Annex K

Heritage Specialist Report

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Date: 11th April 2011

To whom it may concern,

Declaration of Consultants Independence

Lita Ethel Webley (PhD) and David John Halkett (MA) of ACO Associates cc, authors of the Victoria West (Mini), Touws River (Paardevlei) and Sutherland Wind Farm specialist reports on heritage, hereby declare that we are independent consultants appointed by ERM to provide specialist input to the Mainstream wind farm projects. I hereby confirm that we have no business, financial, personal or other interest in the activity, application or appeal in respect of which we have been appointed other than fair remuneration for work performed in connection with the activity and application. All opinions expressed in my specialist report are our own.

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HERITAGE IMPACT ASSESSMENT: PROPOSED PERDEKRAAL WIND AND SOLAR ENERGY FACILITY , WESTERN CAPE PROVINCE

(Assessment conducted under Section 38 (8) of the
National Heritage Resources Act as part of an EIA.)

Prepared for:
Mainstream Renewable Power South Africa
ERM Southern Africa

Prepared by:

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EXECUTIVE SUMMARY

ACO Associates cc have been appointed by ERM on behalf of the proponent, Mainstream SA, to undertake a Heritage Impact Assessment, as part of the EIA process, for the establishment of a wind and solar energy facility on the farm Perdekraal located approximately 25km north east of Touwsrivier, Western Cape Province. Ms Mary Patrick of Cape Archaeological Survey cc was appointed initially for the Scoping process but subsequently, ACO Associates cc have been appointed to compile the heritage component of the EIA.

The layouts for laydown areas, cables and substations was not provided at the time of the survey and they will have to be examined and assessed based on our field knowledge, and if necessary during the EMP. Proposed road layouts were provided and were considered in only a broad sense as turbine positions remain nominal at this stage.

The fieldwork was conducted on the 15 & 16 February 2011. It involved a walk and drive survey of some of the turbine positions and a broad overview of the entire development site.

No significant limitations to the project in terms of heritage were encountered during the survey.

<u>Heritage Recommendations:</u>

The Palaeontological Impact Assessment recommended:

- A field survey prior to major construction to determine the nature and extent of mitigation;
- Mitigation normally involves recording and collection of fossil material with a permit issued by Heritage Western Cape;
- It seems unlikely that any infrastructure will have to be repositioned;
- Selective monitoring of substantial excavations may be required.

The Pre-colonial and Colonial Archaeology:

- Sites tend to be found on the banks of river beds;
- Discrete scatters of Middle Stone Age artefacts were identified in a number of locations but they are not considered to be of of high significance;
- Micro-siting of turbines and access roads during the EMP will avoid significant impacts;
- Archaeological excavations or recording of sites is unlikely if appropriate micro siting takes place as necessary.

The Built Environment:

- There are two occupied dwellings on the farms Perdekraal and Rietpoort. They are not threatened by the turbines and they are not of high heritage significance;
- There are numerous ruins on both farms, relating to late 19th and early 20th farming activities. These remains are not of high significance.
- Micro-siting of turbines and access roads during the EMP will avoid significant impacts

Graves:

- There is an unfenced graveyard on Rietpoort which is not threatened directly by the turbine positions;
- There are numerous stone cairns along the dry river beds which may represent graves;
- While the identified cairns are not threatened by the turbine positions, we may not have identified all graves in the study area;
- Graves may be impacted by access roads and associated infrastructure;
- A more detailed survey must be conducted along the proposed access roads and connecting cables to ensure graves are not disturbed;
- If unmarked graves are uncovered during construction, work should cease in that area and HWC must be notified.

Cultural Landscape:

- The proposed energy facility will not be visible from the N2, but will be visible from the unnamed and infrequently used dirt road linking the N2 to the R355;
- The cultural landscape is agricultural in nature, stock farming with occasional agriculture;
- The visual impact of the turbine positions will be assessed by a separate Visual Impact Assessment.

1. INTRODUCTION

ACO Associates cc have been appointed by ERM on behalf of the proponent, Mainstream SA, to undertake a Heritage Impact Assessment, as part of the EIA process, for the establishment of a wind and solar energy facility on two portions of land approximately 25km south of Touwsrivier, in the Western Cape Province (Figure 1).

The land parcels (with a total site area of 6376 ha) are:

- The Remainder of Lower Stinkfontein 245 (Perdekraal);
- Portion 1 of Rietpoort 243.

