McGregor Museum
Department of Archaeology

PAULPUTS CSP PROJECT
NEAR POFADDER, NORTHERN CAPE

SPECIALIST INPUT FOR THE IMPACT ASSESSMENT PHASE OF THE ENVIRONMENTAL IMPACT ASSESSMENT
ARCHAEOLOGY

David Morris
April 2016

PAULPUTS CSP PROJECT
NEAR POFADDER, NORTHERN CAPE

SPECIALIST INPUT FOR THE IMPACT ASSESSMENT PHASE OF THE ENVIRONMENTAL IMPACT ASSESSMENT
ARCHAEOLOGY

David Morris, McGregor Museum, Kimberley & Sol Plaatje University, Kimberley
P.O. Box 316 Kimberley 8300
Tel 082 2224777 email dmorriskby@gmail.com
22 April 2016

1. Background

This report provides an Impact Assessment phase evaluation of the footprint of a proposed construction of a 200 MW Concentrated Solar Power (CSP) Tower facility, and associated infrastructure immediately north of an existing solar thermal facility on the farm Scuit-Klip 92 near Pofadder in the Northern Cape. It is a desk-top study aimed at providing high-level identification of potential areas of sensitivity, together with a recommended methodology for the EIA process.

The CSP Tower facility is proposed to make use of molten salt technology and include the following infrastructure: CSP Tower up to 300m in height with heliostat field; on-site project substation, switching station, 132 kV power line to Paulputs Substation; Water supply abstraction point located at the Gariep river; filter and booster station; water supply pipeline; on-site water storage reservoir and tanks; lined evaporation ponds; packaged water treatment plant; auxilliary wet cooled tower/chiller plant; power island including salt storage tanks, steam turbine generator, heat exchanger, and dry cooled condenser, plant substation and power line to evacuate the power from the facility into the Eskom grid; internal access roads and fencing; workshop area for maintenance, storage, and offices.

1.1. Specialist details

The author of this report is an archaeologist accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists, employed at Head of Archaeology at the McGregor Museum in Kimberley and an Extraordinary Professor in the Heritage Studies Department at the Sool Plaatje University. Work has previously been carried by the author in the vicinity of the proposed activity (Morris 1999a-b, 2000a-c, 2001, 2010, 2012, 2014).

The author works independently of the organization commissioning this specialist input, and provide these preliminary scoping observations within the framework of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This is the context for this Heritage Impact Assessment and specialist report, required by the relevant heritage resources authority/ies to assess whether authorisation may be granted for the disturbance or alteration, or destruction of heritage resources.

1.2. Content of the Heritage Impact Report

This specialist study is a stand-alone report (as per the EIA Regulations, 2014) and incorporates the following information:

(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;

(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;

(g) an identification of any areas to be avoided, including buffers;

(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

(i) a description of any assumptions made and any uncertainties or gaps in knowledge;

(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;

(k) any mitigation measures for inclusion in the EMPr;

(l) any conditions for inclusion in the environmental authorisation;

(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;

(n) a reasoned opinion—

  (i) as to whether the proposed activity or portions thereof should be authorised; and

  (ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
(q) any other information requested by the competent authority.

2. Description of the receiving environment and potential impacts

The environment is arid, comprising relatively flat drainage plains with dunes to the west of the proposed development and several outcropping rocky features in the north eastern part of the development footprint. A water pipeline is to be situated westwards to the Gariep River. The landscape is sparsely vegetated, hence any surface archaeological traces are likely to be highly visible.

