

**ARCHAEOLOGICAL IMPACT ASSESSMENT OF THE
PROPOSED KLOOFSIG 1 SOLAR PV ENERGY FACILITY
ON THE REMAINDER OF THE FARM KALK POORT 18,
PETRUSVILLE AREA, RENOSTERBERG LOCAL
MUNICIPALITY, NORTHERN CAPE**

Prepared for:

SRK Consulting (South Africa) (Pty) Ltd

Att: Ms Nicola Rump, PO Box 21842, Port Elizabeth, 6000

E-mail: NRump@srk.co.za

Prepared by:

Madelon L. Tusenius

Natura Viva cc

PO Box 12410

Mill Street, Cape Town

8010

Phone: (021) 462 3622

E-mail: naturaviva@universe.co.za

23 December 2016

EXECUTIVE SUMMARY

Natura Viva cc was appointed by SRK Consulting (South Africa) (Pty) Ltd to undertake an Archaeological Impact Assessment (AIA) for the proposed development of a 225 MW solar photovoltaic (PV) energy facility (consisting of three phases) on the farm Kloofsig (Kalk Poort 18) some 10km to the northwest of Petrusville, Renosterberg Local Municipality, Northern Cape. Petrusville lies to the west of the Vanderkloof Dam on the Orange River. Kloofsig 1 lies at the centre of the proposed three phase development on privately owned agricultural land and includes two on-site substations and a short connection to the 400 kV power line crossing the site. A 132 kV power line (approximately 8.5km long) and a switch station are proposed to the south of the three phase project. The total footprint of Kloofsig 1 is about 270 ha and includes the 31m wide servitude of the 8.5 km power line. Kloofsig 2 and 3 lie to the north and south of the first phase and are the subjects of two separate AIAs. The assessments were conducted under Section 38(8) of the National Heritage Resources Act (Act 25 of 1999).

The survey of the Phase 1 area (Kloofsig 1) was undertaken as part of the baseline study conducted on Kloofsig farm between 17 and 19 June 2015 (Tusenius 2015). The farm was covered by vehicle on existing tracks and short walked loops in the veld. A subsequent foot survey of the proposed 132 kV power line and switch station was conducted on 16 January 2016. Visibility of archaeological material on the ground was generally good.

Most of the archaeological remains recorded in the study area consist of a background scatter of weathered and patinated, typologically mixed Middle Stone Age (MSA)/ Later Stone Age (LSA) artefacts, with the former being more common. These artefacts occur dispersed within the surface gravels, rather than as discrete concentrations, and are in a secondary context in areas affected by sheet erosion. The fact that there appears to be no stratigraphic context and no organic remains are preserved would suggest that most of the proposed Kloofsig 1 development area is of low archaeological heritage sensitivity.

One area of medium local archaeological sensitivity does however occur close to the proposed development footprint. This consists of a concentration of Early Stone Age (ESA), MSA and Fauresmith material occurring amongst coarse alluvial gravels along the watercourse to the north of the proposed eastern power line (shown in the satellite images in Figures 4a and 4b). This material is mostly exposed along the southern bank of the watercourse and in the bed of the stream, but buried gravels with stone artefacts are visible between the bedrock and overlying alluvium in the northern bank. Although this occurrence is assigned a rating of IIIB local significance which may require mitigation before destruction (SAHRA 2013), it lies outside and immediately north of the footprint of the proposed servitude of the power line. It will not be directly affected by construction activities if the recommended management measures to minimise the negative impact of the proposed construction of the power line on this archaeologically sensitive area are followed. This area must be avoided and safeguarded by a cordon of security tape. The Environmental Control Officer (ECO) must ensure that proposed construction activities along this section of the power line be restricted to the disturbed areas between the telephone lines and the gravel road, i.e. south of the watercourse.

Due to the generally low archaeological heritage sensitivity of most of the study area, the impact of the proposed development on these archaeological resources in the areas which

are directly affected - the power line with servitude, the switch station, substations, solar panels, roads and associated infrastructure - is expected to be of low significance (Table 1). In addition, there will be no impact on the sensitive archaeological resources identified on Kloofsig farm during the baseline study (Tusenius 2015). Therefore, no loss of unique archaeological heritage resources is anticipated if the recommended management measures are strictly adhered to. This assessment applies to the construction phase of the proposed Kloofsig 1 solar energy facility. No further significant impacts on archaeological heritage resources are anticipated during the operational and decommissioning phases.

If the above measures of avoidance of the ESA/MSA/Fauresmith occurrence along the watercourse to the north of the eastern power line are followed, the overall impact of the development will be of low significance in terms of local archaeological heritage. The cumulative impact of the proposed Kloofsig 1 development in the broader area is considered to be low as long as the above-mentioned artefact concentration is left intact. No other Fauresmith material has been recorded by impact studies for several other projects in the immediate area of the proposed development. However, low sensitivity Stone Age material comparable to the background scatter of artefacts is dispersed over the surface throughout the wider region.

If the management plan is adhered to, no further specialist archaeological work or mitigation is recommended for Kloofsig 1.

Provided that the recommendations regarding avoidance are followed, there are no objections, on archaeological grounds, to the authorisation of the proposed developments - Kloofsig 1, the switch station and the 132 kV power line. However, if any human remains, graves or stone burial cairns are found during the construction of the proposed development, work in that area must cease and the ECO must immediately notify (South African Heritage Resources Agency (SAHRA)).

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	2
1. INTRODUCTION.....	5
2. LEGAL FRAMEWORK.....	7
3. TERMS OF REFERENCE.....	7
4. STUDY APPROACH	
4.1 Method.....	8
4.2 Limiting factors.....	8
5. DESCRIPTION OF THE AFFECTED ENVIRONMENT	
5.1 Archaeological background.....	8
5.2 Area of proposed Kloofsig 1.....	9
6. RESULTS.....	13
7. ASSESSMENT OF IMPACTS AND SIGNIFICANCE.....	19
8. CONCLUSIONS.....	20
9. REFERENCES.....	21
10. ACKNOWLEDGEMENTS.....	23
11. SPECIALIST DECLARATION AND EXPERTISE	
11.1 Declaration of Independence.....	23
11.2 Expertise of the specialist.....	23
12. APPENDIX.....	24

1. INTRODUCTION

Natura Viva cc was appointed by SRK Consulting (South Africa) (Pty) Ltd to undertake an Archaeological Impact Assessment (AIA) for the proposed development of a 225 MW solar photovoltaic (PV) energy facility (consisting of three phases) on the farm Kloofsig (Kalk Poort 18) some 10km to the northwest of Petrusville, Renosterberg Local Municipality, Northern Cape (Figure 1). Petrusville lies to the west of the Vanderkloof Dam on the Orange River. The site of the proposed development extends over privately owned agricultural land with an area of approximately 970 ha. The three areas identified for Phases 1 to 3 were originally part of a proposed larger 6 phase development (Figures 1 and 2). This report deals with the first phase of the proposed project, namely Kloofsig 1, which includes an associated 132 kV power line (approximately 8.5km long) with a 31m wide servitude and a 132 kV switch station.

Phase 1 lies at the centre of the proposed three phase development (Figures 2 and 3). The proposed power line and switch station are located to the south of the Kloofsig development (Figures 2 and 4a). Kloofsig 1 also includes two substations – one for Phase 1 and one which will service all three phases - and a short connection to the 400 kV power line crossing the site. The main components of the proposed three phase project include solar panels, underground cables and power lines, a laydown area and construction camp. Associated infrastructure includes access roads (the existing gravel road to the north-east of the site, as well as a proposed second access road to the south), internal roads, water supply via existing or new boreholes, wastewater treatment and solid waste management. The total footprint of Kloofsig 1, including the power line, is about 270 ha. Kloofsig 2 and 3 lie to the north and south of Phase 1 and are the subjects of two separate AIAs (Tusenius 2016a, b).