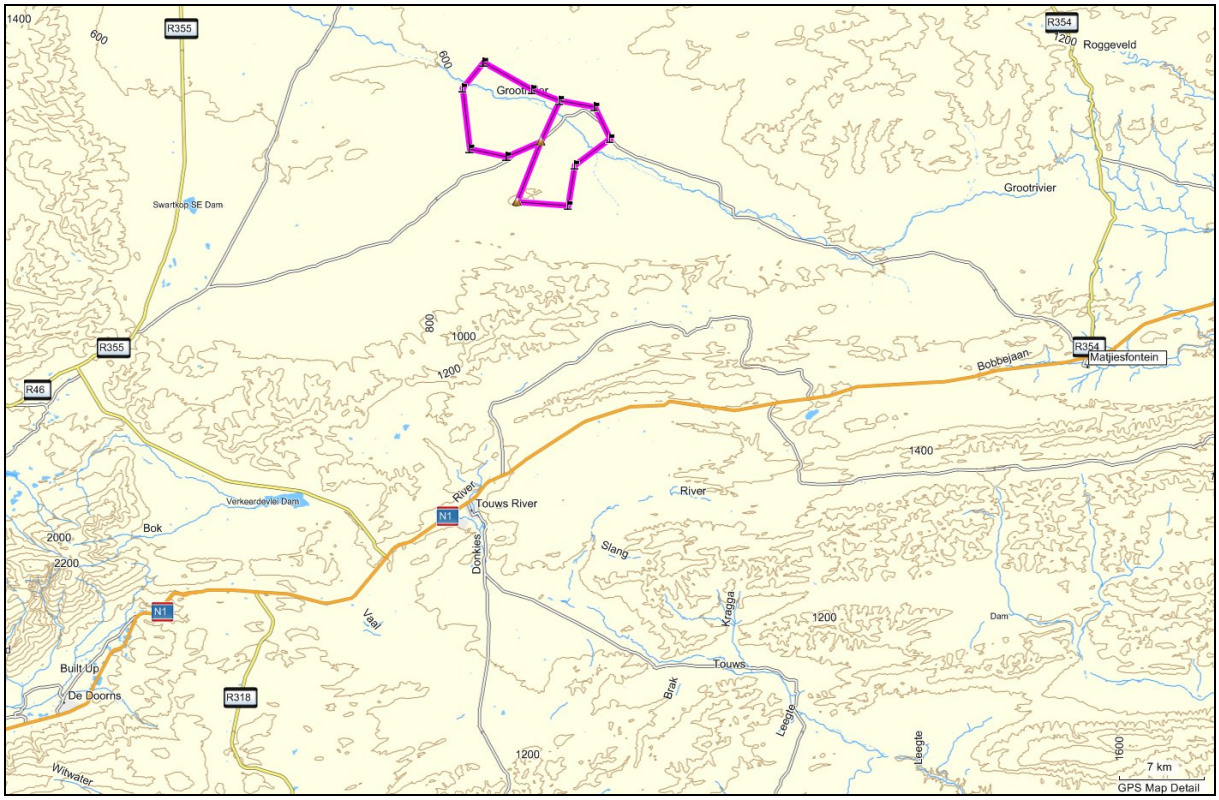

Figure 1: The location of the two farms (purple polygons) in regional context (Mapsource).

1.1 Development Proposals

It is proposed to construct a renewable energy facility at Perdekraal with a generation capacity of between 310MW-468MW, using both wind turbines and photovoltaic cells.

- It is proposed to construct between 169 – 223 wind turbines;
- The turbines will be between 80m and 120m high, with a concrete foundation base of 5 m x 5 m;
- There will be a gravel standing area adjacent to each turbine of approximately 2500 m² that will be used during the construction and maintenance phase;
- Approximately 2km² of solar PV arrays;
- Access roads will involve the up-grading of existing farm tracks but new tracks (with a maximum width of 6 m) may also need to be constructed;
- An office and storage building will be constructed on site;

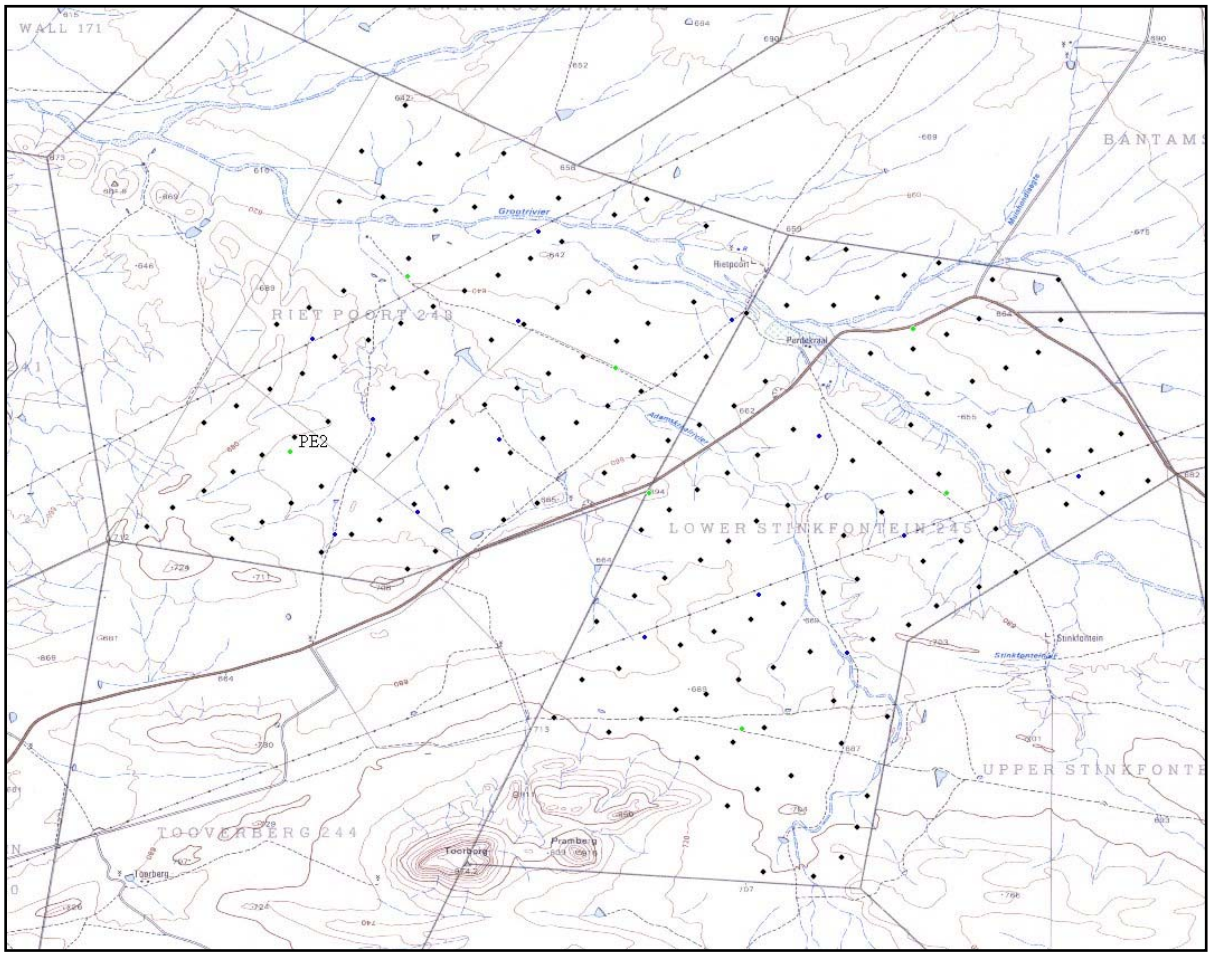

Figure 2: Proposed turbine superimposed on the 1:50 000 map

- Turbines and PV arrays will be connected to each other via underground electrical cables;
- Perdekraal will connect to the Eskom national grid at Kappa sub-station, or connect to the grid on site via a 400kV transmission line.