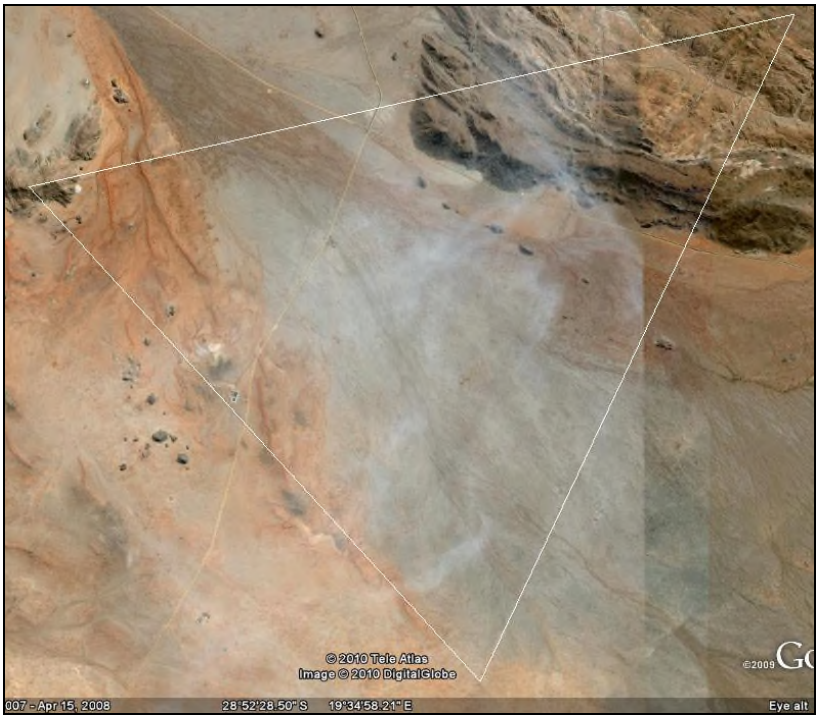

Figure 1. Google Earth image of the terrain prior to the initial development of the Kaxu and Xina solar thermal facilities, in which physical landscape features mentioned are clearly visible.

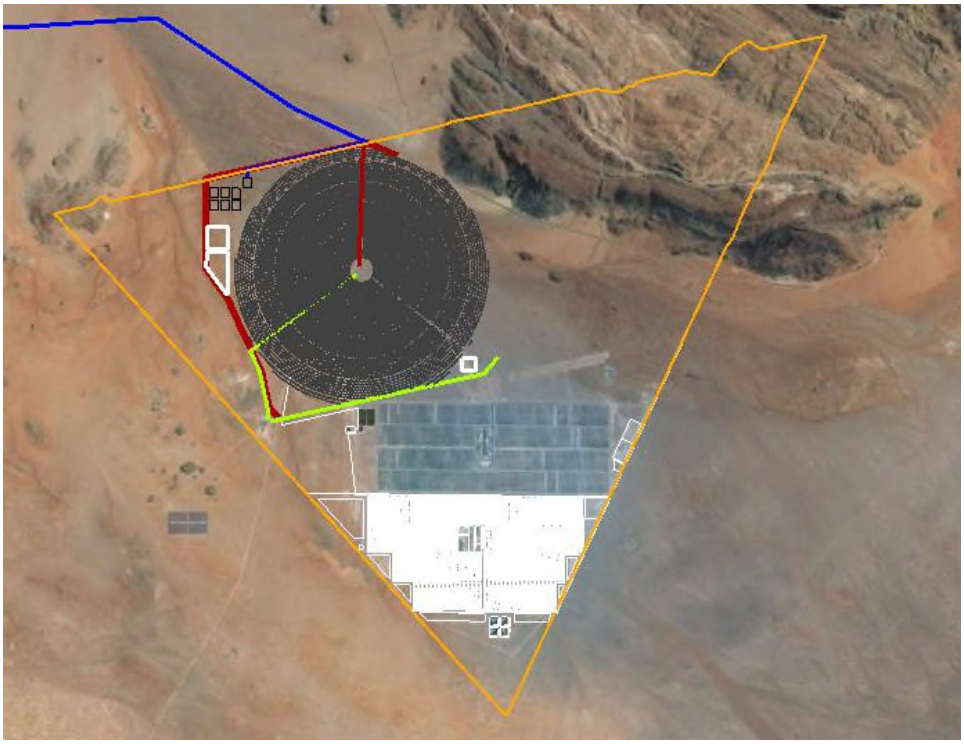

Figure 2. Google Earth image showing the proposed development north of the existing Kaxu Solar One development and projected southern Xina footprint, and including re-routing of the MR73 road, and the incoming pipeline along the road from Onseepkans.

2.1 **Description of Heritage features of the region**

2.1.1 Colonial frontier

This report repeats details provided by the author in earlier studies of the same property.

The eighteenth- and nineteenth-century records for this region (Penn 2005) include the travelogues of George Thompson (1827) and E.J. Dunn (1931, Robinson 1978), who visited the area in 1824 and 1872 respectively. Place names were becoming fixed in this colonial frontier period (in a cadastral sense, on maps and in farm names), many such names having Khoekhoegowab origins encapsulating vestiges of precolonial/indigenous social geography. Genocide against the indigenous people is documented in this area (Anthing 1863; de Prada Samper 2012), with certain mountainous areas (like Gamsberg near Aggeneys and Namies) being the likely settings of massacre sites, referred to by Dunn in 1872 (Robinson 1978) and, more obliquely, by Anthing (1863; Jose Manuel de Prada-Samper pers. comm. 2009). Dunn refers to conflict at Zwart Modder, the farm adjoining Scuit-Klip, where he recorded an isolated grave of a member of the Northern Border Police, which has yet to be relocated. Immediately below the Ysterberg ridge, located on the Farm Scuit-Klip, there is a road-side twentieth century grave (Morris 1999a).