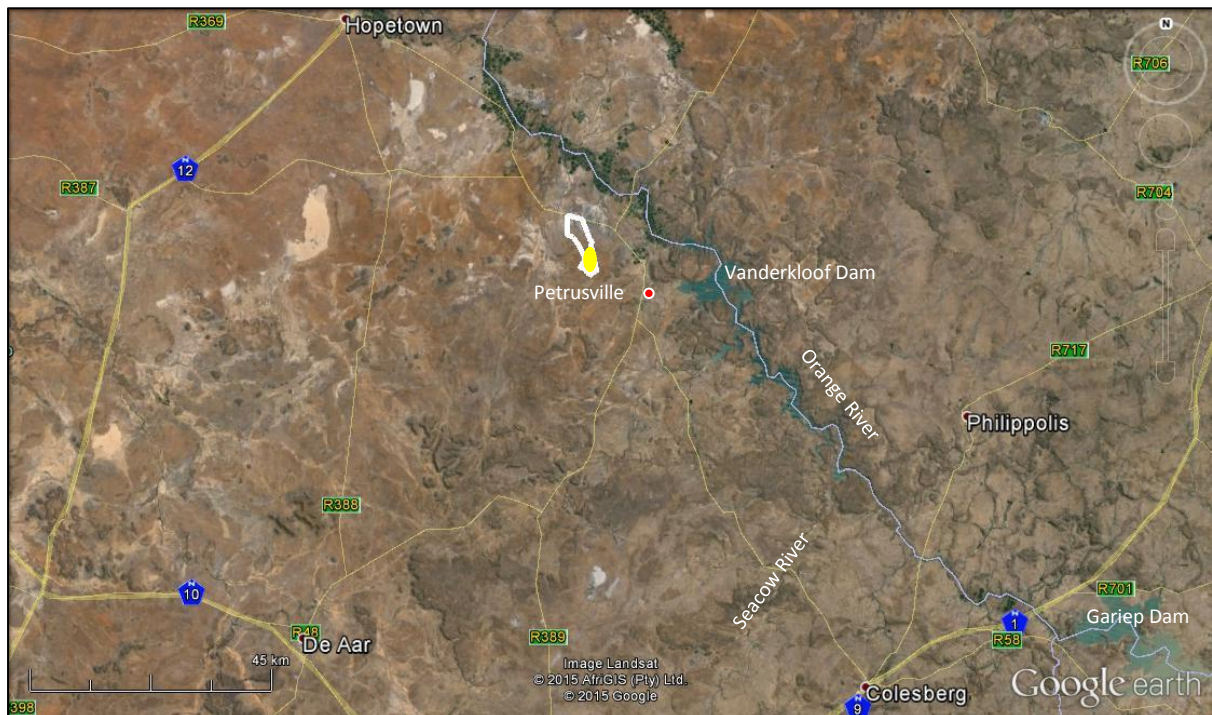


Figure 1: Google earth image showing the location of the proposed Kloofsig Solar PV Energy Facility (outline of the original larger project indicated in white, the present three

phase project indicated in yellow) on the farm Kloofsig to the northwest of Petrusville and the Vanderkloof Dam. The relevant 1:50 000 topographical maps are 2924DC Havengabrug and 3024BA Petrusville.

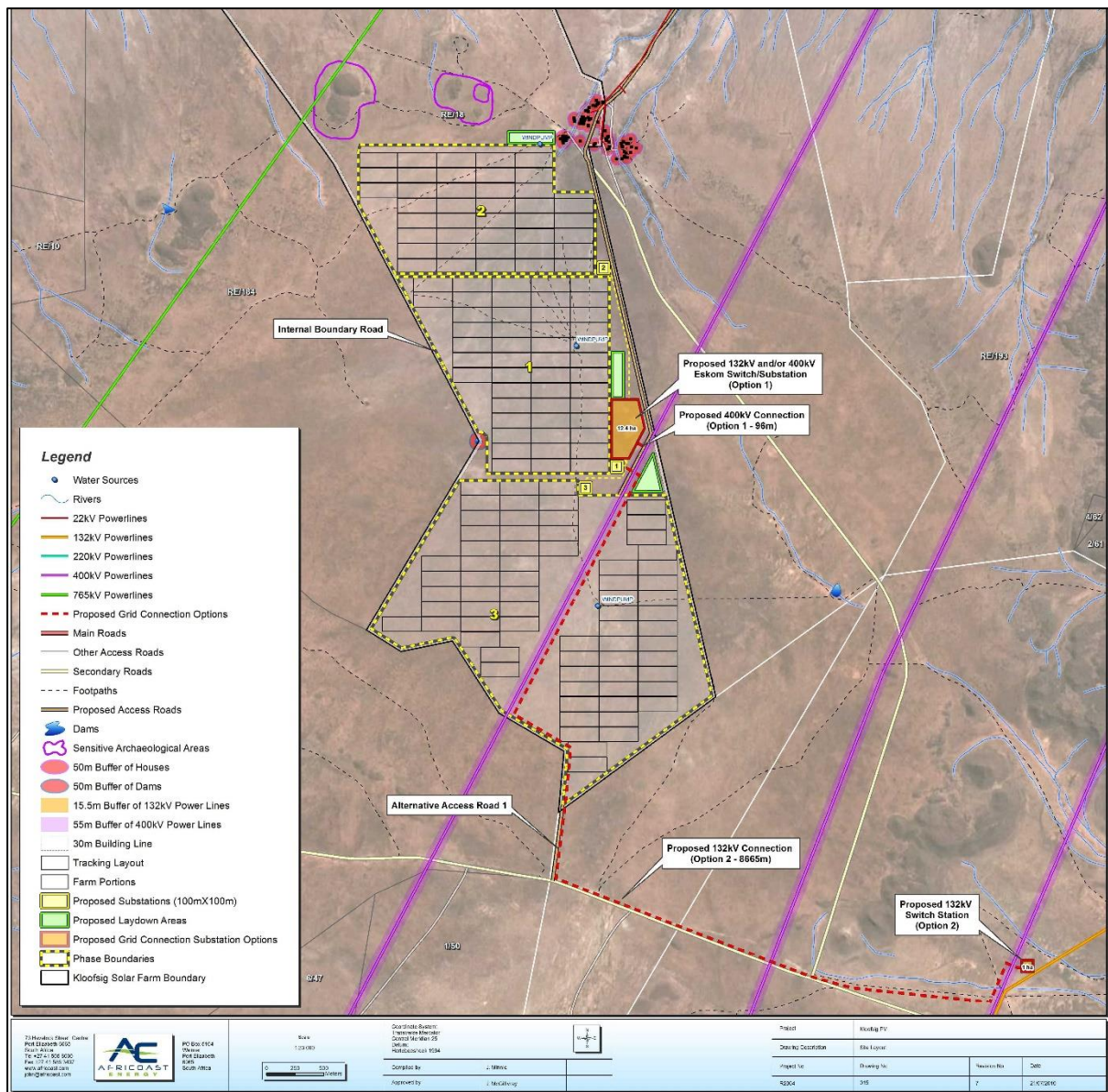


Figure 2: The layout of the proposed three phase Kloofsig Solar PV Energy Facility with the proposed 132 kV power line and switch station to the south and southeast of the development in red (Image courtesy of SRK Consulting). Archaeologically sensitive areas identified in the baseline report (Tusenius 2015) - dolerite 'koppies' with LSA remains and a cemetery - are outlined in purple to the north of the proposed development. Farm buildings, encircled by red, lie to the north-east of the affected area.

