ARCHAEOLOGICAL IMPACT ASSESSMENT OF A PROPOSED WIND ENERGY FACILITY, POWER LINE AND LANDING STRIP IN COPPERTON, SIYATHEMBA MUNICIPALITY, NORTHERN CAPE

Prepared for:

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By

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EXECUTIVE SUMMARY

Aurecon South Africa (Pty) Ltd (Aurecon), on behalf of Plan 8 Infinite Energy (Pty) Ltd, appointed the Agency for Cultural Resource Management to conduct an Archaeological Impact Assessment for a proposed wind energy power generation facility, power line and landing strip. The wind farm and power line are proposed on a farm locally known as 'Struisbult' which lies on portions 4 and 7 of Nels Poortje 103. The landing strip is proposed to the west of Copperton on the farm Smous Pan 105. Copperton is a small mining town situated about 60kms south-west of Prieska in the Bushmanland region of the Siyathemba Municipality in the Northern Cape Province.

Plan 8 proposes to construct 56 x 2.5MW turbines (total 140MW) and an overhead power line linking to the national transmission grid either via Cuprum substation or to the existing grid onsite. The proposed relocation of an existing landing strip will have a footprint of just under 35 hectares whilst each turbine has a maximum depth of 3m and a spatial footprint of 20m x 20m depending on the geo-technical conditions. A hardstanding for a crane made of an impermeable material such as concrete or tar and approximately 20m x 6m would be constructed adjacent to each turbine. Access roads, 6m in width, would also be required between each turbine. Finally, a substation handling the wind farm has also been proposed in one of the alternatives dependent on Eskom's recommended connection configuration (either Cuprum or onsite connection). This development will therefore have a large overall footprint.

The aim of the study is to locate and map archaeological sites that may be impacted by the planning, construction and implementation of the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate against the impacts.
The archaeological study entailed the following:

- A 4-day site visit that included a foot survey and scoping study of the proposed development sites. The developer has proposed layouts of the turbines but an assessment of the sensitivity of the entire property was required as the positions of the turbines may well be altered depending on the wind monitoring reports.
- Sections of the proposed transmission line to Cuprum outside of the road reserve were surveyed around the pan 'Saaipan'.
- The two pans (Blomsdampan & Valspan) closest to but *outside* the western end of Nels Poortje 103 were also investigated to further understand the archaeological character of the immediate area.
- Panoramic photographs were taken from various places outside of Struisbult and Smous Pan 105 and archaeological material was documented at these positions.

The following archaeological findings were made:

A pan known as 'Modderpan' lies on Struisbult and this was intensively investigated following the findings made by Kiberd (2002, 2006) on Bundu Farm which is about 18km north-west of Struisbult. Artefacts from the Early, Middle and Later Stone Age were found at the pan in high quantities of more than 50 artefacts per square metre in places. Large numbers of mainly **Middle Stone Age** (MSA) tools were documented over the rest of the proposed development site. These include large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Raw materials were predominantly in fine grained quartzite, heavily patinated hornfels, banded ironstone, haemetite, gneiss, vein quartz and calcrete. Localised Stone Age quarries exploiting the quartzitic bedrock and boulders of vein quartz were found .

Later Stone Age (LSA) tools were found in comparatively fewer concentrations as compared to the MSA tallies. LSA tools consisted of chert, hornfels and other indurated shales, banded ironstone, vein quartz and quartzites. Adzes, scrapers, retouched and utilized flakes, bladelets,

small round cores, and unmodified flakes and chunks were seen and this was also noted by Kaplan (2010) to the south-east of the copper mine.

Early Stone Age (ESA) scatters were documented with a number of bifaces (handaxes) seen in a highly weathered quartzite. This study therefore corroborated many of the findings made by Kiberd (2002, 2006).
A stone kraal measuring 6m x 5m was also found on a slightly elevated koppie and this most likely dates to the historical period as broken glass and a rusted metal plate were found nearby. Another kraal, more ephemeral and with very low walls, was reported to the archaeologist by the owner, Mike Meyer after the survey was done.

The Modderpan site and the two stone kraals were identified as three **'no-go'** areas. These sites deserve a significance rating of 3a (local high). The pan is currently used by sheep on the farm and this may continue as this activity is not compromising the site. A radial buffer of 250 metres from the centre of the pan must be excluded from construction activities. A radial buffer of 100 metres from the centre of each kraal must also be excluded from development of the wind farm.

On the rest of the properties including Smous Pan 105, the density of artefact scatters was generally medium to high, but in places where the Kalahari sands reached a depth or more than 10cm the artefact counts dropped sharply. This pattern was consistent across the sites and artefact counts increased as soon as the calcrete layers were exposed beneath the aeolian sands. Some isolated finds were made on top of the sands but in general the artefacts were being deflated downwards to the calcrete levels. Little evidence for lateral movement of material was found as discrete clusters of knapped material from the same rock were often identified in close proximity as well as broad morphological tool types. This is unsurprising as there is almost no change in elevation across the property. Almost every available outcrop of bedrock encountered was quarried.

No pottery, ochre or ostrich eggshell was found at any of the sites. No graves or engravings were found and nor were any outcrops of dolerite present on these properties. Most of the finds have been recorded with a GPS waypoint and photographed. It is maintained that the archaeological study has captured good information and a representative sample of the archaeological heritage present.

Provided the no-go areas are avoided in this application, it is argued that the proposed development of a landing strip on Smous Pan 105 and a 140MW wind energy power generation facility on portions 4 & 7 of Nels Poortje 103 in Copperton will not have an impact of great significance on these and potentially other archaeological remains.

Indications are that in terms of archaeological heritage, the proposed activity (i.e. the construction of a 140MW wind energy power generation facility and a landing strip) is viable, and impacts are expected to be manageable.
The following recommendations are made:

1. Section drawings, measurements and photographs must be taken of each pit and for each pit wall (i.e. 4 sections per pit with a metre scale) by the contracted engineer assigned to the construction phase. The format for this report must be drawn up in consultation with the archaeologist. The engineer's excavation report must be submitted to SAHRA, the McGregor Museum in Kimberley and Mr Kiberd. This report will aid others in the development of a broader understanding of the Pleistocene landscape of this area.
2. The three no-go areas including their buffer zones must be cordoned off during the construction phase (see Appendix 4).
3. Archival research for the stone kraals and a conservation management plan for Modderpan and the kraals are highly recommended and should be commissioned by the owner of Struisbult at some point in the future.

4. The proposed wind farm on Struisbult is **one of a number** of energy related applications in the immediate area surrounding Copperton. SAHRA must assess this application in the broader context of other applications in the area in order to guide Eskom and the Department of Environmental Affairs (DEA) towards an acceptable level of overall heritage impact on the area.

SPECIALIST STUDY

DECLARATION OF INDEPENDENCE IN ACCORDANCE WITH REGULATION 33 (b) OF THE NEMA EIA REGULATIONS, AS AMENDED

I, Nicholas George Wiltshire, as the appointed Heritage specialist hereby declare that I:

- am independent in this application;
- regard the information contained in my report as true and correct;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006.
- have and will not have vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations.
- am fully aware of my responsibilities in terms of the National Environmental Management Act of 1989 ("NEMA") (Act No. 107 of 1998), the Environmental Impact Assessment Regulations ("EIA Regulations") in terms of NEMA (Government Notice No. R. 385, R. 386, and R. 387 in the Government Gazette of 21 April 2006 refer).

Signature of the Specialist

Agency for Cultural Resource Management

Name of company

24 October 2011

Date

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1. INTRODUCTION

Aurecon, on behalf of Plan 8 Infinite Energy, appointed the Agency for Cultural Resource Management to conduct an Archaeological Impact Assessment for a proposed wind energy power generation facility on the farm Struisbult near Copperton. The areas of Struisbult formally lie on portions 4 & 7 of Nels Poortje 103. The associated infrastructure would include a power line to connect into the existing grid and roads between the turbines. An existing landing strip would also be relocated to the farm Smous Pan 105 to the west of Copperton. Copperton is a small mining town 60km south-west of Prieska in the Bushmanland region of the Upper Karoo, Northern Cape Province. The proposed development is situated within Siyathemba Local Municipality and the Pixley Ka Seme District Municipality.

South Africa is on the verge of adding renewable power generation to the existing coal fired and nuclear energy power stations. In April 2009, the National Energy Regulator of South Africa (NERSA) published a favourable feed - tariff structure for various forms of renewable energy and this has been one of the catalysts for the establishment of wind farms. However, a tender process with the feed-in tariffs as the maximum price was initiated on 3 August 2011.

Copperton is best known for its copper mine which first started operation in the late 1960s (M. Meyer pers. comm. 2011). The mine was closed in 1991 (Die Beeld 1991) and a small population lives in the area farming sheep and cattle or running services related to the Armscor ammunition testing site at Alkantpan. The two types of turbines currently proposed have a mximum generation capacity of 2.5MW and are specified as follows:

Turbine 1: 100 m tower and 50 m blades (Nordex Model N100)
Turbine 2: 91 m tower and 58 m blades (Nordex N117)

Another application on adjacent Vogelstruisbult 104 for a 20 MW photovoltaic power generation facility was also assessed for archaeological material by ACRM in 2010. No significant findings were made in the previous assessment but the landscape and scale of the project was much smaller than this proposed wind farm. As mentioned by Kaplan (2010) and in the Final Scoping Report by Aurecon (2011), Copperton is situated near the Cuprum and Kronos substations which provide good grid connectivity with major transmission lines to all parts of the country. The region has an excellent solar radiation resource and the wind blew fairly consistently during the survey. At this stage more data is required from the wind monitoring mast already erected on Struisbult to determine the optimum positions for the turbines. Struisbult covers an area of just under 3120 hectares and the landing strip on Smous Pan 105 has a footprint of 35 hectares.