The final design of the facility including the layout, size and type of wind turbine and solar array will be determined using information gathered from the wind testing mast and solar resource measuring station. The operational lifespan of the facility is expected to be 25 years, after which the site will be refurbished or decommissioned and rehabilitated.

1.2 The heritage team

Dr Lita Webley and Mr David Halkett are independent specialist consultants who are in no way connected with the proponent, other than delivery of consulting services.

Lita Webley (PhD) is an archaeologist with 14 years of working experience in heritage consultancy. She is also accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

David Halkett (MA) is an archaeologist with 21 years of working experience in heritage consultancy. He is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

2. METHODOLOGY

This study has been commissioned as the heritage component of an EIA. It assesses the identified range of impacts in terms of accumulated knowledge of the area. The source of information that is used for this process is based on scientific publications related to archaeological work undertaken in the Study Area and other unpublished reports on the history of the region. An on-site survey of heritage resources has been conducted and heritage indicators (conservation-worthy buildings, archaeological sites and places celebrated as heritage) identified and mapped where appropriate. Definitions of heritage and criteria for assessment of heritage are indicated in the National Heritage Resources Act while the Provincial Guidelines for assessing heritage in the Western Cape applies. Both the NHRA and Provincial Guidelines require that cultural landscapes and areas of particular aesthetic and/or cultural heritage significance are included in the assessment.

The study reported on here has been significantly reliant on a physical survey of the Study Area and the body of background information (published) about the area. An independent Visual Assessment and Palaeontological Assessment forms part of the EIA specialist studies.

2.1 Assessing heritage in the context of wind energy developments

Wind energy facilities have grown exponentially throughout the world in response to the international energy crisis and climate change. Initially communities enthusiastically accepted the presence of wind energy facilities, however web-based research of international experience has indicated that they are not without controversy. The impacts of clusters of massive wind turbines on cultural landscape can be severe, both in physical terms and with respect to the intangible and aesthetic qualities of a given locality. A pilot study commissioned by the Provincial Government of the Western Cape as part of its Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape and Report 6 in the series titled "Towards a Regional Methodology for Wind Energy Site Selection in the West Coast region" (2006) considered landscape character rather than the cultural landscape concluded that wind energy facilities have an impact on the surrounding landscape in terms of the natural qualities of places. In terms of landscapes and heritage, there are no pro-active detailed local regional studies that can be consulted, however the pilot study recognises that impacts can occur and suggested a setback of 500 m for roads, communication towers, mountain catchments, private nature reserves, rivers wetlands and heritage sites to avoid physical impacts (See Annexure A).

Wind energy facilities are often big developments. Turbines (some facilities with several hundred turbines are proposed in parts of RSA) can be up to 100m high with blades up to 50m in radius. The structure has to be counterweighted by a concrete block (up to 675 cubic meters) sunk deep into the ground. Each turbine site needs road access that can be negotiated by a heavy lift crane which means that in undulating topography deep cuttings and numerous roads may be made into a landscape to create workable gradients. Due to their size the visual impacts are immitigable (they are easily visible from 10 km) in virtually all landscapes, however indications are (PGWC 2006) that they are perceived to be aesthetically more acceptable in agricultural or manicured landscapes.

The point at which a wind turbine may be perceived as being "intrusive" in terms of the aesthetics of an area is a subjective judgment, however it can be anticipated that the presence of such facilities close to wilderness and heritage areas will destroy many of the intangible

and aesthetic qualities for which an area is valued, or could be potentially valued in the future. Yet the circumstances are variable as in certain landscape forms the graceful shapes of the turbines and the sculptured twist of the rotors is perceived to be aesthetically pleasing.

The degree of physical landscape disturbance caused during the construction of turbines is such that the destruction of archaeological and palaeontological heritage is a very high likelihood. Hence, in the assessment of impacts of wind energy proposals it is necessary to assess both physical damage to heritage caused by the establishment of infrastructure, as well as focus on the way that such a facility can change the aesthetic and intangible values of the cultural landscapes in which the physical heritage resources exist.

2.2 The Perdekraal site

The locations of the proposed turbines were loaded onto handheld GPS receivers (set to the WGS84 datum) to facilitate the identification of the search area during field work that was undertaken on 15 & 16 February 2011. Walk paths and site locations were recorded with GPS and finds were photographed and described.

- The locations of many of the proposed turbines and solar arrays were surveyed by a combination of walking and driving;
- Access roads, substations and laydown areas were not available at the time of the field work and could not be examined.

2.3 Limitations

With regard to information gaps, there is very little published information on the archaeology of the area. This makes it more difficult to compare specifically the results of the survey or to infer the significance of the sites discovered during the field work. Similarly, commercial archaeological and heritage impact assessments in the area are few.

Fieldwork was undertaken in the summer, after a number of heavy thunderstorms had swept across the Karoo region. Some of the gravel sand roads had washed away, and this made access difficult or impossible to certain areas such as the northern section of the property (across the Grootrivier), but overall, access was not restricted and there was a reasonable network of farm roads providing access to most areas of the properties

Time prevented us from visiting every turbine, but it is accepted that positions are at this time notional and will likely change in future. We were not provided with infrastructure layout and so cannot comment on these. We have examined a sample in each of the various landscape types present in the wef site and can probably make some informed statements about infrastructure positioning as a whole.

3. REGULATORY AND LEGISLATIVE OVERVIEW

The basis for all heritage impact assessment is the National Heritage Resources Act 25 (NHRA) of 1999, which in turn prescribes the manner in which heritage is assessed and managed. The National Heritage Resources Act 25 of 1999 has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act

also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

Cultural landscapes (described below)
Buildings and structures (greater than 60 years of age)
Archaeological sites (greater than 100 years of age)
Palaeontological sites and specimens
Shipwrecks and aircraft wrecks
Graves and grave yards.

Section 38 of the NHRA requires that Heritage Impact Assessments (HIA's) are required for certain kinds of development such as rezoning of land greater than 10 000 sq m in extent or exceeding 3 or more sub-divisions, or for any activity that will alter the character or landscape of a site greater than 5000 sq m.