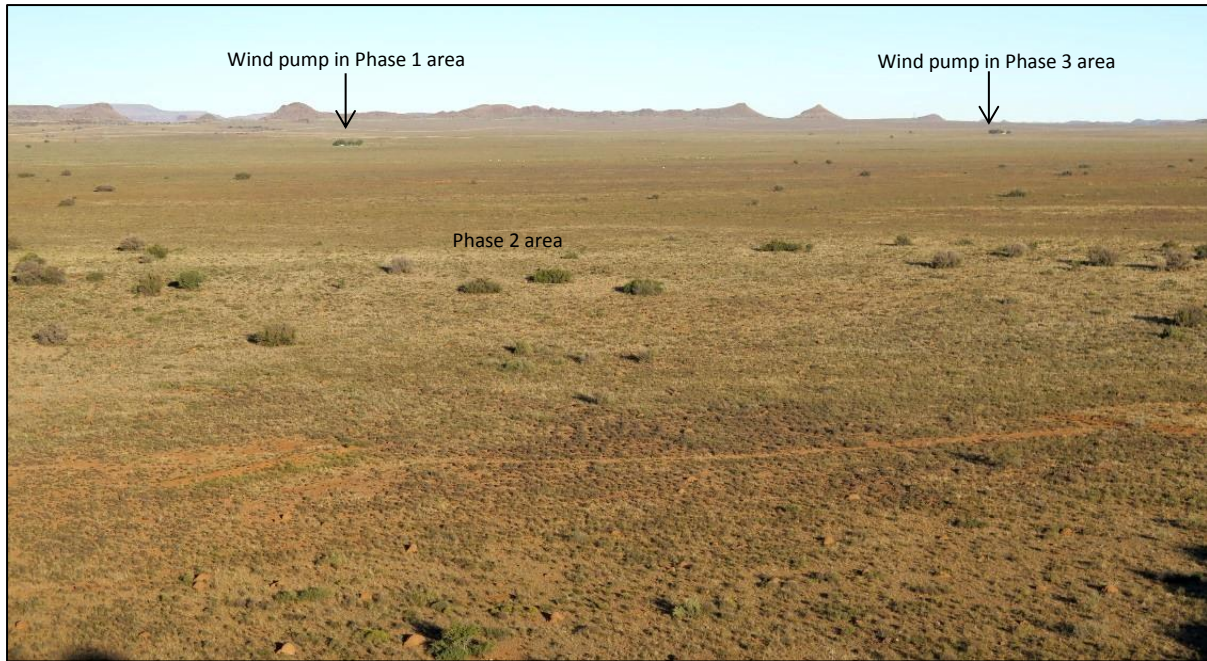


Figure 3: View towards the southeast from the dolerite hills to the north of the proposed Kloofsig Solar PV Energy Facility development. The position of wind pumps in Phases 1 and 3 is indicated.

2. LEGAL FRAMEWORK

In terms of the National Heritage Resources Act (Act 25 of 1999) protection is provided for heritage resources such as archaeological and palaeontological sites (Section 35 (4)), structures older than 60 years (Section 34) and graves older than 60 years (Section 36 (3)). Section 38 of the National Heritage Resources Act is triggered by certain types of development, including changes of character to an area exceeding 5 000m², and makes provision for compulsory Heritage Impact Assessments to assess the potential impacts of such proposed developments on heritage resources. Such heritage assessments are conducted under Section 38 (8) of the National Heritage Resources Act, and as part of the Environmental Impact Assessment (EIA) requirements of the National Environmental Management Act (No. 107 of 1998) (NEMA).

3. TERMS OF REFERENCE

The terms of reference for the study were to:

- Conduct a literature review of known archaeological resources within the area with a view to determining which of these resources are likely to occur within the development footprint
- Assess the area of the proposed solar PV energy facility
- Describe and map any sensitive or no-go areas to inform the final layout
- Comment on potential impacts on these resources resulting from the development
- Make recommendations regarding the mitigation of any damage to archaeological resources identified, or that may be identified during the construction phase.

4. STUDY APPROACH

4.1 Methods

A field survey of Kloofsig farm was undertaken on 17 to 19 June 2015 as part of a baseline study (Tusenius 2015) for a proposed six phase solar development. This project has subsequently been reduced to the present proposed three phase development. During the baseline survey, the farm was covered by vehicle on existing tracks and short walked loops in the veld to gain a general impression of the layout of the farm and the archaeological potential of different areas. During the subsequent survey of the proposed 132 kV power line and switch station on 16 January 2016 most of the area was covered on foot. Members of the Havenga family (in particular Rensa, John and Jenny Havenga) were also consulted about features of archaeological and historical interest on the property. The farm has belonged to the family of Mrs Rensa Havenga for at least 3 generations.

Tracks and archaeological occurrences observed during the survey were recorded by a Garmin GPSMAP 62s set on the WGS84 datum. The general area and archaeological material were extensively photographed. The visibility of archaeological material on the ground was generally good due to relatively sparse vegetation cover, although some areas of denser bush do occur. The first survey took place during winter, a dry season. Some light rain had fallen prior to the January survey but this did not result in a great increase in plant cover.

A summary of aspects of the literature review undertaken of known archaeological resources in the area is given in the archaeological background section below.

4.2 Limiting factors

During the survey for the baseline study (Tusenius 2015), the areas of the present three phase study were identified as being of low archaeological significance so less attention was paid to these than to the areas of medium to high significance described in the relevant report, and given in the archaeological background section below. However, the author feels confident that the conclusions reached about the Phase 1 study area are reasonable and in line with what was observed in other parts of the farm, as well as in accordance with what has been recorded in other AIA and academic studies in the area.

5. DESCRIPTION OF AFFECTED ENVIRONMENT AND SITES

5.1 Archaeological background:

Within the broader region surrounding the study area the most important reference sources for data on the archaeology are Garth Sampson's Orange River Scheme study (Sampson 1968, 1970, 1972) and his work in the Seacow Valley (Sampson 1985). The former study was conducted prior to the construction of the Gariiep and Vanderkloof dams, formerly the H.F. Verwoerd and P.K. le Roux dams respectively, and consisted of a survey of the floodbasins of the two dams. The location of the two dams is indicated on Figure 1. The surface archaeology was mapped and 942 Stone Age occurrences, most of which were found along stream banks, were recorded (Sampson 1972). Twelve buried sites were

excavated. A sequence of six industries covering the Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA), including LSA with ceramics, was recognised. His second study (Sampson 1985) concerns the area surrounding the Seacow River, a minor tributary of the Orange River, which flows to the south of the Vanderkloof Dam (Figure 1). The same six successive industries, with an additional one, were recognised during the mapping of over 16 000 surface stone artefact concentrations. These concentrations reflect the residues of activities carried out by successive populations of Stone Age hunter-foragers, as well as a temporary incursion of stock-herders in the southwest corner of the survey area. San hunter-foragers in this area first came into contact with European Trek boers in the late 1700's.

Archaeological impact studies have been undertaken in the general area indicated in Figure 1 - Petrusville, the Vanderkloof Dam, Hopetown and De Aar, as well as the Hanover area some 120 km south of Kloofsig - and include those by Dreyer (2008a, b), Morris (1997, 2011a, b, c, 2012), Nel (2008), Tussenius (2015), Van Jaarsveld (2006), Van Ryneveld (2013), Van Schalkwyk (2015), Van Vollenhoven (2013) and Webley & Orton (2011). A variable density of stone artefacts, especially MSA material, has been observed over the surface of most of the areas surveyed, with fewer LSA occurrences and very rare ESA material. One Later Iron Age homestead and a shelter with rock paintings has been recorded close to the Vanderkloof Dam (Van Ryneveld 2013). Other archaeological material which has been noted includes rock engravings on dolerite boulders (Nel 2008, Webley & Orton 2011), stone kraal complexes and historical farmsteads (Webley & Orton 2011), stone burial mounds (Morris 2012, Van Vollenhoven 2013), plus ration tins and the remains of a block house related to the Anglo-Boer War (Dreyer 2008b, Morris 2012). The last is a reminder that there was an Anglo-Boer War presence in the area which includes a battlefield and concentration camp in the Hopetown district (Dreyer 2008b).