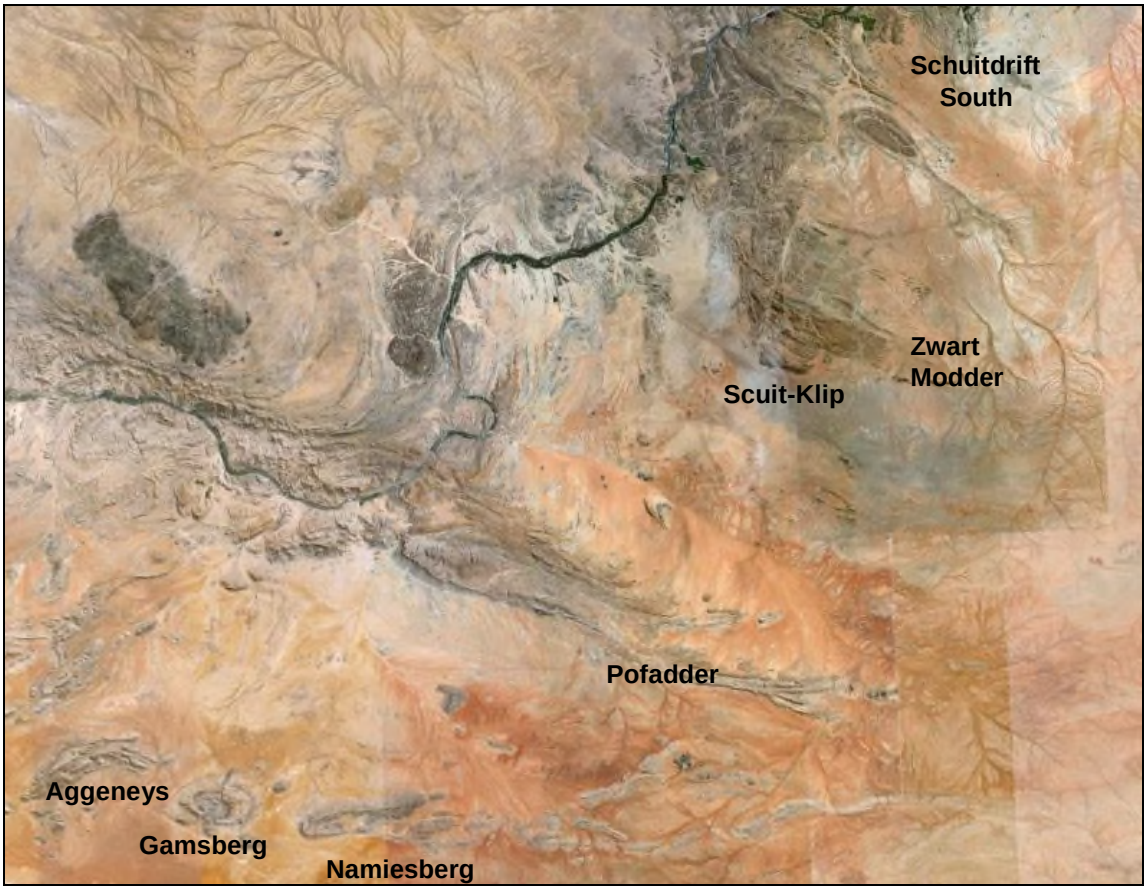

Figure 3. Regional focus: the study area relative to Aggeneys and some other places mentioned.

2.1.2 Later Stone Age

Late Holocene Later Stone Age (LSA) sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region (Morris 1999a-b, 2000a-c, 2001, 2010). Beaumont *et al*. (1995) have shown, with reference to the LSA, that "virtually all the Bushmanland sites so far located appear to be ephemeral occupations by small groups in the hinterland on both sides of the [Orange] river" (1995:263). This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1990), which reflected the "much higher productivity and carrying capacity of these bottom lands." "Given choice, the optimal exploitation zone for foragers would have been the Orange River." The appearance of herders in the Orange River Basin, Beaumont *et al*. argue, led to competition over resources and ultimately to marginalisation of hunter-gatherers, some of whom then occupied Bushmanland, probably mainly in the last millennium, and focused their hunting and gathering activities around the limited number of water sources in the region. Surveys have located signs of human occupation mainly in the shelter of granite inselbergs, on red dunes which provided clean sand for sleeping, or around the seasonal pans (Beaumont *el al*. 1995:264). Possibly following good rains, herders moved into the Orange River hinterland, as