3.1 Cultural Landscapes

Section 3(3) of the NHRA, No 25 of 1999 defines the cultural significance of a place or objects with regard to the following criteria:

(a) its importance in the community or pattern of South Africa's history;
(b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
(i) sites of significance relating to the history of slavery in South Africa.

3.2 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised by DEA&DP as a category of heritage resources. In the DEA&DP Guidelines for involving heritage specialists in the EIA process, Baumann & Winter (2005) comment that the visual intrusion of development on a scenic route should be considered a heritage issue. This is also given recognition in the Notice of Intent to Develop (NID) application which is used by Heritage Western Cape.

3.3 Heritage Grading

Heritage resources are graded following the system established by Winter and Baumann

(2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

Table 1: Grading of heritage resources (Source: Winter & Baumann 2005: Box 5).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

3.4 Wind Energy Guidelines

A pilot study commissioned by the Provincial Government of the Western Cape "Towards a Regional Methodology for Wind Energy Site Selection in the West Cape region" (May 2006) is the only locally available draft policy guideline. The study looked at landscape character rather than at the "cultural landscape" or "heritage" but concluded that wind energy facilities can have an impact on the landscape in terms of quality of place. In general terms we would expect a setback of at least 500 m from heritage sites but this may be more or less as determined by local conditions/sensitivities. Neither SAHRA nor HWC have developed policies with respect to heritage and renewable energy and therefore the issue of distance of wind turbines from heritage resources has not been resolved.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Study Area is located some 25 km north east of Touwsrivier in the Karoo Region. It is a semi-arid region with rainfall in the form of summer thunderstorms. The vegetation is characteristic of the Succulent Karoo Biome and the site is gently undulating, and covered in knee high scrub.

There is a substantial river, the Groot River, which crosses the northern section of both farms (Figure 2). The river comprises of a number of dry river channels which run parallel to each other, so that the total width is several hundred metres. A number of pools of water occur in the river, and there are dense stands of Acacia trees. A smaller stream, the Adamskraal River, crosses the central portion of the properties and it too has trees in the river bed.

There are a number of farm tracks which cross the study area to service fenced stock camps and associated small dams and accompanying wind pumps. Despite some very low key human intervention, the site remains predominantly natural and isolated, and typical of the

area.

Large ESKOM (400 kV) powerlines cross south west to north east across each of the farms.

Plates 1-2: General views of open landscape, illustrating the distant mountains, river beds with Acacia trees and low scrub.

4.1 Palaeontological heritage of the area

A palaeontological impact assessment (PIA) was commissioned as part of a comprehensive HIA for the Mainstream wind farm project by Ms Mary Patrick (Cape Archaeological Survey cc), in accordance with the requirements of the National Heritage Resources Act, 1999.

Dr Almond notes in his introduction that his report is a pre-scoping desktop study for inclusion in the EIA for the Perdekraal wind and solar energy project and that, as the layout of the turbines, road network, transmission lines and other associated infrastructure had not been finalised, these development components have not been considered during this preliminary palaeontological assessment.

His detailed report will be included in the EIA document, although a summary will be found in Section 5.1.

4.2 Pre-colonial Heritage of the area

Little is known of the archaeology of the study area. Few heritage impact assessments are listed on the SAHRA database (which includes projects up to 2009). The closest in proximity is the Heritage Impact Assessment Orton (2008) undertook on three farms, namely Platfontein, Kolkiesrivier and Jurgensfontein, for the proposed Eskom Kappa substation. These farms are also situated on the back road between Touwsrivier and Ceres and Platfontein is a few kilometres to the south west of Perdekraal. He recorded 9 Middle Stone Age surface sites at Platfontein, 22 MSA sites at Jurgensfontein and 48 MSA sites at Kolkiesrivier. He described the sites thus: "scatters of artefacts can best be described as being part of a gravel lag deposit that coats the ground surface in this area". He also saw no equivocal ESA material and only a few traces of LSA.

4.3 Colonial Heritage

The town of Touws River (initially named Montagu Road) originated as a railway town, with the station established in 1877 and the town developing after 1883. It served as a major staging post on the way to the north. However, the area had been settled by trekboers well before this date.

The farm of Lower Stinkfontein 245 (SG 527/1870) was surveyed in 1868. The Groot River is clearly marked on the early map as well as "the main road to Beaufort (West)". This road probably wound its way down to wards Matjiesfontein having come from Ceres and may coincide with the route of the unnamed dirt road that we have earlier commented on. There are no houses shown on the property at this time. Similarly, Rietpoort (SG529/1870) was also surveyed at the this time and the farm granted to a J. Pienaar.