The baseline report for the original, larger proposed Solar PV development (Tussenius 2015) is of direct relevance to the present three phase project – Kloofsig 1, 2 and 3. Besides the typical background scatter of stone artefacts on the entire farm, three areas of particular archaeological interest and sensitivity were recorded outside and to the north of the present study area. One is an area where *in situ* stone artefacts, mostly MSA, were seen eroding out of older calcretised, white, alluvium in the river banks in the vicinity of an old spring, as well as the nearby remains of a demolished old farmhouse ('ou opstal') with fragments of porcelain, glass, metal and animal bones in the vicinity. Clusters of dolerite 'koppies' were another area of interest - small patches cleared of stones, some of which formed low walls, were noted in association with small scatters of mainly LSA artefacts. A cemetery with 13 definite graves and 1 possible grave of packed dolerite boulders, some dating to the last 20 years but others much older, was recorded.

5.2 Area of proposed Kloofsig 1:

Kloofsig 1 lies at the centre of the proposed three phase development, with Phases 2 and 3 to the north and south respectively (Figures 2, 3, 5 and 6) and the proposed 8.5km long 132 kV power line with 31m wide servitude and switch station to the south and southeast of Kloofsig 1 (Figures 2, 4a, 7 to 10). (See the introduction for further information about the associated infrastructure, also indicated in Figures 2 and 4a.) The study area, currently used primarily for sheep farming, is underlain by Ecca Group rocks and mostly consists of flat-lying 'vlaktes' (plains) covered by calcrete hardpan and thin red soils with calcrete and

hornfels gravels (Figures 3, 5 to 11). Sandy alluvial soils occur in the proposed power line servitude.

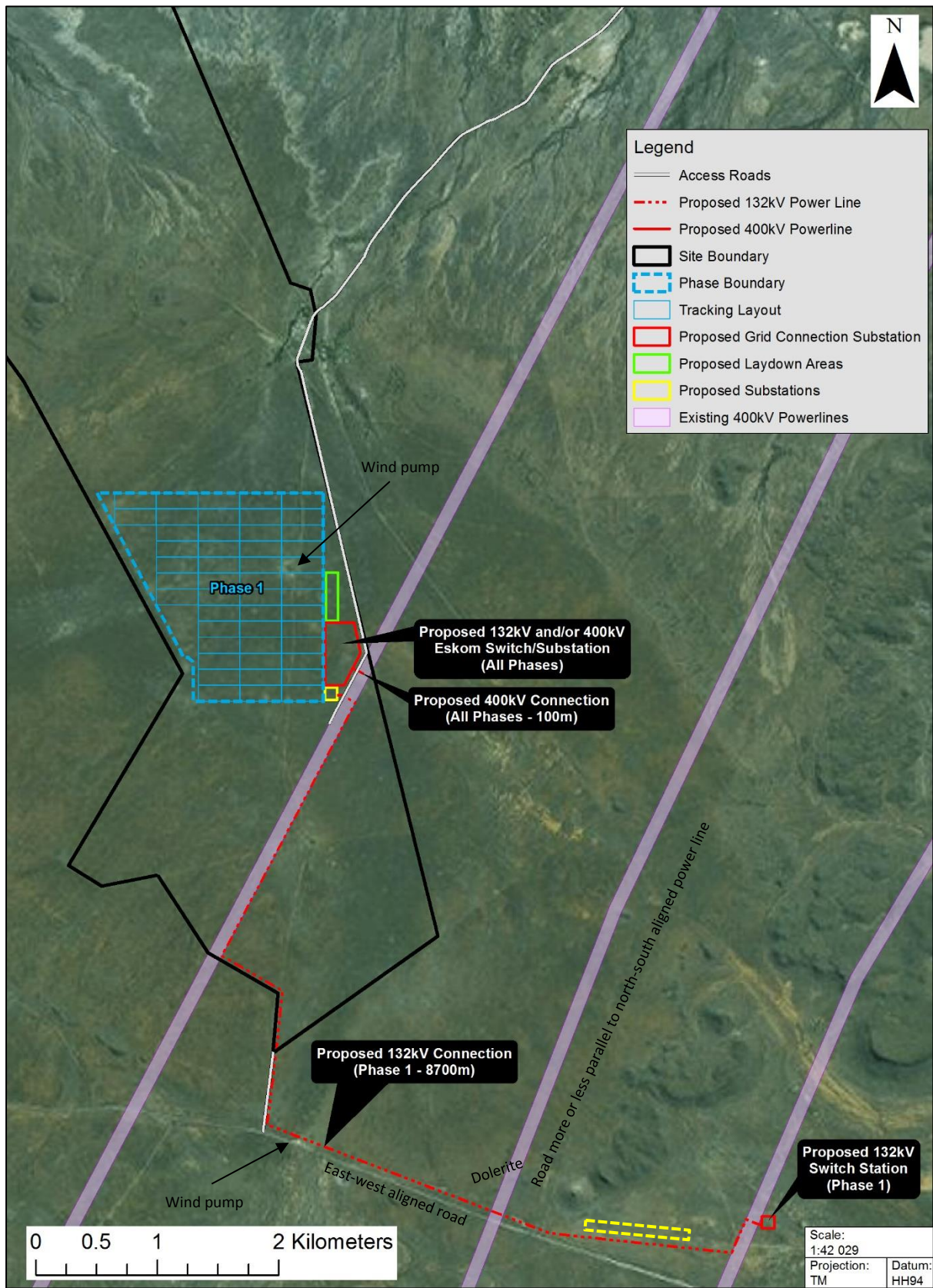


Figure 4a: Layout of Phase 1 of the Kloofsig Solar PV Energy Facility (Image courtesy of SRK Consulting.) The position of the proposed power line and switch station (red), the

gravel roads, the area of dolerite outcrop and the area of archaeological sensitivity (dashed yellow lines) are indicated. See Figure 4b for a more detailed view of the last area.