The final foundation design of the turbines is dependent on a geotechnical investigation but it is likely that foundations would be made of reinforced concrete for this project. The foundations would be approximately 20m x 20m and, on average, 3m deep. The foundation would be cast *in situ* and could be covered with top soil to allow vegetation growth around the 6 m diameter steel tower. A hardstanding for a crane made of an impermeable material such as concrete or tar and approximately 20m x 6m, would be constructed adjacent to each turbine, as well as a laydown area of 20 m x 6m. Access roads 6m in width would also be required between each turbine.

There is electricity distribution infrastructure adjacent to the farm which is designed for 132kV distribution. This line could be used by the proposed project to evacuate the power generated and hence a new line, other than the existing 2 km long connection, would not be required. Eskom may require that the electricity be routed via the Cuprum substation, which is located on the site of the disused rock crushing facility at the copper mine approximately 6.5km away. The final connection will be dependent on the technical requirements and cost set out by Eskom.

The deepest excavation impact will be caused by the foundations for the turbines. The laydown areas and hardstandings for the cranes and the access roads will affect the upper 10-20cm of the surface. The Cuprum power line option, if it is taken, will add an additional but limited depth impact.

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

Dr Johan Almond of Nature viva cc has been appointed to conduct a Palaeontological Impact Assessment (PIA) - desk top study of the proposed project (Almond 2011). This report should be read in conjunction with this AIA to refer to the geological and palaeontological context of the proposed sites.

The Archaeological Impact Assessment forms part of the Environmental Impact Assessment (EIA) process that is being conducted by Aurecon.

The archaeological study entailed the following:

- A 4-day site visit that included a foot survey and scoping study of the proposed development sites. The developer has proposed layouts of the turbines but an assessment of the sensitivity of the entire property was required as the positions of the turbines may well be altered depending on the wind monitoring reports.
- Sections of the proposed transmission line to Cuprum outside of the road reserve were surveyed around the pan 'Saaipan'.
- The two pans (Blomsdampan & Valspan) closest to but *outside* the western end of Nels Poortje 103 were also investigated to further understand the archaeological character of the immediate area.
- Panoramic photographs were taken from various places outside of Struisbult and Smous Pan 105 and archaeological material was documented at these positions.

2. TERMS OF REFERENCE

The terms of reference for the archaeological study are to:

- Conducting a detailed desk-top level investigation to identify all archaeological, cultural and historic sites in the proposed development areas;
- Undertaking field work to verify results of desktop investigation;
- Document (GPS coordinates and map) all sites, objects and structures identified on the candidate sites;
- Submit the relevant application form, as required by South African Heritage Resources Agency and Northern Cape Provincial Heritage (Boswa ya Kapa Bokone);

Compile a report which would include:

- Identification of archaeological, cultural and historic sites within the proposed development areas;
- Assess the sensitivity and significance of archaeological remains in the site;
- Evaluation of the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources, in terms of the scale of impact (local, regional, national), magnitude of impact (low, medium or high) and the duration of the impact (construction, up to 10 years after construction (medium term), more than 10 years after construction (long term));
- Recommendation of mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance;

- The preparation of a heritage resources management plan which includes recommendations on the management of the objects, sites or features, and also guidelines on procedures to be implemented if previously unidentified cultural resources are uncovered during later developments in the area;
- Consideration of relevant guidelines; and Cognisance must be taken of the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving heritage specialists in EIA processes"13".

3. THE STUDY SITE

The proposed wind farm is situated on portions 4 & 7 of Nels Poortje 103 (known as Struisbult) about 3kms north east of the mining town of Copperton. Copperton is situated about 60kms south-west of Prieska. The proposed site is currently zoned for agriculture and sheep were grazing on Struisbult during the survey as well as some cattle on Vogelstruisbult 104 nearby. The Meyers, who own 'Ietznietz', a guest house converted from the former mining hostel, have been the owners of Vogelstruisbult 104 and Struisbult since 2002 when they purchased the properties from Mr Moolman (M. Meyer pers. comm. 2011). Mike Meyer rotates the sheep and cattle between the farms and evidence of cattle grazing on Struisbult was evident.

Despite the grazing of sheep and cattle and the occasional evidence of modern rubbish dumped on the site, Struisbult and Smous Pan 105 have been relatively undisturbed by people in recent times as compared to the mining area that is surrounded by a mine dump, housing and a derelict golf course. The land has never been ploughed and this provided an excellent opportunity to record sites similar to those mentioned by Kiberd (2002, 2006) at Bundu Farm 18km to the north-west of Struisbult (Figure 1). Two bat-eared foxes, an aardwolf, four springbok, a rabbit, various birds and lizards were seen during the survey on the properties. The massive database of over 16000 sites accumulated by Sampson between the 1970s and 1980s (Sampson 1985) has often been referred to by others working in this area (Beaumont 2005; Morris 2006). Large numbers of Stone Age open site scatters were therefore anticipated on Struisbult and Smous Pan 105.

The vegetation is predominantly Bushmanland Arid Grassland vegetation in the Nama-Karoo biome (Mucina & Rutherford 2006) which consists of Karoo scrub and grass and a few isolated *Acacia karoo* trees. Red Kalahari aeolian sands cover various portions of the site and there are many areas where the calcrete beneath the Kalahari sands is exposed (Appendix 2). Quartzitic bedrock outcrops in low (40cm high) formations occur especially towards the ridges. The site is generally level around 1105m above sea level. On the eastern end of Struisbult the terrain rises gradually and gently to about 1120m and only two 'koppies' occur. On Smous Pan 105 the ground is almost entirely level at 1070m but the ground begins to rise up to 1090m about half a kilometre east from the proposed landing strip. There are no significant large dolerite boulders such as those occurring at Klein Strandberg (+-42km west), Strandberg (+-60km west) or Springbokoog (+-73km south-west). These dolerite boulders are often covered in engravings made by San (or Bushmen) hunter-gatherers, Khoekhoen herders and colonists in historical times (Deacon 1988; Parkington et al 2008).

The natural pan systems and their associated non-perennial streams were identified as likely candidates for the focus of archaeological material on this landscape (Kiberd 2002, 2006). One such pan called 'Modderpan' is located on Struisbult and two pans called 'Blomsdampan' and 'Valspan' fall just outside of Struisbult near the western side of the boundary fence. Another pan called 'Saaipan' is directly in line with a proposed route for a power line connection to Cuprum.

Previous archaeological work in the area was consulted in the SAHRA library in Cape Town. Beaumont (2005) found ESA, MSA and possibly LSA material just north of Prieska much closer to the Vaal River. Besides the recent survey by Kaplan (2010), van Ryneveld (2006a, 2006b, 2006c) completed three surveys near Copperton. The calcrete exposures were frequently mentioned as

well as the red aeolian sands but only few and dispersed MSA and LSA scatters were documented. No pans were documented in any of these studies.

A recent heritage impact study by van Schalkwyk (2011) dealt with the scoping phase of four wind farms across the Northern Cape and the Eastern Cape. One of these lies about 25km east of Struisbult. Another three energy projects are planned on Vogelstruisbult 104 (F. Gresse, pers. Comm. 2011) and therefore this application on Struisbult is one of at least **six** possible energy related projects (wind and/or solar). SAHRA needs to take cognisance of the cumulative impact of these applications on the heritage resources documented in the area thus far and clear recommendations to all the relevant stakeholders will be required from SAHRA in the decision-making process. Recommendations from an archaeological perspective have been included in this report regarding the anticipated cumulative impacts of these applications.