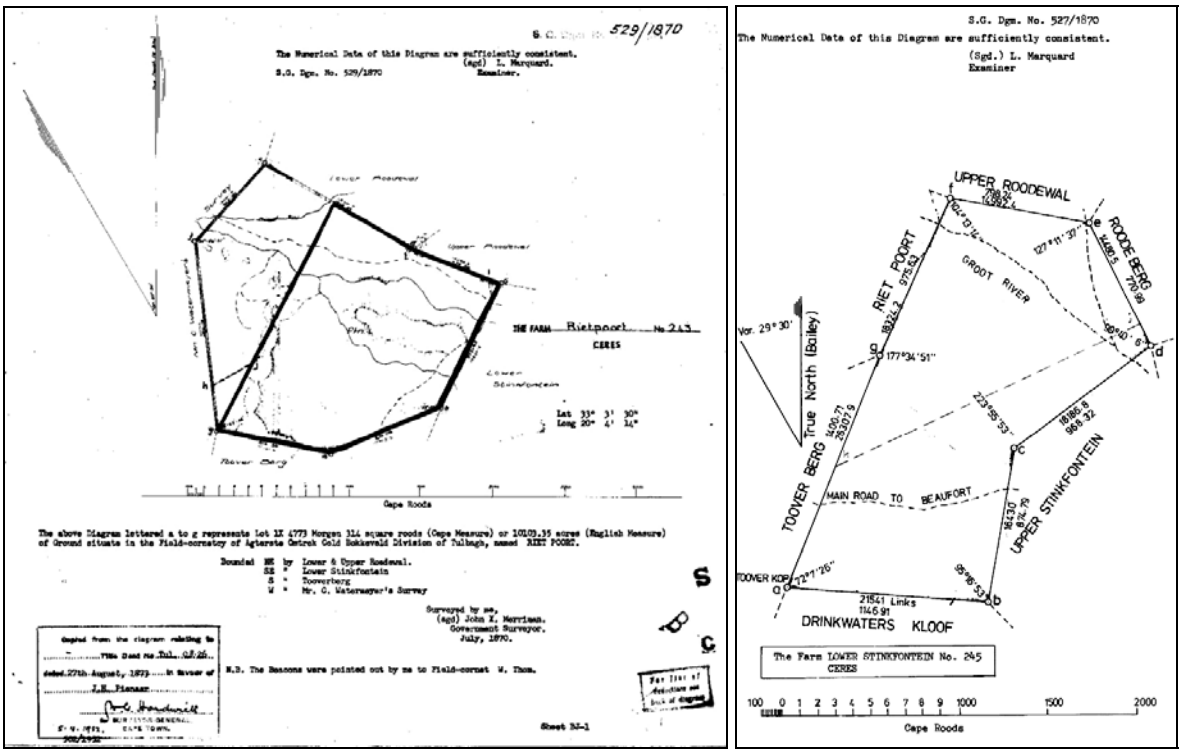

Figure 3: Surveyor General diagrams showing Rietpoort (left) and Lower Stinkfontein (right). Powerline servitudes are indicated on Stinkfontein but not on Rietpoort although one exists there.

5. FINDINGS

5.1 Palaeontology

The PIA pre-scoping desktop study noted that:

"The proposed 160 MW wind farm at Perdekraal in the Ceres or Tanqua Karoo, c. 30km north of Touwsrivier, Western Cape Province, overlies six formations of Palaeozoic sedimentary rocks assigned to the Witteberg Group (Cape Supergroup) as well as to the Dwyka Group and Ecca Group (Karoo Supergroup). The palaeontological sensitivity of these rocks ranges from low to high. Important Early Carboniferous fossil biotas, including fish, invertebrates, vascular plants and trace fossils, are recorded from the Waipoort Formation in this region. The Whitehill Formation in the Tanqua Karoo has yielded beautifully preserved mesosaurid reptiles, palaeoniscoid fish and crustaceans. In contrast, Late Caenozoic surface sediments in the study area (e.g. High Level Gravels, alluvium, colluvium, soils) are generally of low palaeontological sensitivity, but may contain local concentrations of scientifically valuable fossils (e.g. mammalian bones, teeth).

Excavations and other construction work undertaken into Palaeozoic bedrock in order to install the wind turbines and associated infrastructure may expose, disturb, destroy or seal-in valuable fossil material. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of Palaeozoic Gondwana. Consequently, the potential impact from disturbance and/or destruction of fossil heritage in these rocks is of high significance, at both local and regional levels" (Almond 2010).

5.2 Pre-colonial Archaeology

We have not seen any heritage/archaeological scoping study and can therefore not take it into account.

Numerous scatters of stone artefacts were recorded across the study area, although predominantly located on ridges in close proximity to dry river beds (Figure 3 and Appendix 1). All of our observations relate to the surface, but we saw no indication to lead us to expect significant deeply stratified material anywhere on the site. No associated organic remains were noted with any of the stone scatters.

Most of the material we observed can probably be ascribed to the Middle Stone Age (MSA). A few isolated large implements were recovered which resembled incomplete bifaces (ESA) but the observations remain equivocal. There were also some scatters of indurated stone tools which appeared to have recent flake scars and which could be interpreted as Late Stone Age (LSA), although no distinctive LSA implements were recovered or noted. The patination on many of the artefacts is consistent with significant vintage. Flakes, blades, chunks and cores make up the majority of the scatters, and retouch was present on some items. Raw material was almost exclusively hornfels of various colours in the grey to dark black band. There is a characteristic brown to red/orange patina evident on some of the older worked and unworked material. Yellow chert is also used to a lesser degree.

Plates 3-6: Middle Stone Age artefacts recovered from the study area.

Plates 7& 8: Middle Stone Age artefacts made on natural rock slabs

Plates 9 & 10: These artefacts appear to have some Early Stone Age characteristics.

In addition to the typical Middle Stone Age material found widely in the region, we also recovered some retouched implements which appear to have been manufactured on rectangular slabs of indurated shale, in other words the implement are not made on flakes (Plates 7 & 8).

5.3 Graves

A single, unfenced, formal graveyard was recovered near the ruins of the Rietpoort farmhouse. This collection of 7 graves, arranged in a row facing east, comprised 5 of packed stone and 2 with cement casings. Two had engraved headstones. One contained a name, the other a more extensive inscription in Dutch. However, the inscription was weathered and no date could be found on it (Appendix 1).

Further collections of stone cairns, which are interpreted as graves, were found near ruins of settlements, and predominantly situated on the margins of dry river beds. We have observed this pattern of burial in the soft river sands, elsewhere (Appendix 1).

Plates 11& 12: Graves from the Rietpoort family cemetery

Plates 13-14: Informal graves marked by stone cairns on the margins of river beds

5.4 Built Environment

There are two extant buildings, one on Rietpoort and one on Perdekraal, both of which are currently occupied. The Perdekraal farmhouse has some early 20th century attributes but has been substantially transformed by later additions. The Rietpoort farmhouse, also at least 80 years old, is constructed from stone and mud brick and is in a good condition.

In addition to the above, there are the remains of stone structures on both farms. These include the ruins of a stone house, foundations of rectangular stone structures (possibly workers cottages), stone kraals, a stone oven, a stone windbreak, a possible stone threshing floor and a well (Appendix 1).

Plates 15&16: The Perdekraal farmhouse (left) and the Rietpoort farmhouse (right). The original Rietpoort farmhouse, as appears on the 1:50 000 map, is closer to Perdekraal and was washed away by a flash flood coming down the Groot River. We have recorded the remains as a site.