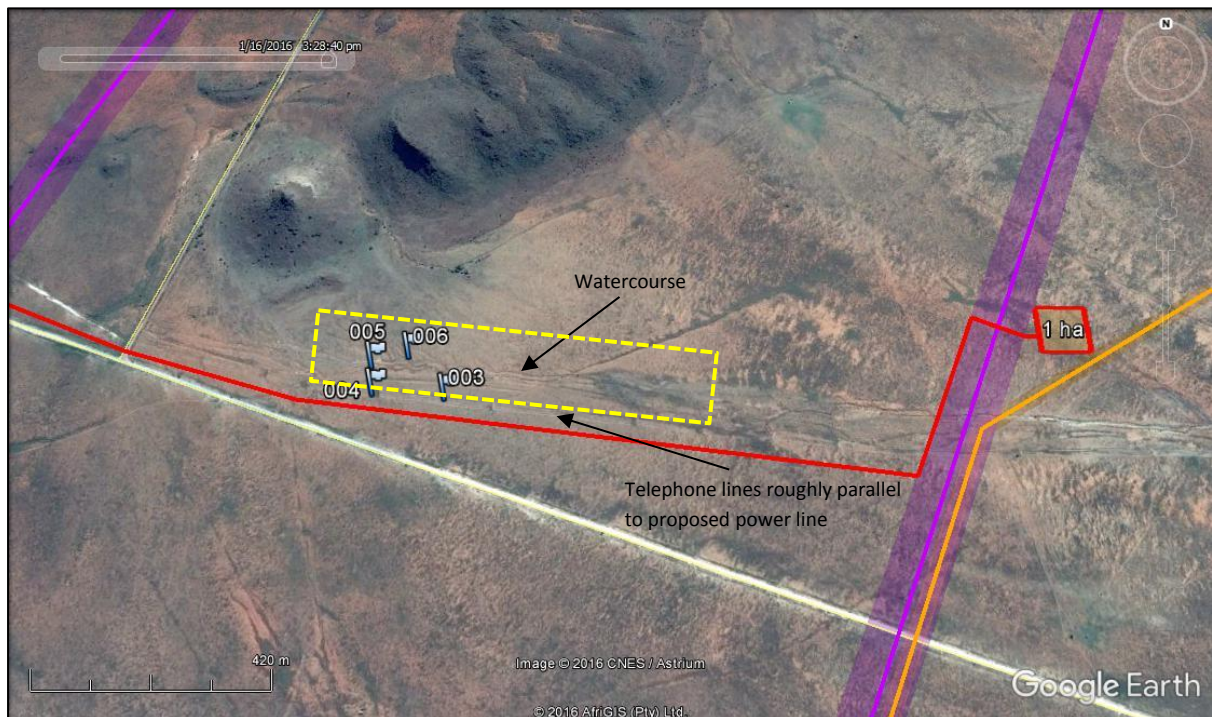


Figure 4b: Detail of the archaeologically sensitive area (yellow) with a concentration of ESA/MSA/Fauresmith material in the eastern power line study area (red). Waypoints 003 to 005 indicate the approximate extent of gravels with artefact concentrations exposed in disturbed areas between the telephone lines and watercourse (Figures 11 and 20). Waypoint 006 shows the position of the buried gravels with artefacts (Figure 21) See the Appendix for details of the co-ordinates.

The Phase 1 area is generally featureless, except for a wind pump which is situated in the centre of the eastern half of it (Figure 5). The proposed power line is situated to the north of an east-west orientated gravel road and is bisected by another which is roughly parallel to one of the existing 400 kV power lines (Figures 2, 4a, 7 and 10). Two roughly east-west aligned telephone lines and a shallow watercourse lie to the north of the proposed power line (Figures 7, 10, 11 and 21). Several very small dams/ water catchment areas are dispersed at intervals along the watercourse in this area of disturbance. Further digging has occurred as pipes have been buried along sections of this disturbed zone. The area to the east of the bisecting north-south road slopes gently to the east and the proposed switch station lies at the eastern-most end of the proposed line (Figures 7 and 8). The western part of the line passes through an area of low dolerite outcrop and then slopes down towards a wind pump in the west (Figure 10). From the wind pump it heads north towards and through the Kloofsig 3 project area to the Kloofsig 1 study area (Figure 9). Evidence of sheet wash is apparent over the entire study area. The Nama Karoo vegetation is dominated by scattered small shrubs and bushes, most below 50 cm high. Grass cover is limited.



Figure 5: Phase 1 area - view towards the east showing the sparse surface gravels amongst which the down-wasted stone artefacts occur. The windpump is visible in the background.
Figure 6: Phase 1 area - view towards the south showing soil and denser vegetation covering the gravels in parts of the study area.

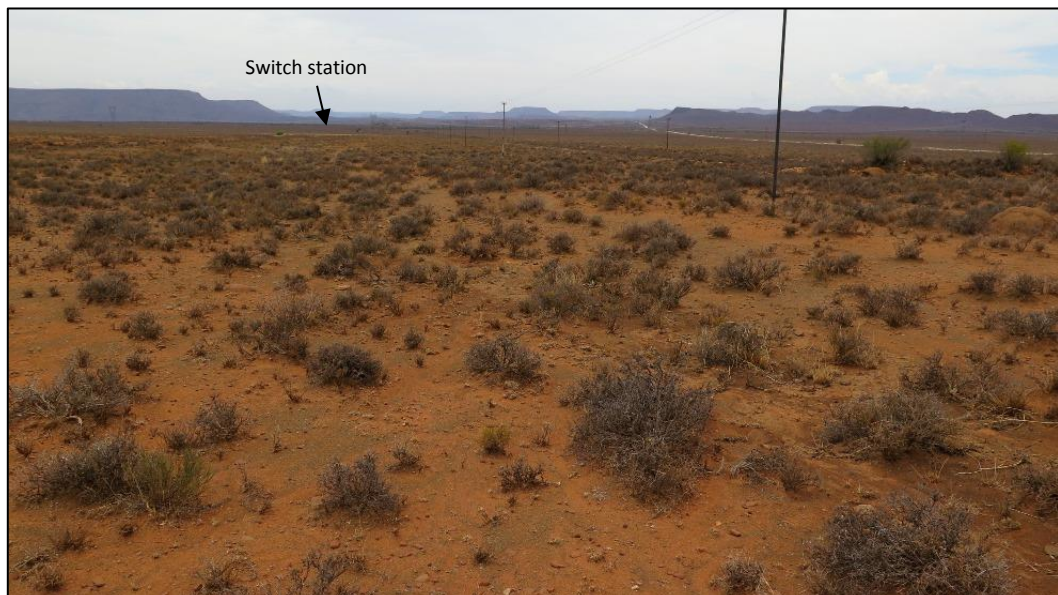


Figure 7: Eastern power line area: View towards the east of some gravels exposed in the alluvial soils of the area which slopes gently down to the east. The approximate location of the proposed switch station is indicated by the black arrow. The telephone lines and the east-west aligned gravel road are evident on the right of the image. Surface gravels have been partially exposed by sheet erosion.

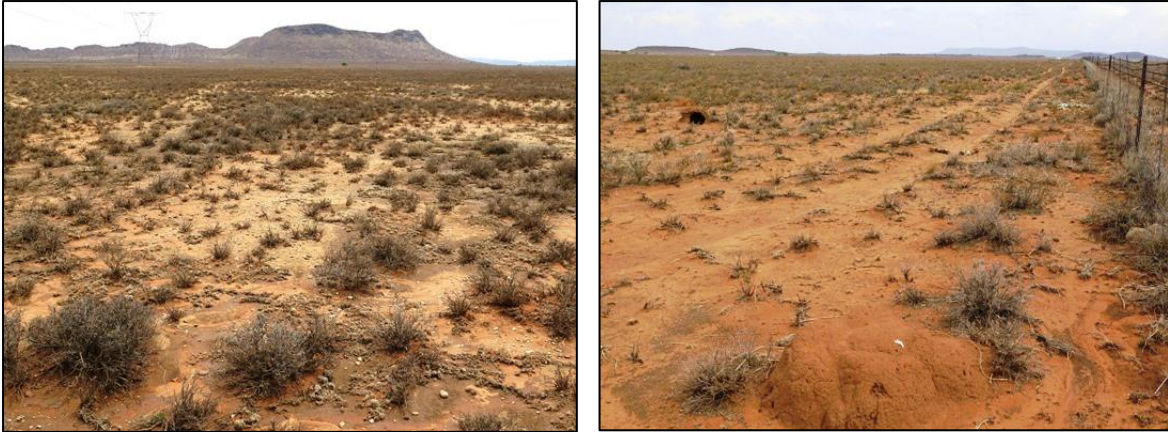


Figure 8: View towards the northeast of the proposed switch station area at the easternmost end of the proposed power line. Figure 9: Western power line area - view towards the south of the area between Phase 3 and the east-west aligned gravel road.



Figure 10: Western power line area which slopes gently down to the west. Outcropping dolerite and gravels exposed under the alluvial soils are evident in the foreground. The telephone lines and gravel road are visible in the background. The position of the wind pump lies close to where the proposed power line turns north towards the Phase 3 area.