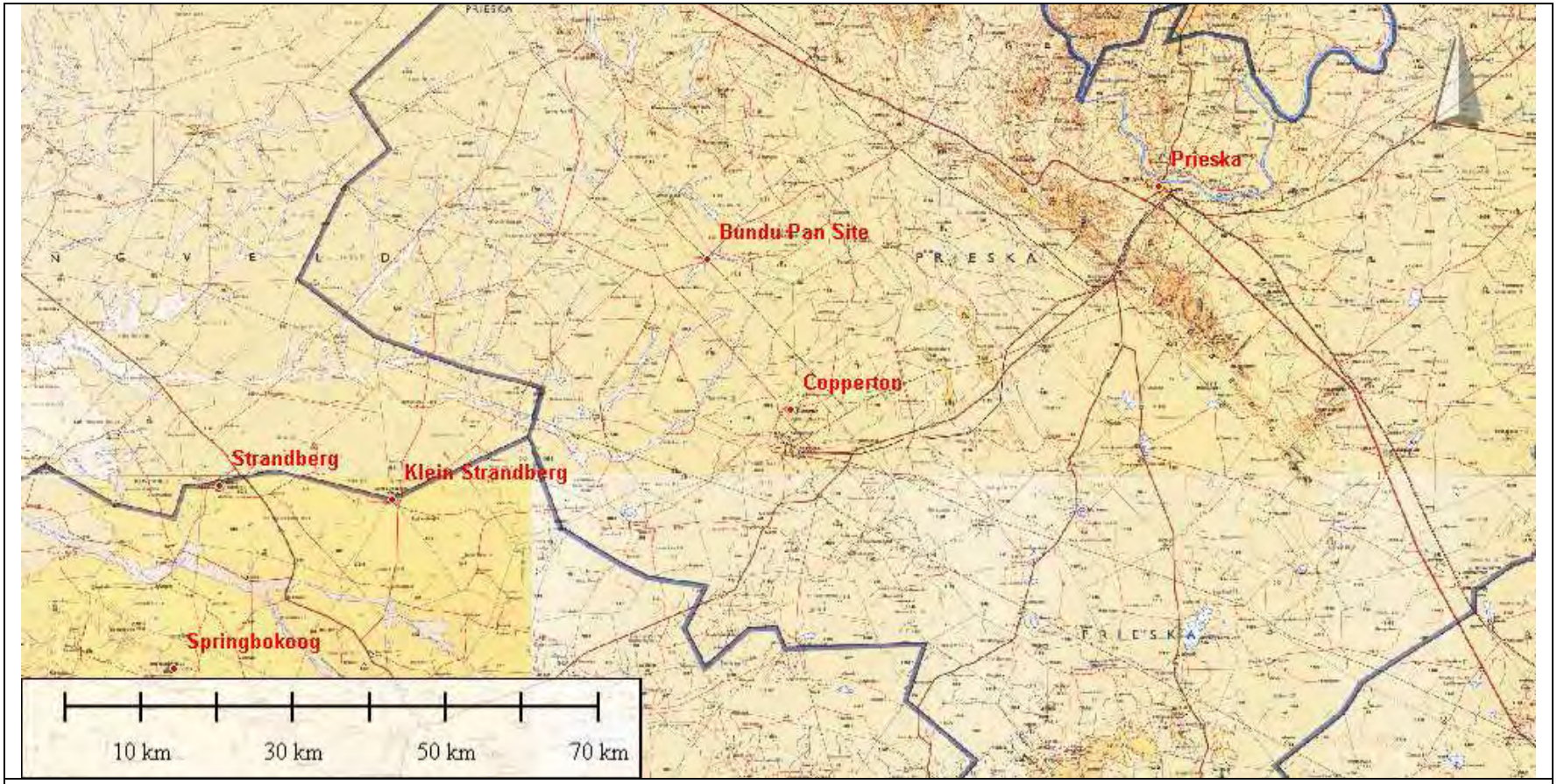

Figure 1. Locality map showing the location of Copperton 60km south-west of Prieska and well known areas for karoo rock engravings to the west and south-west of Copperton. Bundu Pan excavated by Kiberd (2002, 2006) is also shown to the north-west. The Orange River runs just to the north of Prieska.

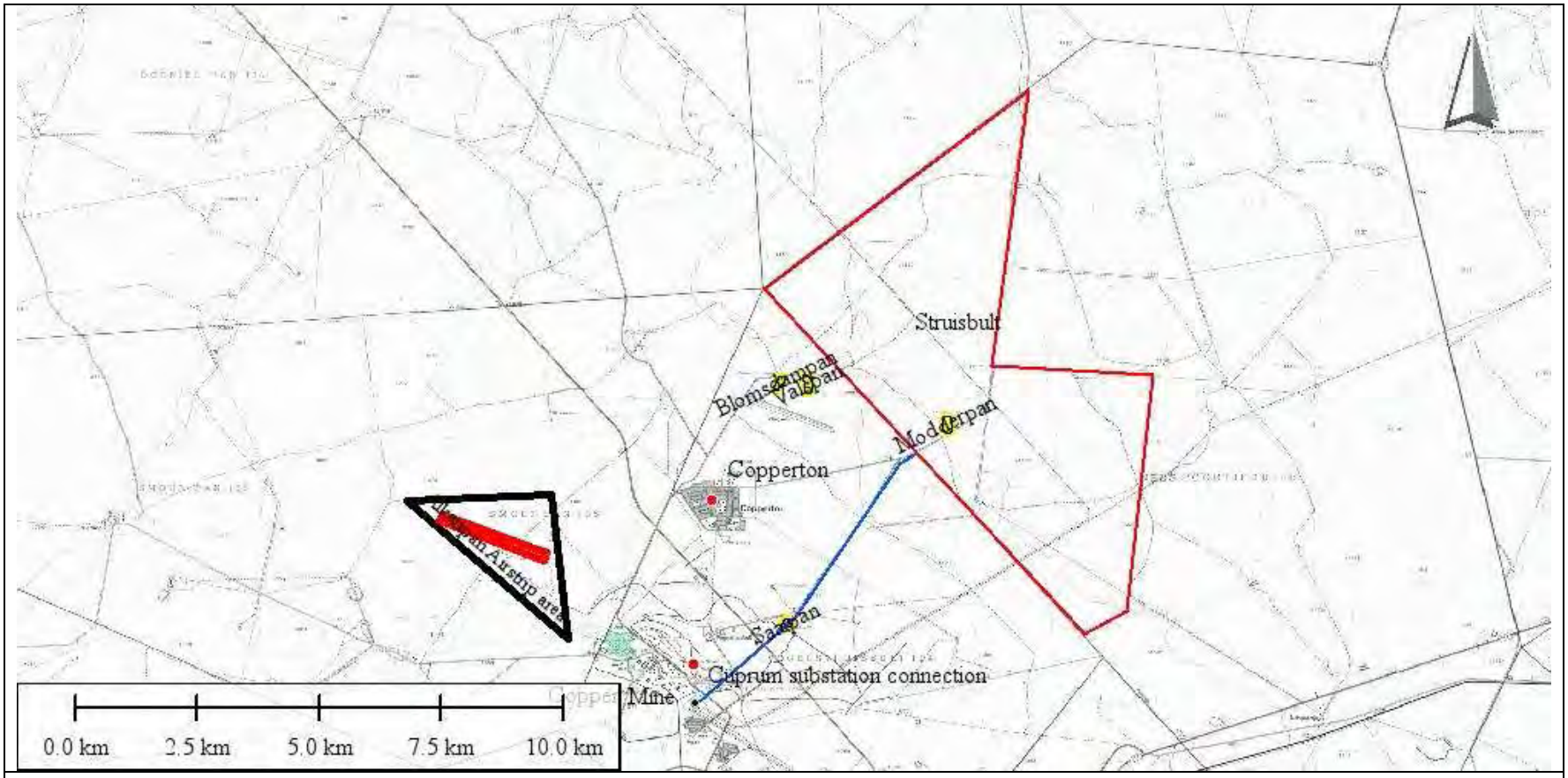

Figure 2. Locality map showing the location of portions 4 & 7 of Nels Poortje 103 (Struisbult), Smous Pan 105 and Vogelstruisbult 104 over which a possible overhead power line marked in blue will run to connect the wind farm to the Cuprum substation at the abandoned copper mine. Pans in yellow polygons.

4. METHODOLOGY FOR THE STUDY

4.1 Method of survey

A desktop study using the SAHRA GIS Report Mapping Project was conducted to assess the archaeological studies conducted near Copperton in the past. Three and a half days of ground surveying was completed and over a hundred archaeological observations were recorded. The developer has proposed layouts for the turbines but an assessment of the sensitivity of the entire property was required as the positions of the turbines may well be altered depending on the wind monitoring reports. The project includes the proposed wind farm of 56 turbines over 3120 hectares at Struisbult and a new landing strip on 35 hectares at Smous Pan 105.

The general high density of Stone Age material was noticed almost immediately into the first day of surveying at Struisbult and therefore a number of strategies were employed to adequately characterise the archaeology on the impacted properties. The AIA was conducted between Thursday 8th and Monday 12th September, 2011.

Panoramic photographs were taken from various places outside of Struisbult and Smous Pan 105 and archaeological material happened to occur at these points and they were therefore also documented.

Based on Kiberd's (2002, 2006) work at Bundu Farm only 18km away and as Struisbult lies in a similar geomorphological context, the pans were identified as the focal points to begin the survey. Only one pan, Modderpan, lies within the boundaries of Struisbult or Smous Pan 105, but it is possible that older pans are buried beneath the aeolian sands. Modderpan was extensively surveyed and the visible surface boundaries of the site were walked using the trackpath feature on the GPS.

Struisbult was then divided into two sections (north-west and south-east) either side of the Modderpan, and physically walked from end to end, taking in the only change (albeit subtle) in elevation along the north-east side of the property. Obvious structures such as the windmills, existing power lines and cattle enclosures were visited and used as landmarks on an otherwise level landscape.

Sections of the proposed transmission line to Cuprum outside of the road reserve were surveyed around the pan ‘Saaipan’.The two pans (Blomsdampan & Valspan) closest to but *outside* the western end of Nels Poortje 103 were also investigated to further understand the archaeological character of the immediate area.

The proposed landing strip footprint was intensively surveyed on Smous Pan 105 in addition to other areas of the property. Two other methods of recording the density of artefacts were employed in addition to the mapping of selected scatters and observations. The one test involved the capture of GPS readings for every flake between two points without photographs while walking along a fairly straight line. The other method aimed to photograph as many finds as possible along a more tightly compacted trackpath in the footprint area of the proposed landing strip. The nature of the finds matched those at Struisbult earlier. The assessment therefore found that the archaeological patterns were similar between the two properties.

The owner of Struisbult, Mr Mike Meyer, was consulted on the background and history of the farm and to inquire whether he knew the locations of any archaeological sites on the property.

A large number of digital photographs of the site was taken and have been saved to DVD. A GPS trackpath of the archaeological survey was created. This trackpath has been saved to a DVD and submitted with a digital copy of the report along with other GIS shapefiles created for this report.