attested archaeologically at sites with ample pottery near Aggeneys and, east of Pofadder, at Schuitdrift South – Morris 1999a). However, Thompson (1824) refers to herder groups settled at the stronger springs such as Pella dispersing during periods of drought to smaller springs in the region, which could equally well account for the traces referred to here. Dunn, in 1872, refers to a place at Schuit Klip (i.e. Scuit-Klip) where water collected following rains and was still available after a year of no rain in the vicinity (Robinson 1978:60-61). At such times competition between groups over resources and stress within an already marginalised hunter-gatherer society, must have intensified.

Fairly minimal traces of LSA have been found on dunes immediately west of the KaXu project (e.g. Morris 2012, 2014).

2.1.3 Pleistocene: Middle and Earlier Stone Age

As indicated previously, Beaumont *et al*. (1995:240-1) have noted 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 extensive surface spreads of Dwyka tillite. Systematic collections of this material made at Olyvenkolk, south west of Kenhardt and Maans Pannen, 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. This is suggested by the known greater reliance of people in Acheulean times on quite restricted ecological ranges, with proximity to water being a recurrent factor in the distribution of sites.

A handaxe and isolated large flakes were previously found near a rocky outcrop in the KaXu footprint.

2.2 Description and evaluation of environmental issues and potential impacts identified in the scoping phase

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments such as those envisaged can have a permanent destructive impact on these resources. The objective of an EIA would be to assess the sensitivity of such resources where present to assess the significance of potential impacts on these resources and to recommend no-go areas and measures to mitigate or manage said impacts.

Area impacts are possible in the case of the Paulputs CSP Facility itself; the proposed substation; the power lines, water supply lines and access roads would represent linear impacts. Potentially associated with roads are borrow pits (although none is indicated) which – in the event of their use – could have a major impact if heritage resources are present.

2.2.2. Direct, indirect and cumulative impacts (in terms of nature, magnitude and extent)

The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. In the long term, the proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.

With respect to the magnitude and extent of potential impacts, it has been noted that the erection of power lines would have a relatively small impact on Stone Age sites, in light of Sampson's (1985) observations during surveys beneath power lines in the Karoo (actual modification of the landscape tends to be limited to the footprint of each pylon), whereas a road or a water supply pipeline would tend to be far more destructive (modification of the landscape surface would be within a continuous strip), albeit relatively limited in spatial extent, i.e. width (Sampson compares such destruction to the pulling out of a thread from an ancient tapestry). A water pipeline, if sourcing water at the river, could traverse more sensitive terrain, i.e. impacting a potentially greater density of archaeological sites.

3. Methodology

A site visit was necessary to inspect various parts of the terrain on foot, focusing on areas of expected impact (construction of plant, sub-station, and secondary infrastructure such as roads, pipelines and power lines). Heritage traces would be evaluated in terms of their archaeological significance (see tables below). A set of Scoping phase predictions were made which the study would test with observations made in the field.

3.1 Assumptions and limitations

It was assumed that, by and large in this landscape, with its sparse vegetation and shallow soil profiles, some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features). It was not considered necessary to conduct excavations as part of the EIA to establish the potential of sub-surface archaeology.

A proviso is routinely given, that should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to heritage authority).

With regard to fossils, an assessment of the likelihood of their occurring here should be obtained from a palaeontologist.

3.2. Scoping phase predictions

3.2.1. Potential areas of sensitivity

During the Scoping phase (Morris 2015) it was predicted that based on previous experience in the area, it is estimated that the terrain close to hills or rocky features, particularly sandy spots near sheltering rocks, may tend to have traces of precolonial Stone Age occupation/activity. Such a site was previously documented on the adjoining farm Zwart Modder (Morris 1999a), while rather minimal evidence of LSA occupation has been noted on a dune between the KaXu Solar One development and the MR73 road (Morris 2012, 2014). A handaxe and a few large ESA/MSA flakes (illustrated below) were found adjacent to a rock outcrop north of the KaXu Solar One development (Morris 2012).

Figure 4. Stone artefacts found downslope from this rocky outcrop shown in Figure 5. (Morris 2012).

Figure 5. Rocky outcrop and location where Earlier Stone Age artefacts were located.