Plate 17: The ruins of a stone house on Perdekraal. **Plate 18:** Three sides of a stone kraal on Perderkraal


Plate 19: A collapsed stone oven on Perdekraal. **Plate 20:** A circular stone feature (possibly a threshing floor) on Rietpoort.


Plate 21: The stone foundations of a house; Plate 22: Associated historical material.

5.5 Cultural Landscape

The landscape of the farms Rietpoort and Lower Stinkfontein (Perdekraal) comprises a flat Karoo landscape, with distant views of mountains. There are occasional farmsteads surrounded by a few trees. The landscape is cut up into large camps by means of fences but much remains in fairly "natural" state despite years of grazing. The built environment is

marginal and visual impacts are perhaps reduced to a degree by distance from major scenic routes (N1), (R355). There are however no other major industrial interventions at the site itself, although the Kappa substation is being constructed several kilometres to the south west. The cultural landscape of the wef site, as defined in Section 3.1 above, is therefore considered to be of low significance.

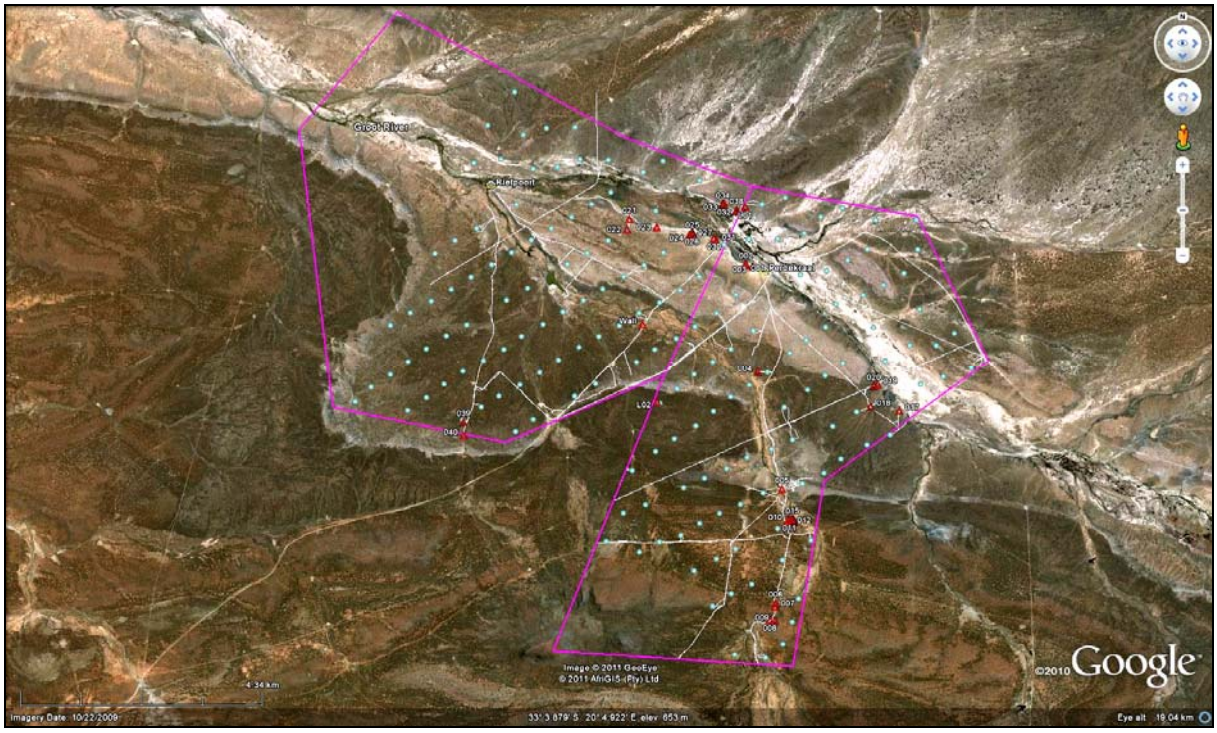

Figure 3: Map of survey tracks (white) and location of archaeological sites (red triangles) property boundaries (purple), turbines (blue circles). Note the concentration of sites along dry river channels.

6. IMPACT IDENTIFICATION AND ASSESSMENT

In assessing impacts it must be remembered that much of the position al information is notional and will only be finalised after all the specialist studies are taken into account. Our assessment of impact is therefore based on the turbine placements presented to us for the EIA study.

6.1 Turbines and solar array

Palaeontology: Any deep excavation has the potential to impact palaeontological material. Deep turbine foundations may well intersect fossil deposits but as there has been no specific field assessment of the wef site it is not clear how to gauge the potential impact.

Archaeology: Scatters of stone age implements were recovered, mainly in close proximity to dry river beds. Some may be impacted by construction and are likely to be destroyed. In general, the stone scatters are considered to be of minor significance. They are probably not in original context, and not associated with organic remains such as bone, which could provide valuable information on prehistoric lifeways. However, it is important to note that little is known about the distribution of the Early and Middle Stone Age in the dry interior of South Africa. In this regard, all field observations on the distribution of such material assists with the compilation of the national database.

Built Environment: There are only two extant buildings on the farms. Both are presently occupied and neither is in danger of destruction by the construction of the wind and solar farm. They are considered to have low heritage significance. Further, a number of collapsing stone structures, including buildings, kraals, a well, oven and threshing floor were recorded. They too have low heritage significance. They do not require mitigation.

Graves: Apart from the unfenced "formal" graveyard on Rietpoort, we made numerous observations on stone cairns which could represent graves (Appendix 1). In some cases these cairns were close to other evidence of human settlement while in others they appeared to be isolated occurrences. We cannot be sure that they are all graves, nor can we be sure that we have identified all stone cairns/graves in the study area. There is a high probability that further unmarked graves will be uncovered during the construction phase, especially when construction takes place close to the banks of dry river beds. Graves are considered of high significance in terms of the NHRA and their destruction needs to be avoided where possible.

Cultural Landscape: The turbines and solar array will not be visible from the N1 highway but are located on either side of a minor gravel road. In our opinion, hey will have an overall negative impact on the cultural landscape of the Karoo in this area.

The visual impact will be addressed as a separate specialist study.