6. RESULTS

Most of the Kloofsig farm features dispersed Stone Age archaeological material in the form of an ubiquitous background scatter of stone artefacts within the surface and sub-surface gravels of the study area (Figures 7 to 13), rather than discrete concentrations of artefacts. The distribution of the material is patchy – sometimes there are several artefacts within a metre of each other, other times there is a gap of many metres between them – but there appear to be no areas where they are completely absent. Visibility of this material is best where there are deflated areas as the artefacts probably originate from the soils, are then

down-washed onto the calcrete hardpan and concentrated amongst the gravels when the soils are removed by water erosion. There are many signs of sheet wash throughout the study area so there has been transport of the material both horizontally and vertically. In other parts of Kloofsig farm, to the north of the dolerite 'koppies', sub-surface gravels with *in situ* artefacts were seen in thick alluvial deposits (Tusenius 2015).

Immediately north of the proposed servitude of the power line, coarse alluvial gravels are partially calcretised and consist mainly of hornfels and dolerite clasts. They are exposed in disturbed areas, for example, in the strip surrounding the two roughly east-west aligned telephone lines to the north of the proposed line, as well as along the shallow watercourse and in areas where sheet wash has removed some of the topsoil (Figures 8, 10, 11 to 20). Road building activities have also revealed patinated hornfels blocks which lie on the surface close to the dolerite outcrop on either side of the north-south aligned gravel road (Figure 12). Not many of these blocks have been flaked but they serve to illustrate the local availability of this source of favoured raw material, close to the contact zone between the mudrock and dolerite.



Figure 11: Eastern power line area - view towards the east showing the partially calcretised hornfels gravels with dispersed stone artefacts exposed along the southern bank of the watercourse. Figure 12: Western power line area - exposed gravels consisting of hornfels clasts, most of which have not been flaked. The ruler is about 15cm in length.

The surface background scatter of artefacts within the dispersed surface gravels throughout the entire study area consists mainly of very weathered and patinated flakes, blades, chunks, cores and scrapers which appear to be of mixed Middle Stone Age (MSA) and Later Stone Age (LSA) origin, with the former being more common (Figures 13 to 19). Less patinated artefacts may indicate a younger age or less transport by alluvial and sheet wash processes. Hornfels of varying grain sizes was the preferred raw material used but some local dolerite and sandstone, as well as occasional cryptocrystalline silica (CCS) including chert, agate and banded ironstone (probably from the Orange River gravels) for LSA artefacts were also noted. Retouch is evident on some of the flakes, adzes and scrapers.



Figures 13 and 14: Phase 1 area - examples of weathered and patinated MSA/LSA stone artefacts, including a MSA point, exposed in the down-wasted calcrete gravels. The scale is in cm.



Figures 15 and 16: Proposed switch station area - examples of weathered and patinated artefacts, mainly MSA, in the background scatter exposed by sheet erosion of the topsoil. The ruler is about 15cm in length.



Figure 17: Western power line area - weathered artefacts, mostly MSA. Figures 18 and 19: Western power line area - flaked hornfels cores and flakes of varying patination. The ruler is about 15cm in length.

The stone artefacts observed in the coarser sub-surface alluvial gravels appear to be of mixed MSA and Early Stone Age (ESA) origin (Figures 20 to 30). Diagnostic MSA artefacts include blades and convergent points (e.g. Figures 29 and 30), whereas bifaces and cleavers are characteristic of the ESA (Figures 22 to 27). The occurrence of small bifaces in association with MSA elements, such as long blades, could indicate the presence of the so-called Fauresmith industry which appears to be transitional between the ESA and MSA (Sampson 1972, Underhill 2011). Sampson later (1985) assigned this on typological grounds to the final Acheulian, i.e. final ESA. (The locations of areas with concentrations of archaeological material and/or bifaces are indicated in Figures 4a, 4b and the Appendix.)

The most abundant ESA/MSA/Fauresmith material, including small handaxes, is concentrated within coarse alluvial gravels along part of the watercourse in the eastern half of the study area and in the disturbed area between the telephone lines (Figures 4a, 4b, 11, 20 and 21). Possibly between 10 and 20% of the hornfels clasts within the gravels are flaked. There is surface exposure of artefacts along the southern bank and in the bed of the watercourse (Figures 11 and 20). Buried gravels with artefacts are visible in the northern bank (Figure 21) and show the geological context of these gravels - situated between the weathered Eccca Group mudrocks and the sandy alluvial soils. Coarse alluvial gravels with artefacts, including at least one ESA biface (Figure 25), have been down-wasted and exposed under the alluvium to the west of the dolerite outcrop in the western power line area.

No organic material such as ostrich eggshell or bone was observed in the entire study area. No cultural or structural remains of Anglo-Boer War or other historical significance were noted. No signs of graves were noted in the proposed Phase 1 area or in the alluvium of the proposed power line. The lines of dolerite boulders observed in the eastern power line area are anti-erosion measures in association with small earth dams and water catchment areas. The dolerite outcrop in the western power line area was examined for possible rock engravings but none were seen.

Archaeological sensitivity: Most of the archaeological resources recorded in the study area - the proposed Phase 1, switch station area and most of the proposed power line – are the dispersed, typologically-mixed Stone Age artefacts observed on the surface. The fact that there appears to be no stratigraphic context and no organic remains are preserved would suggest that these resources are of limited research value. They are therefore regarded as being of low archaeological heritage sensitivity.

The one area where a concentration of ESA/MSA/Fauresmith material, some of it buried, was recorded along the watercourse to the north of the eastern part of the proposed power line (Figures 4a and 4b) is regarded as being of medium local archaeological sensitivity. Although the exposed material is mixed and is not in a primary context, it appears to be typologically different to the mixed artefacts observed in the surface background scatter. Sampson (1985) has demonstrated that concentrations of Fauresmith material on flat-lying areas close to sources of hornfels – bedrock outcrops, as well as gravels – reflect the preference of past people for these areas rather than post-depositional processes. This archaeological material may be of scientific value and is therefore assigned a rating of IIIB local significance which may require mitigation before destruction (SAHRA 2013). However, as this area lies outside and immediately north of the footprint of the proposed power line

and 31m wide servitude, it will not be directly affected if the recommended management measures are implemented (see the next section and Table 1).

