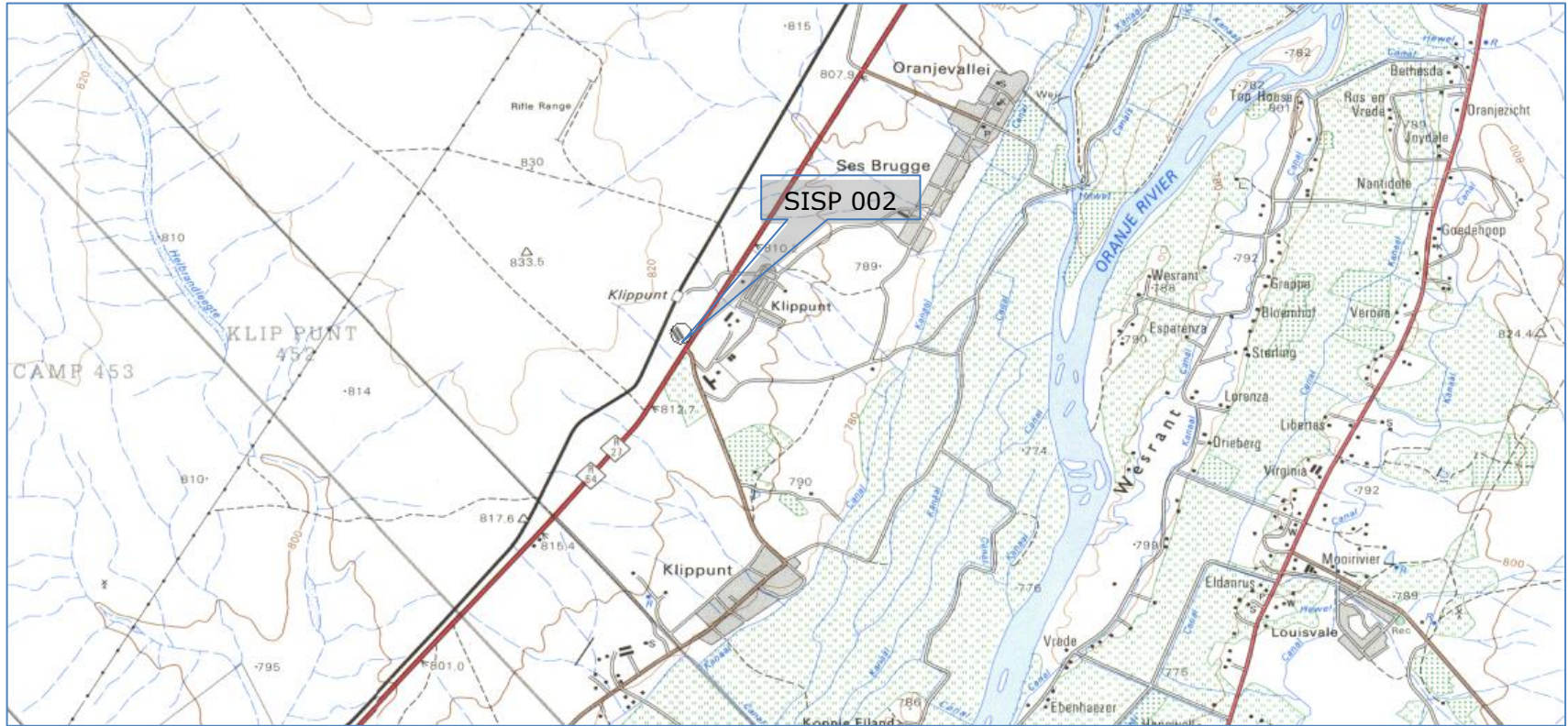
Site SIF1 001



Site SIF1 002



Site SISP 001



Site SISP 002