6.2 Substation/s

No layouts were provided at time of survey and could therefore not be assessed specifically.

6.3 Connecting electrical lines

No layouts were provided at time of survey and could therefore not be assessed specifically. However, we believe the cable trenches will not go deep enough to intersect any major fossil bearing strata or sediments, but this should be ratified by the palaeontologist.

6.4 Access Roads

Although layouts were provided at time of survey, they were not assessed specifically as turbine positions are notional. Roads will certainly have the most significant impact on archaeological sites, graves and the built environment, particularly where they cross or run closely parallel to river/stream courses. Final road layouts must be assessed during the EMP.

Table 2: The potential impact of the construction of the turbines, substation, access roads and power line on the pre-colonial and colonial archaeology archaeology of the study area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Neutral
Extent	Local	On-site
Duration	Permanent	Long-term
Probability/likelihood	Definite	Unlikely
Significance	Moderate	Minor
Irreplaceable loss of resources?	Yes	No

Can impacts be mitigated?	Yes	
Mitigation: Mitigation of the pre-colonial and colonial archaeology should involve micro siting turbine positions during the EMP. If micro siting not an option then some physical mitigation may be required. A permit may be required from HWC in order to undertake such mitigation		
Operational Phase: Unlikely		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 3: The potential impact of the construction of the turbines, substation, access roads and power line on the built environment of the study area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Neutral
Extent	Local	On-site
Duration	Permanent	Long-term
Probability/likelihood	Definite	Unlikely
Significance	Moderate	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation of the built environment should involve micro siting turbine positions during the EMP to avoid placing turbines or infrastructure directly over built environment features.		
Operational Phase: n/a		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 4: The potential impact of the construction of the turbines, substation, access roads and power line on buried graves in the study area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Neutral
Extent	Local	On-site
Duration	Permanent	Permanent
Probability/likelihood	Likely	Unlikely
Significance	Major	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	yes	n/a
Mitigation: Once the exact positions of infrastructure is known, a more detailed assessment of the access and construction roads, laydown areas, substation positions and cable routes needs to be undertaken to identify all marked graves. In the case of unmarked graves, there will need to be a protocol in place in order to deal with them on a case by case basis. Heritage Western Cape would be notified immediately if a burial/human remains are uncovered during the construction phase. Work in the specific area must stop pending inspection and mitigation.		
Operational Phase: n/a		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 5: The potential impact of the construction of the turbines, substation, access roads and power line on the Cultural Landscape of the Study Area.

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Negative & Direct
Extent	Local	Local
Duration	Long term	Long term
Probability/likelihood	Definite (temporary)	Definite Temporary)
Significance	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	No
Mitigation: A suggestion may be for any facilities on site to sited in a way that avoids visual clutter		
Operational Phase: See above		
Decommissioning Phase: None		
Cumulative impacts: We have no information about other sustainable energy projects in the area and therefore cannot give informed comment. The large ESKOM Kappa sub-station is being constructed approximately 10 km to the south and the Gamma-Omega 765 kV powerline will probably pass through Perdekraal (Patrick 2009). It is unclear if that will be in addition to or an upgrade of the existing line.		

7. CONCLUSION AND RECOMMENDATIONS

7.1 Palaeontology

Dr Almond made the following recommendations in his initial report:

1. Before any major construction (*i.e.* substantial bedrock excavation) commences a thorough field survey of representative natural and already existing artificial rock exposures (*e.g.* dams, roadcuts, quarries, streams, steeper hillslopes) within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of high palaeontological sensitivity on the ground.

2. On the basis of the initial field scoping, a realistic, collaborative mitigation programme and protocol should be drawn up by the palaeontologist in conjunction with the developer and Heritage Western Cape so that any important fossil heritage on site may be conserved cost-effectively. This mitigation would normally involve the recording and judicious collection of fossil material within the development area as well as the recording of relevant geological data, before or during the construction phase of the development. The palaeontologist involved in mitigation work will be required to obtain a palaeontological collection permit from Heritage Western Cape and to arrange a suitable repository for any fossils collected (*e.g.* Iziko: South African Museum, Cape Town).

Note that for those sites or areas of inferred high palaeontological sensitivity, repositioning of infrastructure should not be necessary except in exceptional cases, but selective monitoring of substantial excavations during development by a specialist palaeontologist might be required.

Should further substantial fossil remains be exposed during construction, these should be recorded (*e.g.* photographed, with GPS location) and safeguarded by the responsible ECO, preferably *in situ*. Heritage Western Cape and / or a qualified palaeontologist should be alerted as soon as possible so that any appropriate mitigation measures can be considered.

7.2 Archaeology

Our main concern is the banks of the dry river beds, namely the Groot River and Andrieskraal Rivier (Figures 2 & 3). The distribution of ESA and MSA stone artefacts are found on the higher lying areas near the rivers, while evidence for colonial settlement (ruined structures, kraals, well, ovens, threshing floors, etc) are all found in proximity to rivers. In particular, cairns/graves are found in the soft soils on the margins of the river beds.

While turbines may be micro sited to avoid impacts to stone scatters, built environment, and graves, acess and construction roads remain the greatest risk to all forms of heritage sites and routes will need to be carefully assessed when finalised.

Although a great deal of artefactual material was found as seemingly discrete artefact scatters in the study area, a lot of it is likely to be of little scientific value as they are probably not *in situ* and are not associated with organic remains. Nevertheless archaeologists have a very limited knowledge of the distribution of the ESA and MSA in the dry interior of South

Africa and this must be taken into consideration. Mitigation is feasible for turbines and infrastructure. If any mitigation, in the form of archaeological excavations is required, then a permit must be obtained from HWC.

As a general comment, areas along river banks, which appear to have been the focus of settlement during the last two centuries (see Appendix 1), should be avoided. Many graves are located here, and in addition to the identified ones, there are likely to be others that have no surface identifiers. If human remains/burials are uncovered during the construction phase, work in the specific location should cease, and HWC should be notified. They may request an archaeologist to investigate and implement mitigation, in the form of exhumation. The mitigation of human remains requires a permit to be issued by the SAHRA Burials Unit.

7.3 Visual impact

The visual impact of the turbine and infrastructure will be assessed as part of the Visual Impact Assessment to be included within the EIA document.