Most of the archaeological occurrences and observations were plotted using a Garmin Etrex Legend Cx unit, set on map datum WGS 84 and photographed. Individual occurrences were not point plotted except between Track Log Flags # 1 – 42 in Figure 6. A spreadsheet of the waypoints and a description of the archaeological occurrences have been included on the DVD but have not been printed in the report for site management purposes.

4.2 Constraints and limitations

The archaeological visibility was generally high in most places surveyed but certain areas were covered in moderate to deep Kalahari sands (Appendix 2) and this appeared to reduce the visible artefact counts. The bushes grew higher in these sands as they can hold a fair amount of water, but this did not seriously impede the survey. A major constraint was the sheer size of the properties.

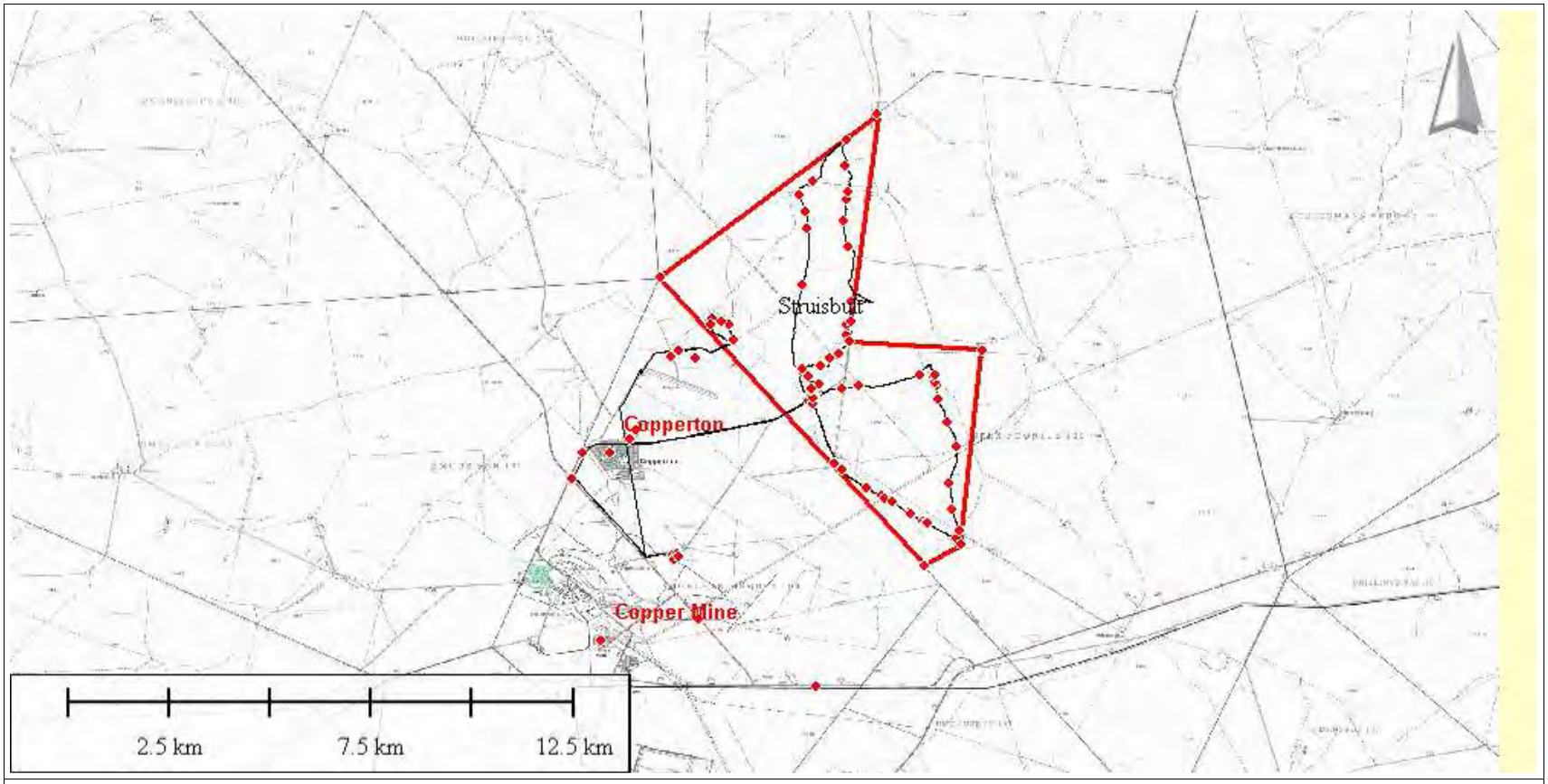

Figure 3. Overview of the Struisbult phase of the archaeological survey for the proposed wind farm.

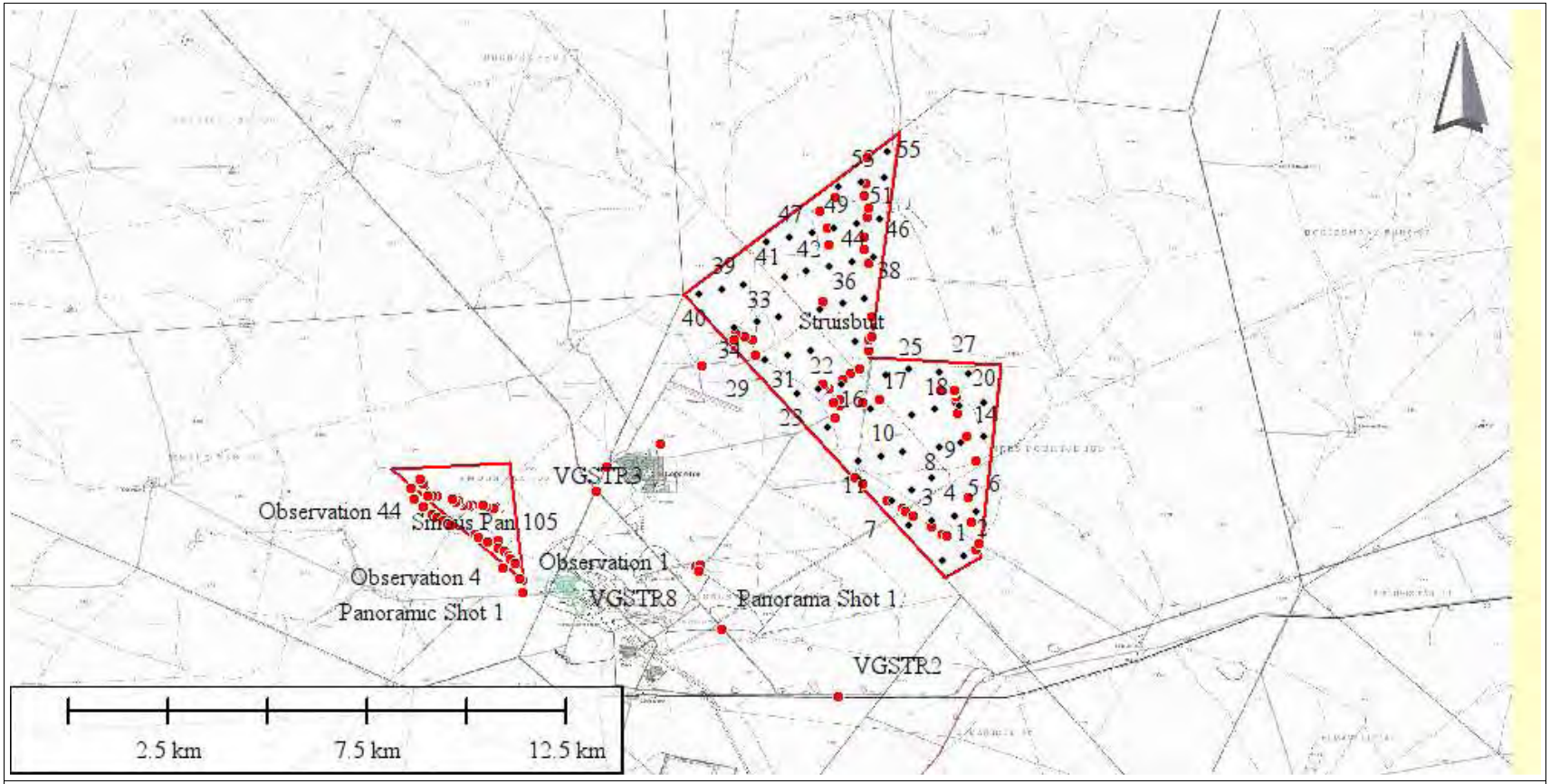

Figure 4. Overlay of a possible layout of the 56 wind turbines in BLUE dots across Struisbult against the recorded archaeological sites in RED dots.