While places in the open plains have been found to have sparsely scattered artefacts (such as at Konkonsies near the Paulputs Substation site – Morris 1999a), these areas are expected to be less significant. An exception to this is where rocky outcrops at the surface on the plains provide places where water pools exist after rains. Such places often attracted people in the past with traces of this including artificial grinding grooves in the bedrock and ample evidence of stone artefacts and pottery. A very good example of this is at Schuitdrift South. The name Scuit-Klip may refer to such a locale on this property, though not necessarily in that portion selected for the present project. It is in fact described in some detail by Dunn (Robinson 1978:60-61): "Two holes occur in the gneiss at the crest of a ridge … when heavy thunder rains sweep over this arid country the water runs into and sometimes fills these most useful reservoirs, in which it is stored up and lasts many months."

The sand dunes in the north western part of the area may also have been a focus for past human occupation.

Colonial era sites or features within the study area include the known road-side grave below Ysterberg, a presently unknown grave recorded by Dunn (see above) of a member of the Northern Border Police (near Zwart Modder), and a farm cemetery and homestead/kraal ruins at the old Skuit-Klip farm between the study area and Zwart

Modder. Strauss and Esterhuizen family graves in the cemetery date between 1914 and 1974.

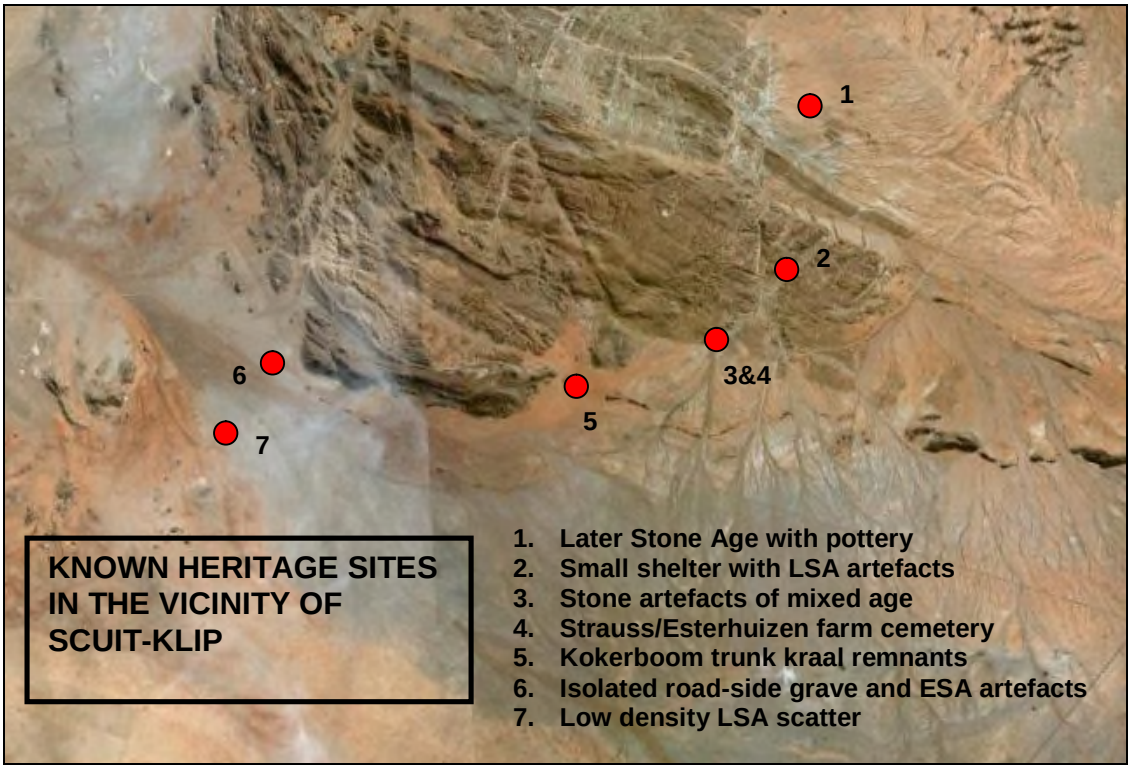

Figure 6. Previously known heritage sites.

3.3. Potentially significant impacts to be assessed in the EIA process

In view of the above, anticipated locations for both area and linear, primary and secondary, developments should be examined on foot, particularly on dunes and around rocky outcrops – both of which features occur in the area of proposed development. Any disturbance of surfaces in the development area could have a destructive impact on heritage resources. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, the Northern Cape Heritage Resources Authority. Should exceptional heritage features be found (not considered likely), some could require preservation *in situ* and hence modification of intended placement of development components.