8. LIST OF DEFINITIONS AND ABBREVIATIONS

Archaeology: *Remains resulting from human activity which is in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Early Stone Age: *The archaeology of the Stone Age between 700 000 and 2500 000 years ago***.**

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).*

Holocene: *The most recent geological time period which commenced 10 000 years ago.*

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.*

National Estate: *The collective heritage assets of the Nation.*

Palaeontology: *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.*

SAHRA: *South African Heritage Resources Agency – the compliance authority which protects national heritage.*

Structure (historic:) *Any building, works, device or other facility made by people and which is fixed*

to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.

Acronyms

BP	Before the Present
DEA	Department of Environmental Affairs
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act, No 25 of 1999
SAHRA	South African Heritage Resources Agency

9. REFERENCE LIST

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Appendix 1: List of heritage sites recorded during the survey

Site	Lat S (dec°)	Long E (dec°)	Type	Description	Significance
001	-33.04823500	20.10783000	graves	Graves, at least 4, marked by mounds covered by local pebbles	high
002	-33.04816400	20.10803200	graves	Graves, 2 probable, immediately adjacent to track, crude stone cairns	high
003	-33.04850400	20.10923900	graves	Stone mounds possibly graves	high
004	-33.06549800	20.11025200	stone walling	Stone walling (possible kraal or windbreak, on rock outcrop	medium - low
005	-33.08436200	20.11490200	graves	Graves, 3, on river bank marked by rock cairns	high
006	-33.10268400	20.11363700	grave	Grave, big circular rock cairn	high
007	-33.10322700	20.11350300	stone walling	Remains of a stone structure and associated artefactual material in the form of bottles, wire, tin cans etc. (1960's)	low
008	-33.10532300	20.11252300	stone kraal	Stone structure, 3 sided, probable kraal. Also some early 20th c ceramics. A small baking oven nearby	high - medium
009	-33.10552100	20.11351000	stone walling	Stone walling? on koppie opposite 008. No enclosure defined?	low
010	-33.08942900	20.11603100	stone dwelling	Ruined stone cottage (approx 15x7m) with hearth stack, probably 3 rooms (incl kitchen). Evidence of cement plaster on outside. Associated artefactual material includes blue, green, and white glass, Annular ware, other plain refined earthenware, blue and white pattern refined earthenware. Tin cans.	high
011	-33.08928300	20.11629200	well	Well, quarried into bedrock associated with 010	medium - low
012	-33.08938100	20.11668100	stone kraal	Kraal, small stone square	medium - low
013	-33.08972400	20.11724400	stone structure	Stone structure, possibly small dwelling	low
014	-33.08934000	20.11712000	grave	Grave on river bank	high
015	-33.08925400	20.11688900	grave	Grave on river bank	high
016	-33.08925500	20.11698000	grave	Grave on river bank	high
017	-33.07178200	20.13738100	graves	Graves, 2 possible	high
018	-33.07108300	20.13192000	MSA artefact scatter	Artefact scatter, silcrete cores, flakes next to road	low
019	-33.06748600	20.13323100	graves	Graves, 2 neatly packed stone mounds, probably graves. In the Eskom servitude. Close to river in soft soils.	high
020	-33.06778000	20.13250000	MSA artefact scatter	Artefact scatter consisting of MSA flakes, cores, chunks made on quartzite, hornfels and silcrete At Eskom pylon in servitude	low
021	-33.04086200	20.08564500	MSA artefact scatter	Scatters of stone artefacts next to the river	low
022	-33.04252900	20.08522100	ESA artefact	Isolated artefact, probable ESA handaxe	low
023	-33.04217800	20.09090400	graves	Graves, possibly 4-5 marked by stone piles, associated white ceramics (1950's?) nearby.	high
024	-33.04343000	20.09717700	stone structure	Circular (8 m diameter) stone feature, possibly a trapvloer	low
025	-33.04321000	20.09776800	stone structure	Rectangular stone outline, 8 m x 3 m, representing a worker's house?	low
026	-33.04315300	20.09766900	graves	Graves, approx 8, close to 025. Covered by large cobbles	high
027	-33.04304700	20.09769000	domestic dump (historic)	Domestic dump, containing glass, bone, metal, charcoal. Medicinal type bottle, white ceramic with floral decoration	medium
028	-33.04300600	20.09766200	domestic dump (historic)	As for 027	medium
029	-33.04300000	20.09774300	graves	Graves, approx 5 possible with associated ceramics and glass fragments	high
030	-33.04394300	20.10189300	stone structure	Small rectangular stone feature (4x3m) next to farm road. Associated aqua and green glass	
031	-33.04430600	20.10226000	stone structure	Small stone feature next to farm road	low

032	-33.03841300	20.10384100	domestic dump (historic)	Domestic refuse dump, held in place by retaining wall on river side. Glass, ceramics, metal	medium
033	-33.03847400	20.10367000	stone kraal	Kraal, small circular stone	medium - low
034	-33.03847400	20.10358700	stone structures and graves	Various wall footings and possible graves. One "grave" has exotic marine shell (oyster and whelk).	high
035	-33.03959900	20.10616400	graves	Formal graves associated with old farmstead Polygon defined by points (035-038)	high
036	-33.03963000	20.10625800	"	"	
037	-33.03948500	20.10632800	"	"	
038	-33.03944100	20.10618800	"	"	
039	-33.07359200	20.05386300	MSA artefact scatter	Artefact scatter, heavily patinated grey hornfels. Chunks, flakes, blades, cores but also quite a number of retouched pieces including denticulates	medium
040	-33.07576700	20.05388600	MSA artefact scatter	Artefact scatter, extensive as for 039	medium
L01	-33.03888530	20.10781410	MSA artefact scatter	Site above river. Discrete scatter of MSA stone tools, fine-grained, patinated hornfels. Single large blade.	low
L02	-33.07031700	20.09097310	MSA artefact scatter	Located at T114. A scatter of MSA flakes on grey hornfels.	low
"Wall"	-33.05773780	20.08818950	linear feature	Long single row of cobbles, representing stones packed along the bottom of a wire fence (now gone).	low

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