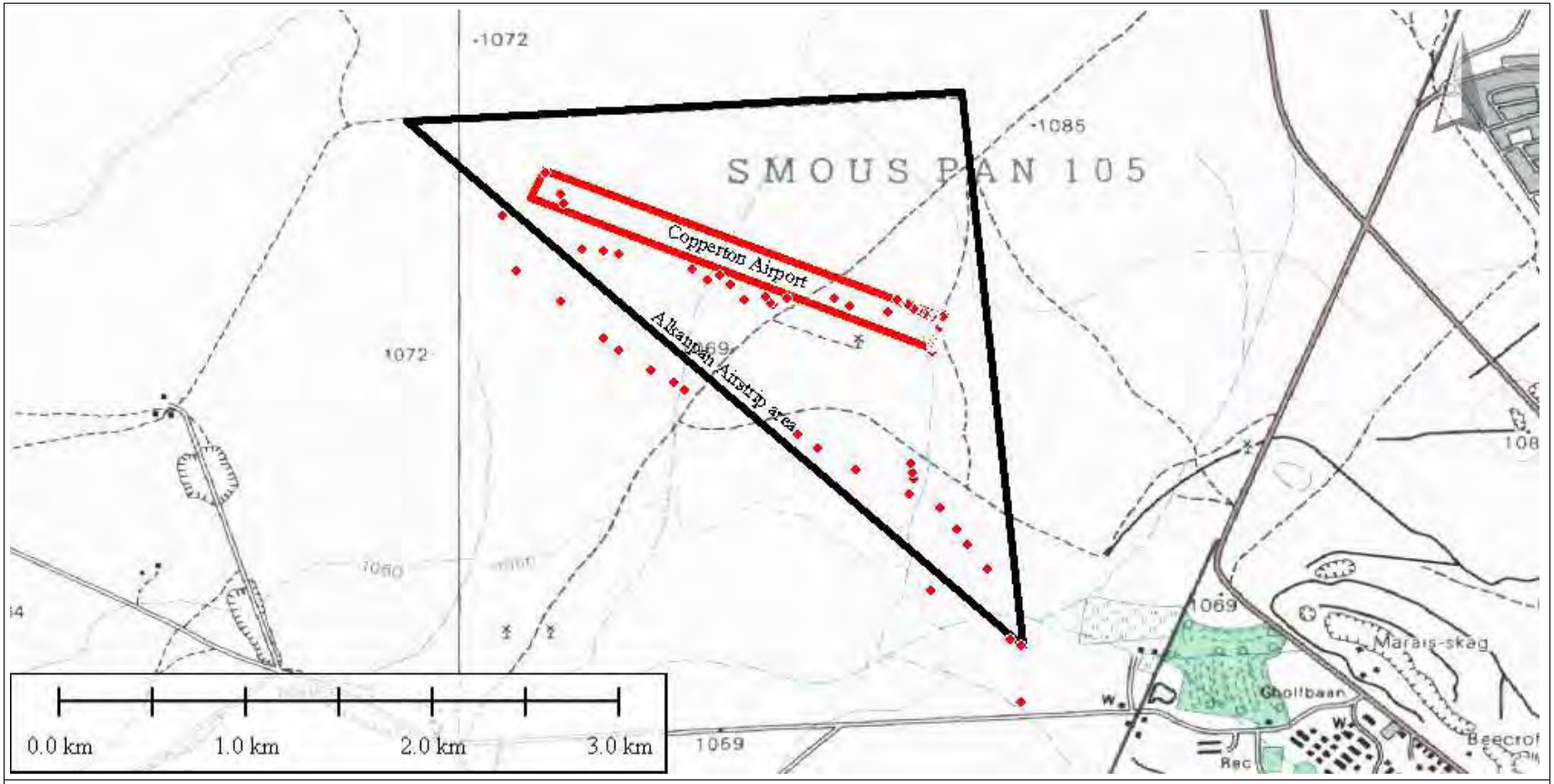

Figure 5. Overview of the Smous Pan 105 phase of the archaeological survey for the proposed landing strip.

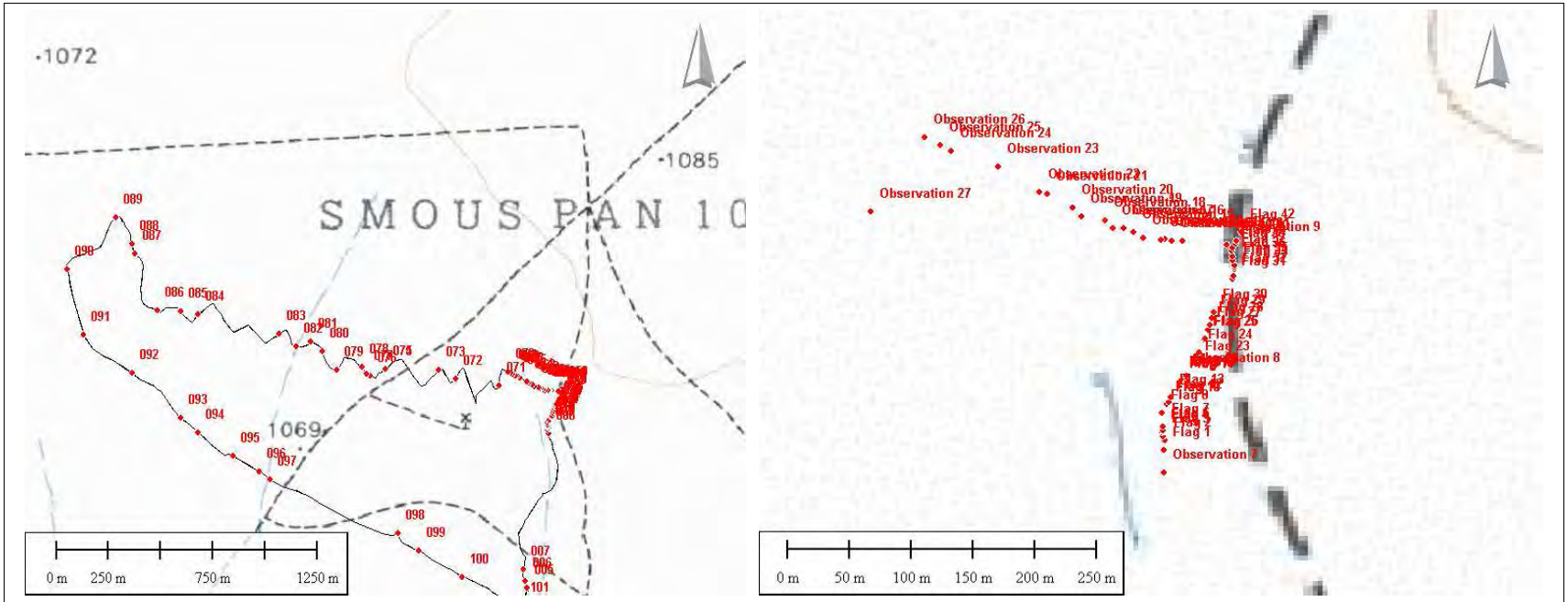

Figure 6. Maps showing the artefact plot tests (right) between Flags 1-42 and the zigzag path approach (left). These were both done at Smous Pan 105.

5. FINDINGS

Three sites were found deserving a significance rating of 3A. This is a high, local significance rating intended for heritage management at the local municipality level under the National Heritage Resources Act (Act 25 of 1999). The first site is known as Modderpan (Vogelstruisbult 4 = VGSTR4), the second is a stone kraal (NPRT4 = Nels Poortje 4) found on a low ridge on the eastern side of Struisbult and the third is also a stone kraal on the southern slope of the north-eastern corner ridge. These sites have been set aside as **no-go** areas in development of the proposed wind farm. A buffer of **250m** is recommended from the centre of Modderpan (VGSTR4) and **100m** from the centre of the stone kraals (NPRT4). GIS shapefiles of the buffer zones have been included on the DVD and submitted to Aurecon. Struisbult is currently used for farming sheep and cattle and this does not pose a major threat to the conservation of these sites.

A total of 127 observations and sites were mapped, recorded and digitally photographed. During the survey, the varying depth of the red Kalahari aeolian sands played a major role in the artefact counts. In areas where the sand was absent, the underlying calcretes or quartzitic bedrock were exposed. Stone Age quarries and dense (>50 artefacts per square metre at times) deflated artefact scatters were found on these surfaces. The lateral spatial integrity of these scatters was fairly preserved as a result of the low gradient and paucity of constant and frequent fluvial action (i.e. scatters were in their original contexts). However, the mixture of MSA, ESA and LSA artefacts from higher and lower horizons was also visible and thus downward deflation had definitely occurred in most places.

In other areas the aeolian sands reached depths of more than 30cm and the height of the vegetation (grasses and shrubs, sometimes even a large thorn tree) increased from <20cm to above waist height. Very few artefacts were found in these zones and the odd isolated LSA flake was seen. The artefact counts increased dramatically as soon as one moved away from these areas into the deflated and exposed calcretes or less ancient hard packed aeolian sands. It is therefore concluded that the aeolian sands have buried most of the MSA and ESA in these zones as found by Kiberd (2002, 2006).

An excellent example of this pattern of alternating high-low artefact visibility can be tracked by referring to Appendix 1 & 2, starting at Observation 13 and ending at Observation 17. At Observation 13 a highly visible scatter of ESA and MSA artefacts was found on an exposed calcrete surface. Observation 14 is a set of photographs showing deep aeolian sand burial and high stands of grass. Very few artefacts were found between Observation 14 and 16. A large thorn tree at Observation 16 has taken advantage of the deeper soils. At Observation 17 the Kalahari sands thin out and the hardened surface and calcretes return along with high artefact counts. The area of deep Kalahari sands is quite easily visible on the aerial photographs in Appendix 1 & 2 and a red line has been added to roughly outline the border where the sands begin to deepen and where they thin out. Photographs related to these observations can be found on the accompanying DVD.