Disturbance of any surface includes any construction: of a road, a pipeline, erection of a pylon, or preparation of a site for a sub-station, or plant, or building, or any other *clearance* of, or *excavation* into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also obviously possible). Without context,

archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

Some of the activities indicated here have a generally lower impact than others. For example, Sampson (1985) has shown that powerlines tend to be less destructive on Stone Age sites than roads since access along the route of the line during construction and maintenance tends to be by way of a 'twee-spoor' temporary roadway (not scraped, the surface not significantly modified). This does not mean that the route of the line should not be checked in the EIA process, as individual tower positions might be of high archaeological significance (e.g. a grave, or an engraving). The impact of a 'twee-spoor' could be far greater on Iron Age sites in other parts of South Africa, where stone walling might need to be breached.

3.4. Determining Archaeological Significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes *any* trace, even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 (below) is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	**Landform**	**Type 1**	**Type 2**	**Type 3**
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near feature such as hill	On old river terrace
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Sloping floor or small area	Flat floor, high ceiling
Class	**Archaeo-logical traces**	**Type 1**	**Type 2**	**Type 3**
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

Class	**Attribute**	**Type 1**	**Type 2**	**Type 3**
1	Length of sequence/context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density

				of arte/ecofacts
2	Presence of exceptional items (incl regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

4. Observations and Assessment of Impacts

The manner in which archaeological and other heritage traces or values might be affected by the proposed development may be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The most obvious impact in this case would be land surface disturbance associated with infrastructure construction.

4.1 Fieldwork observations

The study area was visited on two separate occasions 11 July 2012 and 14 February 2014 to survey the proposed development footprint area and ancillary infrastructure locales for KaXu Solar One and XiNa Solar One respectively. The findings can be reported in relation to predictions made in the scoping report (see 3.2 above):

Characterising the significance of impacts

The following criteria are used in this Environmental Impact Assessment to characterise the significance of direct, indirect and cumulative impacts (Jodas 2010):

- 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:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- 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 a score is assigned:
  - 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, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 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 (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as either positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the *degree* to which the impact can be *mitigated.*

The **significance** is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

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).

Impact table summarising the evaluation of Potential Impacts Associated with the Construction of the Facility at the EIA phase

Nature:
Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected).

These potential impacts would tend to be direct, once-off events occurring during the initial construction period. In the long term, the proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity. Certain activities would generally have a lower impact than others (i.e. power lines tend to be less destructive on Stone Age sites than access roads).

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short (1)
Magnitude	High (8)	Low (4)
Probability	Improbable (2)	Very improbable (1)
Significance	Low (**28**)	Low (**6**)
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes, if and where present – but occurrence is between zero and extremely low density, no or low significance. Sensitive areas at and around rocky outcrops have been excluded from the development because of sensitivity.	
Can impacts be mitigated?	Yes but not considered necessary.	

Mitigation: Artefact densities are zero to extremely low over the development footprint and along the pipeline route. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the "Without mitigation" column err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary.

Assessment of Cumulative Impacts

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[1].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed

[1] Unless otherwise stated, all definitions are from the 2014 EIA Regulations, GNR 982

project in the area will increase the impact). This section should address whether the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or wholescale changes to the environment or sense of place
- Unacceptable increase in impact

Cumulative impact table:

Nature: Complete or wholescale changes to the environment or sense of place (example text only)

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Local (1)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Improbable (2)	Probable (3)
Significance	Low (**28)**	**Medium (39))**
Status (positive/negative)	Negative	Negative
Reversibility	No	No
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes.	Yes

Confidence in findings:

High.

Mitigation:

No-go areas have been recommended in this study in order to mitigate impacts on sensitive elements in the landscape that provided shelter and resources for people in Stone Age times. In this way cumulative impacts on sense of place are also addressed.

5. Measures for Inclusion in the Draft Environmental Management Plan

OBJECTIVE: Archaeological or other heritage materials occurring in the path of any surface or sub-surface disturbances associated with any aspect of the development are highly likely to be subject to destruction, damage, excavation, alteration, or removal. The objective should be to limit such impacts to the primary activities associated with the development and hence to limit secondary impacts during the medium and longer term working life of the facility.