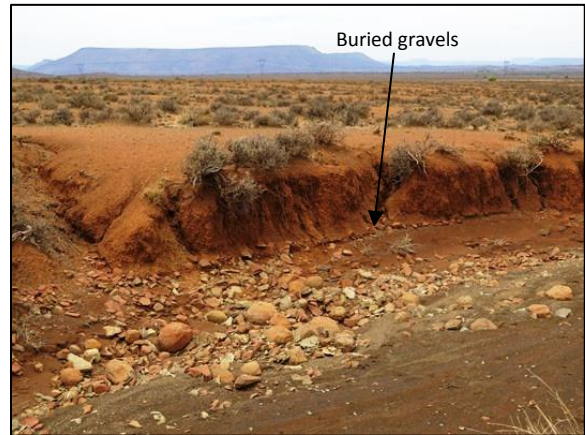


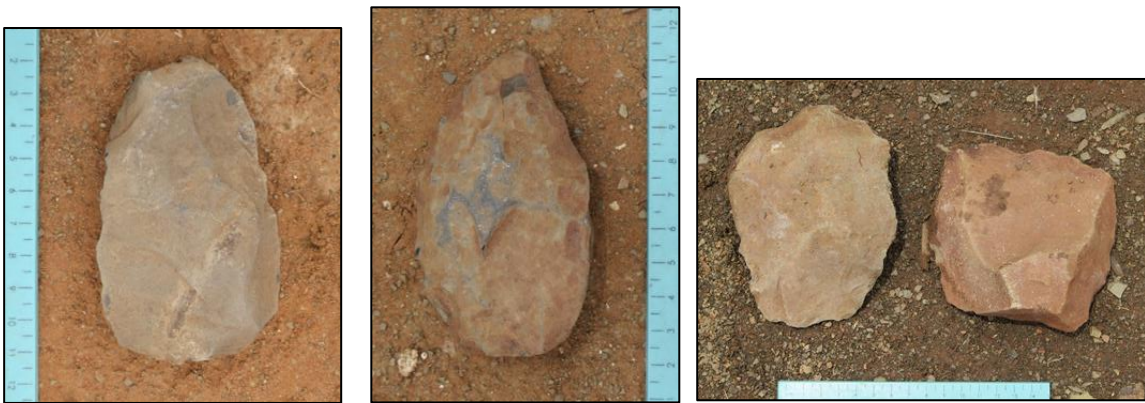
Figure 20: Eastern power line area - detail of the exposed hornfels gravels which include ESA/MSA artefacts. The ruler is about 15cm in length. Figure 21: Eastern power line area - view towards the northeast of the northern bank of the watercourse showing buried gravels with ESA/MSA material exposed below the alluvium.



Figure 22: Eastern power line area - examples of hornfels ESA and MSA artefacts, including bifaces and cores. The top right and bottom left artefacts are bifacially flaked and can also be seen in Figure 23. Figure 23: Eastern power line area - examples of several hornfels bifaces, including Fauresmith handaxes (bottom middle and right). The ruler is about 15cm in length.



Figure 24: Eastern power line area - examples of typologically mixed artefacts including a MSA core (top left) and ESA biface (bottom right). Figure 25: Western power line area - hornfels ESA and MSA artefacts including a biface in the second row from the top. The ruler is about 15cm in length.



Figures 26 and 27: Eastern power line area - further examples of possible Fauresmith bifaces. Figure 28: Eastern power line area - cleavers. The ruler is about 15cm in length.



Figure 29: Western power line area - MSA blade. Figure 30: Western power line area - MSA point on the right with blade fragment above. The scale is in cm.

7. ASSESSMENT OF IMPACT AND SIGNIFICANCE

Following the impact rating methodology used by SRK Consulting, the assessment of impact of the proposed Kloofsig 1 development (including the power line and switch station), the significance rating of the anticipated impact on archaeological resources and recommendations regarding management (mitigation) are given in Table 1 and expanded upon in the text below. The cumulative impact assessment, taking Phases 2 and 3 as well as other developments into account, is discussed towards the end of this section. This assessment applies to the construction phase of the proposed development, since no further significant impacts on archaeological heritage resources are anticipated during the operational and decommissioning phases.

The proposed construction of Kloofsig 1 will result in the damage, destruction and long term (permanent) loss of archaeological heritage resources due to earthmoving, construction and installation activities. This is a negative impact. The impact of the proposed surface clearance will be local, i.e. restricted to the areas where the power line with servitude, the switch station, substations, solar panels, roads and associated infrastructure will be located in the three-phase development and will not affect the entire Kloofsig farm. As the area of medium local archaeological sensitivity along a section of the watercourse close to the eastern power line (Figures 4a and b, as discussed in the previous section of the report) lies to the north of and outside the footprint of the proposed power line and 31m wide servitude, the intensity of the impact of construction on archaeological heritage in the directly affected areas is regarded as being low (Table 1).

The overall impact of the development will thus be of low significance in terms of local archaeological heritage. The degree of confidence in the rating is indicated as medium, given that it was not possible to determine the extent of the concentration of gravels with artefacts, particularly to the north of the watercourse.

Several management measures to minimise the negative impact of the proposed construction of the power line on the archaeologically sensitive area along the watercourse are recommended. This area must be avoided and safeguarded by security tape. The ECO must ensure that proposed construction activities along this section of the power line be restricted to the disturbed areas between the telephone lines and the gravel road.

If any human remains, graves or stone burial cairns are found during the development of the proposed solar facility, work in that area must cease, it should be cordoned off with security tape and the ECO must immediately notify the South African Heritage Resources Agency (SAHRA) (telephone number 021 462 4502). Avoidance, rather than mitigation, would be the best option. The latter will involve exhumation by a suitably qualified professional archaeologist with appropriate accreditation from the Association of Southern African Professional Archaeologists (ASAPA), under a permit issued by SAHRA. Mitigation would be at the cost of the developer.

Table 1: Significance rating of impact of the proposed Kloofsig 1 development on archaeological heritage resources during the construction phase and recommended mitigation measures

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+-	Confidence
Before Management	Local	Low	Long term	Low	Definite	Low	-	Medium
Management Measures								
<ul style="list-style-type: none"> • Avoid the section of the watercourse to the north of the eastern power line which was identified as being of medium local archaeological sensitivity and cordon it off with security tape. • Restrict construction activities in the eastern power line area to the disturbed zone between the telephone lines and the gravel road. • If dense concentrations of stone artefacts are uncovered during construction, the ECO should notify SAHRA. • If any human remains, graves or stone burial cairns are found during construction, work in that area must cease and the ECO must immediately notify SAHRA. If the burials cannot be avoided, exhumation by a suitably qualified and accredited professional archaeologist would need to be done under a permit issued by SAHRA. Mitigation is at the cost of the developer. 								
After Management	Local	Low	Long term	Low	Probable	Low	-	Medium

The cumulative impact of the three phases of the proposed Kloofsig development, as well as two other solar projects have been assessed. The last projects consist of Swartwater Solar PV Power Facility, close to Petrusville (Van Vollenhoven 2013), and Grootpoort PV Solar Energy Facility, near Luckhoff, Free State (Van Schalkwyk 2015). Information in the baseline study for Kloofsig (Tusenius 2015) has also been taken into account. Other developments close to the general Kloofsig area for which archaeological impact assessments have been done are the Hydra-Perseus and Beta-Perseus 765kv transmission power lines (Van Jaarsveld 2006) and the upgrade of the Transnet railway line between Hotazel and Coega (Nel 2008).

These studies, as well as those also mentioned in the background section of this report, have revealed that Stone Age material comparable to the background scatter in part of the affected area is dispersed over the surface throughout the wider region. The author is not however aware of the occurrence of Fauresmith material recorded by other impact studies in the area immediately west of the Vanderkloof Dam. As long as the concentration of ESA/MSA/Fauresmith artefacts along the watercourse is avoided, the cumulative impact of the proposed Kloofsig 1 solar energy facility on archaeological heritage remains in the broader area is considered to be low.

8. CONCLUSIONS

Provided that the recommended management measures - particularly the avoidance of the area of archaeological sensitivity close to the eastern power line servitude - are followed, no further specialist archaeological work or mitigation is recommended as it is expected that a representative sample of the background scatter of material will be left after construction activities. There will be no impact on the sensitive archaeological resources identified on Kloofsig farm during the baseline study (Tusenius 2015) and thus no loss of unique

archaeological heritage resources is anticipated. There are therefore no objections, on archaeological grounds, to the authorisation of the proposed developments - Kloofsig 1, the switch station and the 132 kV power line. However, if any human remains, graves or stone burial cairns are found during the construction of the proposed development, work in that area must cease and the ECO must immediately notify SAHRA.

9. REFERENCES

Dreyer, C. 2008a. First Phase Archaeological and Cultural Heritage Investigation of the Vanderkloof Dam – Petrusville Main Water Supply Scheme, Northern Cape. Unpublished report prepared for MDA Environmental Consultants. Private Archaeologist/Heritage Specialist, Bloemfontein.