Modderpan (VGSTR4)

Modderpan has been set aside as it provides a range of representative artefact assemblages in contexts which can be dated. Raw materials used for stone tools at Modderpan were more diverse than elsewhere on the property. Around 30 sheep were based at Modderpan during the survey and four dead sheep were found. Aardvark burrowing in the base of the pan was evident and a small erosion gully had formed between the jeep track and the pan on the south-eastern side. Artefacts can be seen embedded in the walls of the erosion gully. The jeep track runs through the south-eastern area of Modderpan and some minor surficial disturbance has taken place as a result of this. Modern glass bottles, tyres and scrap metal were also noted but not in high quantities. A deep rectangular hole dug down to 2m was found at Observation 24 and more modern animal bones and metal had been dumped inside the hole.

Heavily weathered ESA bifaces and large flakes were found in low quantities but more are likely to be buried in the calcrete and aeolian sands. Sporadic LSA finds were seen, mainly on banded ironstones sourced from the Orange River area and very fine grained, non-local quartzites and cherts. The shortest distance that some of this material has traveled is estimated to be about 43km. Many of these flakes had been retouched. No ochre, ostrich eggshell or pottery was found. A lower grindstone with a deep groove was found near a small cluster of LSA artefacts.

Modderpan primarily contains MSA artefacts. Raw materials featured locally obtained vein quartz possibly quarried at VGSTR6 and a dark blue/grey quartzite quarried at VGSTR5. Other quartzites were also found as well as banded ironstones, cherts and hornfels flakes. Based on the excavations made by Kiberd (2002, 2006), similar stratigraphic formations (where exposed) were noted at Modderpan, i.e. the uppermost Kalahari sand and various calcrete layers below. Kiberd found that the fauna at Bundu Farm fell mainly in the 200 – 300 000 years BP range and some later 100 – 200 000 years BP dates were also determined. A wide spectrum of MSA artefacts are present. Radial and bipolar cores were found amongst other irregular cores. Morphologies included blade flakes, trapezoidal flakes, triangular flakes and notched flakes. Cortex[1] percentages tended to be very low on fine grained materials such as hornfels, chert and banded ironstone. Contrastingly, the cortex percentages increased sharply in the unworked tools of locally available quartzite and this further supports the idea that many of the artefacts were locally quarried.

The context of the finds is somewhat complicated as MSA and even ESA artefacts occupied the same deflated stratigraphic horizon in certain places. The calcretes themselves have also undergone successive periods of inundation by standing water followed by dry spells (Kiberd 2006). The MSA, and to a lesser extent, the LSA material, has therefore experienced downward movement by natural erosion processes. Importantly, little lateral movement was evident as morphologically similar tools, raw materials and tool classes were found in clusters across the property. This is to be expected given the low gradient of the terrain.

Modderpan and a buffer of 250m from the centre of the pan has been set aside as a NO-GO zone for the wind farm application.

The site has been graded as 3A – local, high significance.

Figure 7. View of Modderpan.

Figure 8. View of Modderpan looking north-west.

[1] Refers to the natural outer layer of rock.

Figure 9. MSA flake on indurated shale. Scale in 2cm intervals.

Figure 10. Various MSA flakes and cores. Scale in cm.

Figure 11. LSA blade flake in chert and quartzite MSA flakes. Scale in 2cm intervals.

Figure 12. Lower grindstone. Scale in cm.

Figure 13. Erosion gully on jeep track side of pan. Fence posts between road and pan in background.

Figure 14. MSA flakes embedded in sections of the pan. Scale in cm.

Figures 7 –14. Modderpan (VGSTR4), one of the NO-GO zones recorded in this survey.

Quarries VGSTR5-7, NPRT3

Blue-grey quartzite, vein quartz and light grey quartzite Stone Age quarries were found near Modderpan moving north-west from the site. The outcrops were fairly low and stood about 40cm above the ground. Flake debris littered the ground with high cortex percentages and little to no retouch. Almost every single quartzite outcrop on both Smous Pan 105 and Struisbult had evidence of flake scarring. No engravings were found on any of these outcrops. These quarries have not been set aside from development as they are ubiquitous and sufficient quantities of similar examples will be retained where the turbines are not placed and on neighbouring properties.

These sites have been rated as 3B: Local – medium significance.

Figure 15. Dark quartzite quarried at VGSTR5.

Figure 16. Fine grained quartzite core and flake at VGSTR5. Scale in cm.

Figure 17. Vein quartz quarried at VGSTR6.

Figure 18. Vein quartz flake debris at VGSTR6.

Figures 15-18. Selected photographs from some of the quarry sites found at Struisbult.

The kraals (NPRT4 & VGSTR12)

A stone kraal was found on the southern, gentle slope of a low koppie/ridge on the eastern side of Struisbult. NPRT3, a quartzite Stone Age quarry, is nearby and thus the area is generally covered in stone flakes. However, the kraal did not feature a characteristic LSA assemblage (pottery and or

microlithics in banded ironstones, cherts, hornfels, fine grained quartzites) and it is therefore likely that the kraal was built in the historical period - perhaps shortly after the farm was settled by colonial farmers. The walls stand 40cm high and the kraal measures 5x6m. Broken glass and a rusted metal plate were found next to the kraal.

The low hill has a good view of the area and this kraal was seemingly built in this location to take advantage of the slight elevation. Large rocks to build the walls of the kraal are also easily available here. The site has been included in the NO-GO zones for the wind farm and a no development buffer of 100m around the kraal will suffice to protect the site.
Another stone kraal was found by Mr Meyer on the property. The second kraal (VGSTR12) also lies on the southern, gentle slope of the north-easternmost koppie on Struisbult. This kraal is slightly larger than NPRT4 but the walls are scattered and very low. A piece of broken glass was found near this kraal.

These sites have been graded as 3A – local, high significance.

Figure 19. Stone kraal measuring 5x6m on Nels Poortje 103.

Figure 20. View of stone kraal (NPRT4) and wind monitoring mast in background.

Figure 21. Stone kraal VGSTR12 on Vogelstruisbult 104. Photos courtest of Mike Meyer.

Figure 22. Stone kraal VGSTR12 on Vogelstruisbult 104. Photos courtest of Mike Meyer.

Figures 19-22. Photographs of stone kraal (NPRT4) on Nels Poortje 103. This site is a NO-GO area up to a buffer of 100m from the centre of the site.

Saaipan (VGSTR8)

There is a possibility that a power line will be constructed between the wind farm and the Cuprum substation near the copper mine. Most of the route lies in the road reserve and fairly minor disturbance of archaeological material is expected for the most part. Another shallow pan called Saaipan lies in the way of the proposed route and it was thus investigated. The pan is much smaller than Modderpan and is similar to Valspan in that it is really only a very slight depression on the landscape. Unsurprisingly, thousands of mainly MSA artefacts littered the landscape. No mitigation has been recommended for this site as the power line footprint is small and the pan is nowhere near as prominent as Modderpan or Blomsdampan.

Figure 23. View of Saaipan (VGSTR8) with the sand bank in the background which was created around the copper mine.

Figure 24. View of Saaipan looking north in the direction of the proposed wind farm at Struisbult.

Figure 25. MSA hornfels flake at Saaipan. Scale in cm.

Figure 26. Chert core found at Saaipan. Scale in cm.

Figures 23-26. Photographs of Saaipan (VGSTR8) which lies in the path of a possible power line connection to Cuprum substation.

Knapping episode (SMOUS1)

A concentration of MSA flakes were found on Smous Pan 105. The artefacts lay on the hard packed aeolian sand surface and it was possible to refit some of the flakes to the core. This site has been sufficiently recorded with digital photographs and a GPS waypoint.

This site has been graded as 3C – local, low significance.

Figure 27. SMOUS1 knapping site using dark quartzite and lying on hard packed aeolian sand layer. Scale in cm.

Figure 28. SMOUS1 flakes taken from core in adjacent figure. Scale in cm.

Figures 27-28. Photographs of knapping site at SMOUS1.

Photographed Observations: Vogelstruisbult 104 & Nels Poortje 103

A total of 52 mapped and photographed observations were made on Vogelstruisbult and Nels Poortje 103 in addition to 15 'sites' VGSTR1-VGSTR11; NPRT1-NPRT4. In some cases the allocation of 'site' was entirely arbitrary and was based on the point where a panoramic photograph had been taken (VGSTR1-2). In others, the sites represent Stone Age quarries (VGSTR5-7; NPRT3) and coherent pans (VGSTR4, VGSTR8, VGSTR9, VGSTR10). A modern graveyard (VGSTR3) started in 2003 by the Meyers was also recorded near the derelict sports field complex at Ietznietz (M. Meyer pers. comm. 2011). This graveyard is on the edge of the town of Copperton and is far away from the proposed wind farm (+-3km, see Figure 4).

Blomsdampan (VGSTR9) and Valspan (VGSTR10) lie outside the boundaries of Struisbult and will not be impacted by the proposed wind farm. Valspan is a very shallow pan and is detectable by the change in grass covering the slight deflation in the pan. Blomsdampan is the largest pan observed during this visit and had over 100 sheep at the site at the time of recording. MSA artefacts were recorded in many of the exposed banks of the pan and there was a shallow pool of water in the base of the pan. Similar observations to Modderpan were made except in this case the exposed sections were more extensive and eroded.

NPRT2 is a well exposed and easily visible scatter of MSA artefacts on hard packed aeolian sand near the course of a shallow stream. This site was recorded sufficiently and requires no further mitigation.
NPRT1 and VGSTR11 refer to cattle posts inside the boundaries of Struisbult. They will not be modified or altered by the proposed wind farm development.

Figure 29. View of Blomsdampan.