Project component/s	Any road construction over and above what is necessary and any extension of other components addressed in this EIA.
Potential Impact	The potential impact if this objective is not met is that wider areas or extended linear developments may result in further destruction, damage, excavation, alteration, removal or collection of heritage objects from their current context on the site.
Activity/risk source	Activities which could impact on achieving this objective include deviation from the planned lay-out of road/s and infrastructure without taking heritage impacts into consideration.
Mitigation: Target/Objective	A facility environmental management plan that takes cognizance of heritage resources in the event of any future extensions of roads or other infrastructure. It is not regarded as necessary that any mitigation should take place for the areas identified for development.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Provision for on-going heritage monitoring in a facility environmental management plan which also provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of development or operation. No Phase 2 (mitigation) regarded as necessary in terms of present development layout.	Environmental management provider with on-going monitoring role set up by the developer. -	Environmental management plan to be in place before commencement of development. -

Performance Indicator	Inclusion of further heritage impact consideration in any future extension of infrastructural elements. Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
Monitoring	Officials from relevant heritage authorities (National and Provincial) to be permitted to inspect the operation at any time in relation to the heritage component of the management plan.

Findings and recommendations

The study which has been conducted on this landscape over some years has identified sensitive locales with respect to heritage. For the present phase the sensitive sites that should be avoided are identified in Figure 8. These are the rocky outcrops that occur at the north eastern side of the proposed project footprint. These sites and others like them in the broader landscape provided shelter and variety of resources that attracted human activity through Stone Age times.

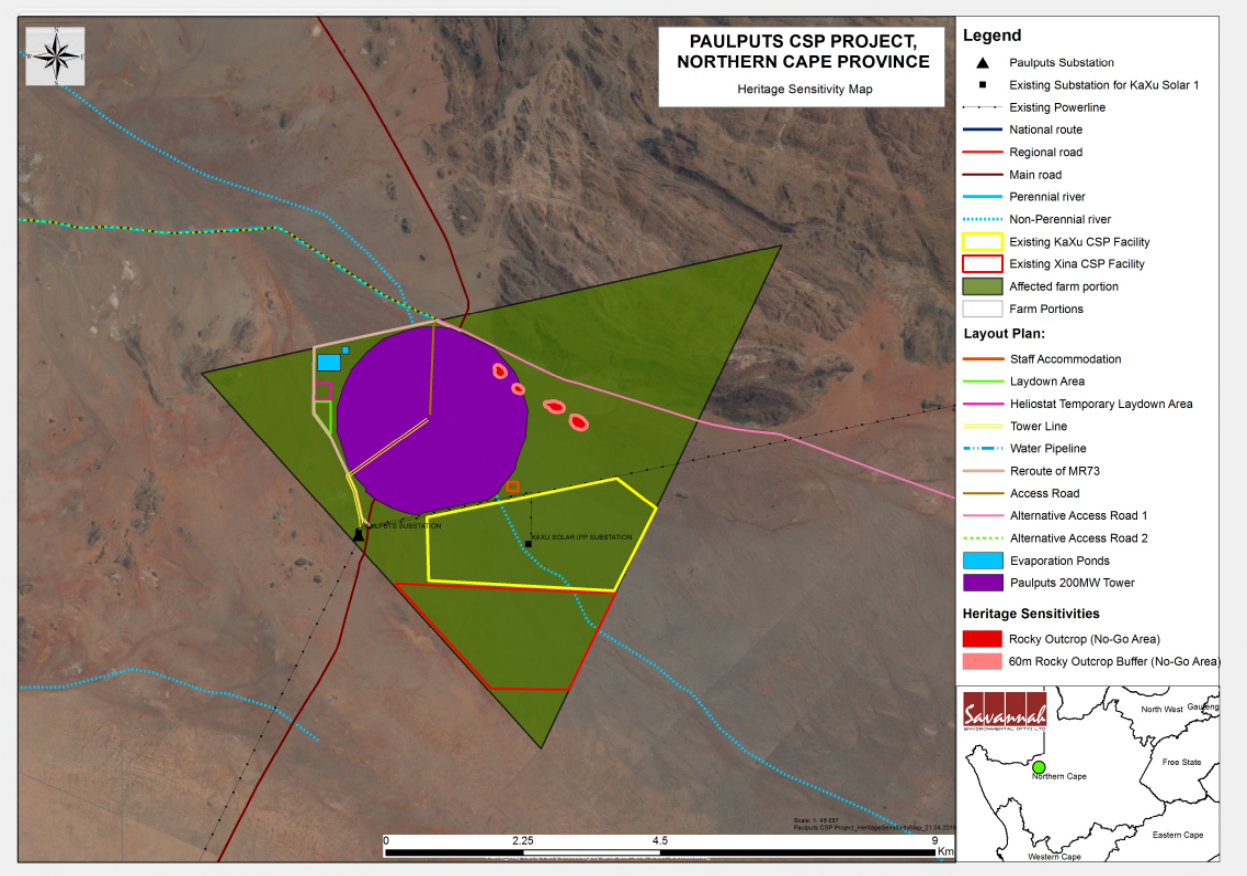

Figure 8. Rocky outcrops identified as sensitive from a heritage point of view are signaled as no-go areas in this study.