Dreyer, C. 2008b. Archaeological and Cultural Heritage Assessment of the proposed MTN mast at the farm Elandsdraai 88, near Orange River Station, Hopetown District, Northern Cape. Unpublished report prepared for Enviroworks Environmental Consultants. Private Archaeologist/Heritage Specialist, Bloemfontein.

Morris, D. 1997. Archaeological Impact Assessment for Gypsum Industries in respect of proposed mining at Kraankuil on the farms Zeerust and Springbokspoor. Phase 1 survey: specialist input. Unpublished report prepared for Gypsum Industries. McGregor Museum, Kimberley.

Morris, D. 2011a. Archaeology Specialist Input on the site of the proposed Taaiboschfontein Photovoltaic Construction Site between De Aar and Hanover, Northern Cape. Unpublished report prepared for Jean Beater. McGregor Museum, Kimberley.

Morris, D. 2011b. Archaeology Specialist Input on the site of the proposed Vanderlindeskraal Photovoltaic Construction Site situated near Hanover, Northern Cape. Unpublished report prepared for Jean Beater. McGregor Museum, Kimberley.

Morris, D. 2011c. Archaeology Specialist Input on the site of the proposed Kalkbult Photovoltaic Construction Site north of De Aar, Northern Cape. Unpublished report prepared for Jean Beater. McGregor Museum, Kimberley.

Morris, D. 2012. Archaeology Specialist Input on the proposed access road for the Vanderlindeskraal Photovoltaic Site situated near Hanover, Northern Cape. Unpublished report prepared for Scatec Solar. McGregor Museum, Kimberley.

Nel, J. 2008. Final Report. Heritage Resources Scoping Survey & Preliminary Assessment. Transnet freight line EIA, Eastern Cape and Northern Cape. Unpublished report prepared for ERM Southern Africa. Archaic Heritage Project Management, University of Pretoria.

Sampson, C.G. 1968. The Middle Stone Age Industries of the Orange River Scheme. Memoir No. 4. National Museum, Bloemfontein.

Sampson, C.G. 1970. The Smithfield Industrial Complex: Further Field Results. Memoir No. 5. National Museum, Bloemfontein.

Sampson, C.G. 1972. The Stone Age Industries of the Orange River Scheme and South Africa. Memoir No. 6. National Museum, Bloemfontein.

Sampson, C.G. 1985. Atlas of Stone Age settlement in the Central and Upper Seacow Valley. Memoirs van die Nasionale Museum Bloemfontein No. 20: 1-116.

South African Heritage Resources Agency. 2013. Minimum Standards: Archaeological Component of Heritage Impact Assessments.

Tusenius, M.L. 2015. Baseline report of the proposed Solar Photovoltaic Energy Facility on Kloofsig (Kalkpoort 18), Petrusville area, Renosterberg Local Municipality, Northern Cape. Unpublished report prepared for SRK Consulting (South Africa) (Pty) Ltd. Natura Viva cc.

Tusenius, M.L. 2016a. Archaeological Impact Assessment of the proposed Kloofsig 2 Solar PV Energy Facility on the Remainder of the Farm Kalk Poort 18, Petrusville area, Renosterberg Local Municipality, Northern Cape. Unpublished report prepared for SRK Consulting (South Africa) (Pty) Ltd. Natura Viva cc.

Tusenius, M.L. 2016b. Archaeological Impact Assessment of the proposed Kloofsig 3 Solar PV Energy Facility on the Remainder of the Farm Kalk Poort 18, Petrusville area, Renosterberg Local Municipality, Northern Cape. Unpublished report prepared for SRK Consulting (South Africa) (Pty) Ltd. Natura Viva cc.

Underhill, D., 2011. The study of the Fauresmith: a review. South African Archaeological Bulletin 66 (193): 15 – 26.

Van Jaarsveld, A. 2006. Hydra-Perseus and Beta-Perseus 765kv Transmission Power Lines Environmental Impact Assessment Impact on Cultural Heritage Resources. Unpublished report prepared for Arcus Gibb (Pty) Ltd. Heritage Resource Manager, Mtunzini.

Van Ryneveld, K. 2013. Archaeological Site Inspection. Laohu Valley Reserve, Northern Cape & Free State, South Africa. Unpublished report prepared for Laohu Valley Reserve. Archaeomaps.

Van Schalkwyk, J. 2015. Cultural Heritage Impact Assessment for the proposed Grootpoort Photovoltaic Solar Energy Facility, near Luckhoff, Free State Province Unpublished report prepared for Environamics. Heritage Consultant, Monument Park.

Van Vollenhoven, A. 2013. A report on a Cultural Heritage Impact Assessment for the proposed Swartwater Solar Pv Power Facility, close to Petrusville, Northern Cape Province. Unpublished report prepared for Usk Consulting. Archaetnos.

Webley, L. & Orton, J. 2011. Proposed De Aar Wind Energy Facility on the North and South Plateau, Northern Cape Province. Unpublished report prepared for Aurecon South Africa (Pty) Ltd. Archeology Contracts Office.

10. ACKNOWLEDGEMENTS

Thanks are due to Ms Nicola Rump and Ms Karien Kilian, SRK Consulting (South Africa) (Pty) Ltd, who commissioned this study and provided some background information; the Havenga family of Kloofsig for information on various aspects of the farm; Dr John Almond, Natura Viva cc, for geological insights on the area and comments on the draft of this report; Dr Lita Webley, ACO Associates, and Dr Sarah Wurz, University of the Witwatersrand, also made some useful comments.

11. SPECIALIST DECLARATION AND EXPERTISE

11.1 Declaration of Independence

I, Madelon Louise Tusenius, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



M.L. Tusenius
Archaeologist, Natura Viva cc

11.2 Expertise of the specialist

Madelon Tusenius (MA in Archaeology, Stellenbosch) has been an accredited member of ASAPA (Association of Southern African Professional Archaeologists), formerly South African Association of Archaeologists, since 1983 and accredited as Field Director for the Stone Age with the Cultural Resources Management (CRM) Section of ASAPA since 2012. The author has been involved in a range of archaeological research projects and impact assessments, mostly as a freelance archaeologist, but also as a researcher based at the former Dept. of Archaeology, University of Stellenbosch, and at Iziko:South African Museum, Cape Town. Research project participations include Klasies River, Ysterfontein 1, Soutpansklipheuvél and a project in Southwest Ecuador. Particular research interests concern charcoal remains from Stone Age archaeological sites, as well as the expansion of comparative modern wood collections. She has mostly worked independently on Phase 1 Archaeological Impact Assessments in the Western and Northern Cape, and has assisted ACO Associates with several Phase 2 projects. She has also been a field assistant for numerous Palaeontological Impact Assessments for developments and conservation areas in the Western, Eastern and Northern Cape undertaken by Dr JE Almond, Natura Viva cc.

12. APPENDIX

Table 3: Waypoints for the location of isolated ESA bifaces and concentrations of ESA/MSA material in the area of the proposed 132 kV power line. With the exception of waypoint 7, all the other points are in the eastern power line area.

Waypoint	South	East	Description of material found
3	30° 3' 36.14"	24°35' 9.73"	Isolated, possible Fauresmith biface (Fig. 22)
4	30° 3' 35.95"	24°35'4.45"	Possible Fauresmith bifaces in association with ESA/MSA material (including Fig. 21)
5	30° 3' 34.07"	24°35' 4.20"	Concentration of ESA/MSA material along the southern bank of the watercourse (Figs. 16, 18 to 20,)
6	30° 3' 33.31"	24°35' 6.85"	<i>In situ</i> gravels with ESA/MSA artefacts in the northern bank of the watercourse (Figs. 17, 23)
7	30° 3' 16.20"	24°33' 55.85"	ESA biface in the western powerline area (Fig. 25)