Figure 30. Exposed calcrete section and cemented manuport, context uncertain. Scale in cm.

Figure 31. Kalahari sand layer on top of calcrete layers. MSA flake in section. Scale in cm.

Figure 32. Close up of MSA flake in section. Scale in cm.

Figure 33. ESA artefacts typical of Smous Pan 105 and Struisbult (Observation 5, Smous Pan).

Figure 34. Ventral side of ESA artefacts typical of Smous Pan 105 and Struisbult (Observation 5, Smous Pan).

Figures 29-34. Photographs of Blomsdampan and calcrete sections more clearly exposed than Modderpan and ESA artefacts found at Smous Pan 105.

Photographed Observations: Smous Pan 105

One site (SMOUS1) and 59 photographed and mapped observations were made on Smous Pan 105. SMOUS1 refers to a site where a dark quartzite rock and associated flakes were found relatively in situ on top of a hard packed aeolian surface. It was possible to refit some of these flakes onto the core.

Observations made without photographs: Smous Pan 105

As mentioned earlier, a density test was carried out to GPS plot each artefact while walking in a straight line. 42 readings were captured and referred to as Flag1 - Flag42. The total distance walked while carrying out this exercise was roughly 190m and only artefacts within a metre wide path were included in the recording. Many more artefacts would add to the total if one stopped to piece plot each flake in this path and this gives an indication of the quantity of Stone Age material on this landscape.

It was also interesting to note a fair number of Early Stone Age artefacts found at Struisbult and Smous Pan 105. These consisted of bifaces, choppers and cleavers on heavily weathered quartzite that had a metallic ring to it when tapped. The flake scars on most of these artefacts were highly patinated and the flakes were surprisingly light given their size.

6. IMPACT STATEMENT

The following table outlines the SAHRA significance ratings for heritage sites:

Significance Rating	Description
1	National Heritage Site
2	Provincial Heritage Site
3A	Local, High significance
3B	Local, Medium significance
3C	Local, Low significance

Table 1. SAHRA significance ratings.

Site/Observation #	Description	Significance Rating
VGSTR1&2	MSA scatters documented at Panoramic Positions	3C
VGSTR3	Small, modern graveyard adjacent to Ietznietz lodge	3A
VGSTR4	Modderpan	3A
VGSTR5, 6, 7	Stone Age quarries	3B
VGSTR8	Saaipan	3B
VGSTR9	Blomsdampan	3A
VGSTR10	Valspan	3B
VGSTR11	Cattle post	Ungraded
VGSTR12	Stone Kraal low walls	3A
NPRT1	Cattle post	Ungraded
NPRT2	MSA scatter	3C

Site/Observation #	Description	Significance Rating
NPRT3	Stone Age quarry	3B
NPRT4	Stone kraal	3A
SMOUS1	Knapping site	3C
Struisbult Observations 1-52	Various scatters of mainly MSA artefacts	3C
Smous Pan Observations 1-59	Various scatters of mainly MSA artefacts	3C
Table 2. Grading summary for this survey.		

Nature of impact: The potential impact of the construction of a wind farm and landing strip, on above ground pre-colonial and historical archaeology		
	Without Mitigation	**With Mitigation**
Extent of impact	Local	Local
Duration of impact	Permanent	Permanent
Intensity	Medium-High	Low
Probability	Definite	Improbable
Significance	Local – High	Low
Degree of confidence	High	High
Mitigation: Mitigation is proposed - the kraals and Modderpan must not be developed within the buffer zones recommended in this report. The excavation report for the trenches must be submitted to SAHRA. Also see recommendations on cumulative impacts.		

7. RECOMMENDATIONS AND MITIGATION ACTION

The following recommendations are made:

1. The development of a wind farm will have a serious negative impact on Modderpan (VGSTR4). A buffer zone of 250m from the centre of the pan must be avoided as a **no-go** zone for this proposal but existing use of the site may continue as a source of water for grazing animals.
2. Two historical stone kraals (NPRT4 & VGSTR12) must be avoided as **no-go** zones with a buffer of 100m from the centre of the kraals. Archival research for the stone kraals is recommended to understand the history of the sites. This need not be done for this application as these sites will be set aside from development.
3. The development of a power line to Cuprum substation will have a low impact on a less significant pan called Saaipan (VGSTR8) and no mitigation is recommended for this aspect of the development.
4. The development of a landing strip at Smous Pan 105 will affect archaeological scatters but these have been sufficiently recorded in this survey to establish that comparative material will remain on the unaffected areas of the site.
5. The excavation of the foundations for the turbines will open up pits 20x20m and up to 3m deep. The Palaeontological Impact Assessment (Almond 2011) found that the fossil sensitivity in this area is low and therefore fulltime Palaeontological monitoring has not been deemed necessary for this proposal. The recording of the varying depth of the Kalahari sands, the calcrete layers and the quartzitic bedrock will provide excellent information to complement the work done by Kiberd (2002, 2006) and the open site surveys. The contracted engineer during the construction phase must produce an

excavation report. This report must be submitted to the consultant archaeologist for dissemination to SAHRA, Mr Kiberd and the McGregor Museum. The engineer must be briefed on the recording requirements by the archaeologist before excavations are done.

6. The rest of the sites have been sufficiently recorded to allow the development of the wind farm and the landing strip. The survey captured a representative record of the archaeological resources that will be affected by the development.
7. A Conservation Management Plan for Modderpan and the stone kraals are highly recommended. This documented should be commissioned by the owners of Struisbult.

The application for a wind farm on Struisbult is one of **at least six energy** related applications in the immediate area around Copperton:

1. SAHRA must be aware of the overall heritage impact that these applications will have on the landscape when formulating its comments to the DEA.
2. From an archaeological perspective, the pan systems must be avoided as exemplified in this report as they hold rich archives that are representative of the archaeological record in the area. Historical kraals were also documented in this study and more of these structures would be expected in the area.
3. Besides the cumulative visual impact of hundreds or even thousands of wind turbines in a concentrated area around Copperton, it is important to conserve the sense of place around the significant archaeological sites such as the pans and the kraals.
4. Sites with engravings may well be found on surrounding properties and these are especially vulnerable to the loss of a sense of place (Deacon 1988). Much larger buffer areas would be required to mitigate against the impacts on engraving sites.

8. CONCLUSION

The development of a 140MW wind farm and landing strip on Struisbult and Smous Pan 105 will impact negatively on archaeological resources unless three no-go areas are avoided in the layout of the wind turbines. An excavation report for the foundations must be copied to the aforementioned bodies as this will assist future work in the area in assessing the geomorphological conditions under which artefact visibility fluctuates.

There are thousands of artefact scatters mainly dating from the Middle Stone Age on the properties. Interesting heavily weathered Early Stone Age material was found with a few isolated occurrences of Later Stone Age artefacts. Quarry sites exploiting the vein quartz and quartzite bedrock were identified and recorded but no graves, engravings, ochre, pottery or ostrich eggshell were found that will be affected by the proposal. The preservation of Modderpan will retain a representative sample of the archaeological material in the area and future research may take advantage of the dating potential on offer as demonstrated by Kiberd (2002, 2006).

Archival research for the stone kraals is recommended to understand the history of the site. This need not be done for this application as the site will be set aside from development.

A Conservation Management Plan for Modderpan and the stone kraals are highly recommended. This documented should be commissioned by the owners of Struisbult.