Pipeline

This study reiterates the findings of the study in 2014 on the Xina Solar Thermal Facility (Morris 2014), which included an archaeological impact assessment of the pipeline route

from the extraction point at Onseepkans. It follows an already disturbed route mostly within the road reserve.

Conclusion

With the isolation of the sensitive rocky outcrop sites at the eastern end of the presently proposed development, and with the pipeline route already assessed, the significance of impact is as reported previously and the same measures for inclusion in the Draft Environmental Management Plan pertain.

From an archaeological perspective the observed heritage resources either fall well outside of the proposed development footprint or are of low significance. Criteria used here for impact significance assessment rate the impacts as Low.

References

Anthing, L. 1863. Letter to the Cape Parliament. Cape Blue Book.

Beaumont, P. B., Smith, A.B., & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In A. B. Smith (ed.). Einiqualand: studies of the Orange River frontier, Cape Town: UCT Press.

Deacon, J. nd. Archaeological Impact Assessment - specialist input to planning and design. Unpublished notes compiled for the National Monuments Council.

De Prada Samper, J.M. 2012. The forgotten killing fields: 'San' genocide and Louis Anthing's mission to Bushmanland, 1862-1863. *Historia* 57(1):172-187.

Dunn, E. J. 1931. The Bushmen. London: Charles Griffin & Co.

Morris, D. 1999a. Archaeological impact assessment, 'Southern Option', powerline 'Schuitdrift' to 'Paulputs', Pofadder District, Northern Cape. Unpublished Report to Eskom.

Morris, D. 1999b. Archaeological impact assessment, Skuitklipkop Microwave Tower, Kenhardt District, Northern Cape. Unpublished Report to Eskom.

Morris, D. 2000a. Gamsberg Zinc Project environmental impact assessment specialist report: archaeology.

Morris, D. 2000b. Archaeological impact assessment, Black Mountain Mine, Aggeneys, Northern Cape. Unpublished report to Walmsley Environmental Consultants.

Morris, D. 2000c. Archaeological specialist report: desktop assessment of possible archaeological resources along the proposed route, Helios to Aggeneis, Northern Cape. Appendix G in Eyethu Engineers CC: Scoping report: environmental impact assessment for the proposed Aggeneis to Helios 400 kV transmission line. Eskom Transmission Group.

Morris, D. 2001. Gamsberg Zinc: supplementary report on archaeological resources at Gamsberg. Unpublished report for Gamsberg Zinc Project.

Morris, D. 2010. Cultural Heritage Assessment: Gamsberg. Supplementary observations to a previous specialist report on archaeological resources. Unpublished report to SRK Consulting.

Morris, D. 2012. Pofadder Solar Thermal Facility KaXu Solar One: specialist input for the Environmental Impact Assessment Phase and Environmental Management Plan: Archaeology.

Morris, D. 2014. Xina Solar Thermal Facility: specialist input for the Environmental Impact Assessment Phase and Environmental Management Plan for the proposed Xina Solar Thermal Facility, Pofadder, Northern Cape Province: Archaeology.

Morris, D. & Beaumont, P.B. 1991. !Nawabdanas: archaeological sites at Renosterkop, Kakamas District, Northern Cape. South African Archaeological Bulletin 46:115-124.

Penn, N. 2005. The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century. Athens, Ohio and Cape Town: Ohio University Press and Double Storey Books.

Prinsloo, H.P. 1998. Argeologiese omgewingsverslag: Pofadder en Aggeneys omgewing. For Klopfer Environmental Consultants.

Robinson, A.M.L. (ed) 1978. Selected articles from the Cape Monthly Magazine NS, 1870-1876. Cape Town: Van Riebeeck Series Second Series No 9.

Sampson, C. G. 1974. The Stone Age archaeology of South Africa. New York: Academic Press.

Smith, A.B. 1995. Archaeological observations along the Orange River and its hinterland. In A. B. Smith (ed.). Einiqualand: studies of the Orange River frontier, Cape Town: UCT Press.

Thompson, G. 1827. Travels and adventures in Southern Africa. Reprint, Cape Town: Africana Connoisseurs Press, 1962.

Whitelaw, G. 1997. Archaeological monuments in KwaZulu-Natal: a procedure for the identification of value. Natal Museum Journal of Humanities. 9:99-109.