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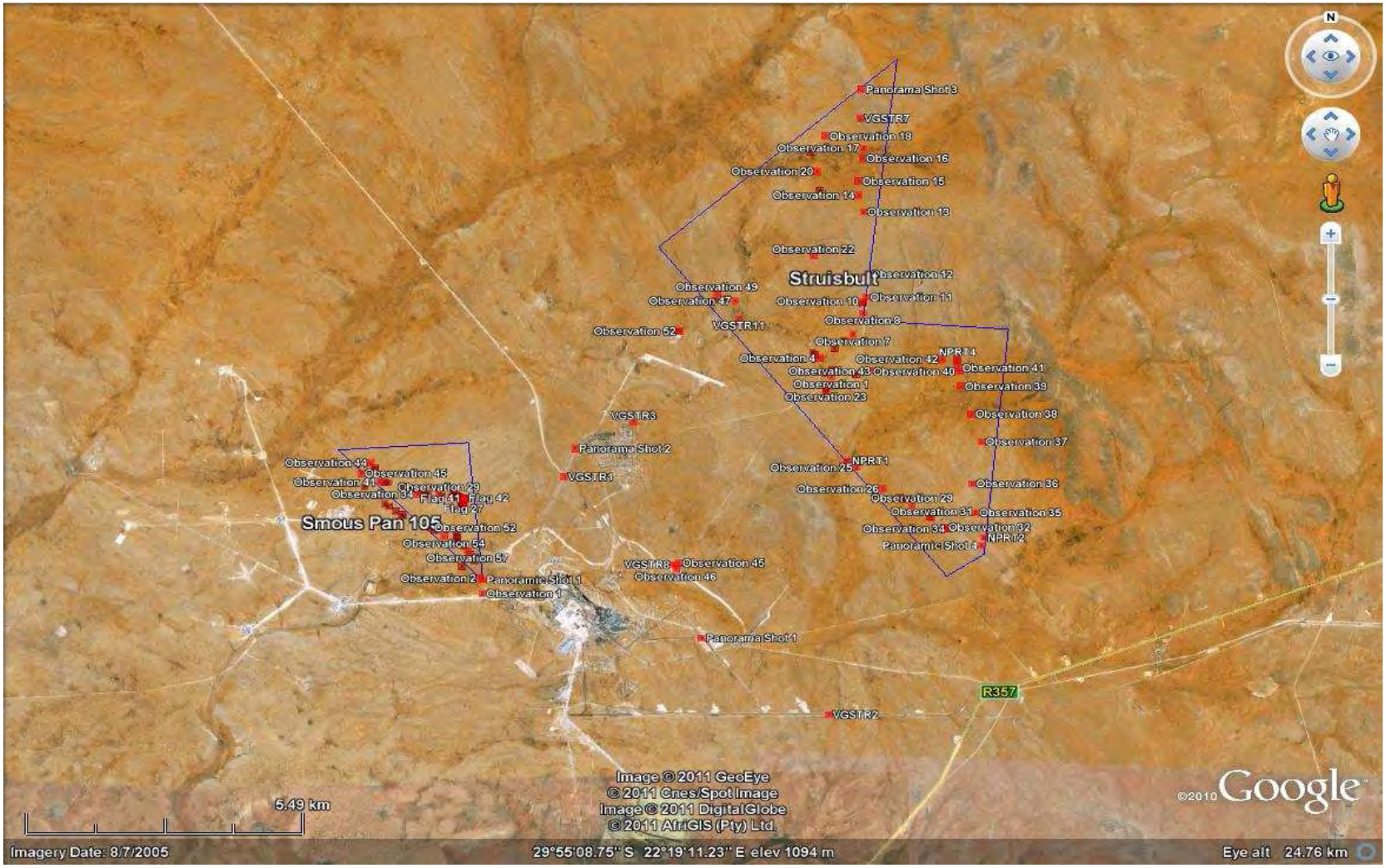
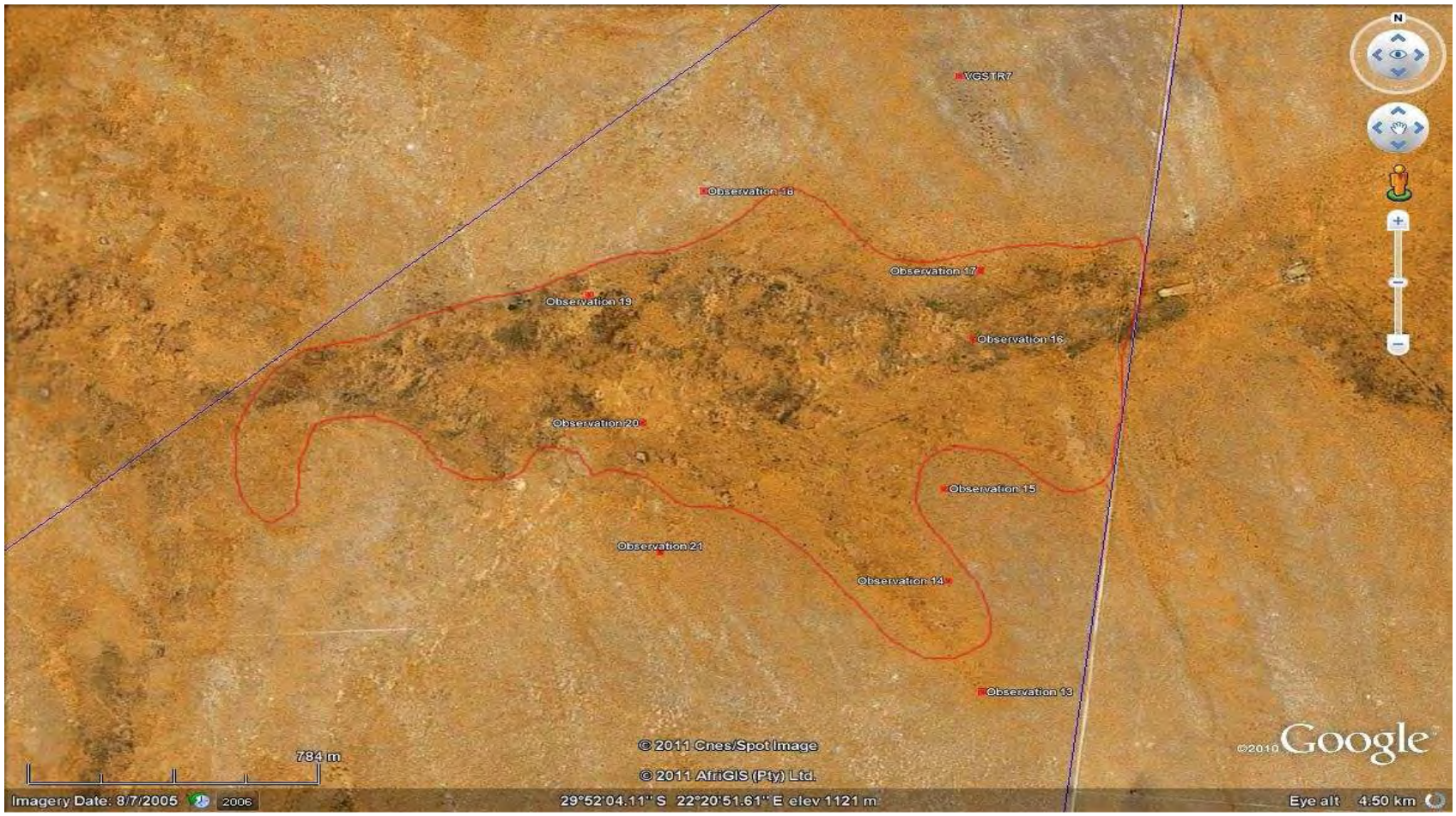
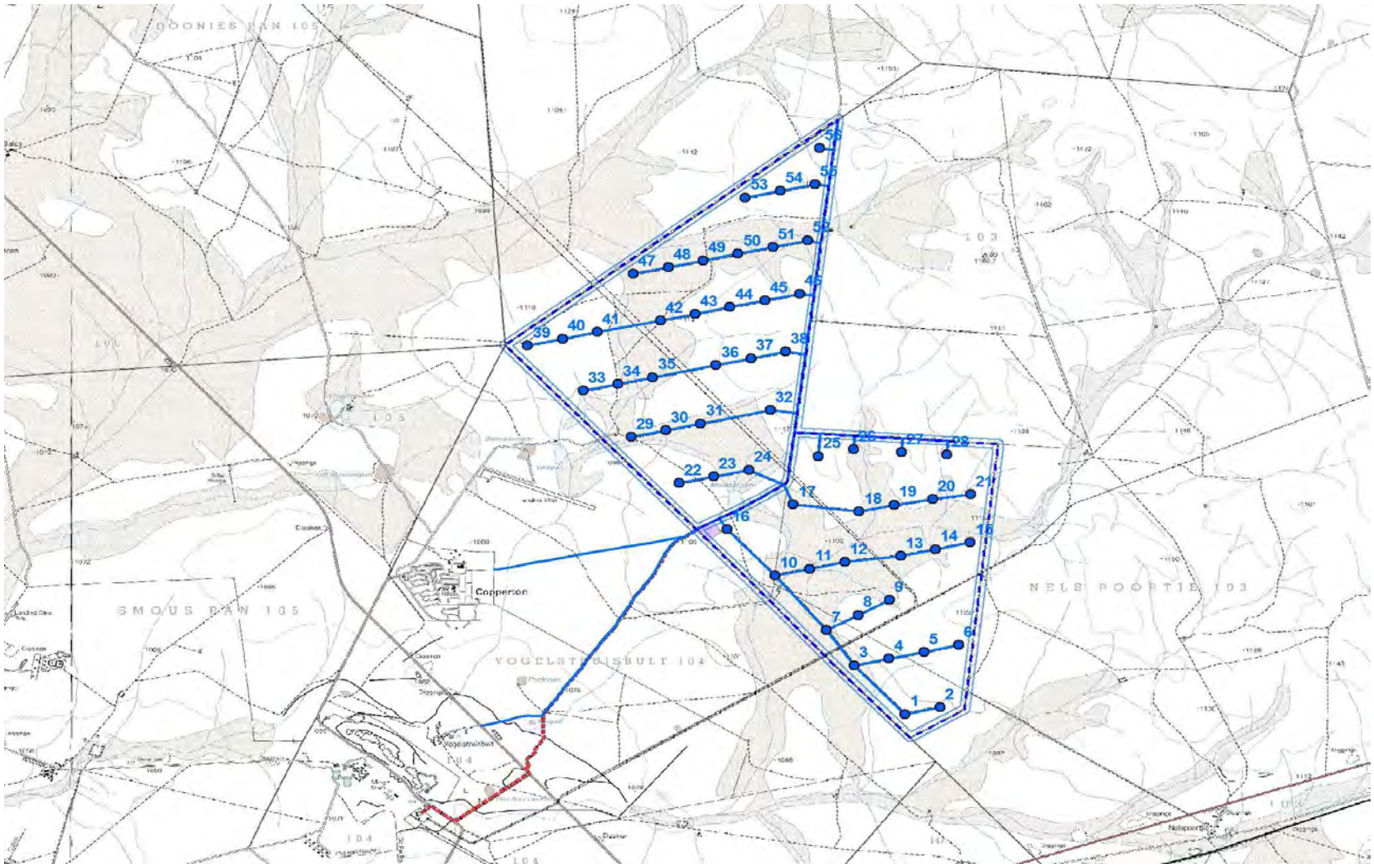
10. APPENDICES



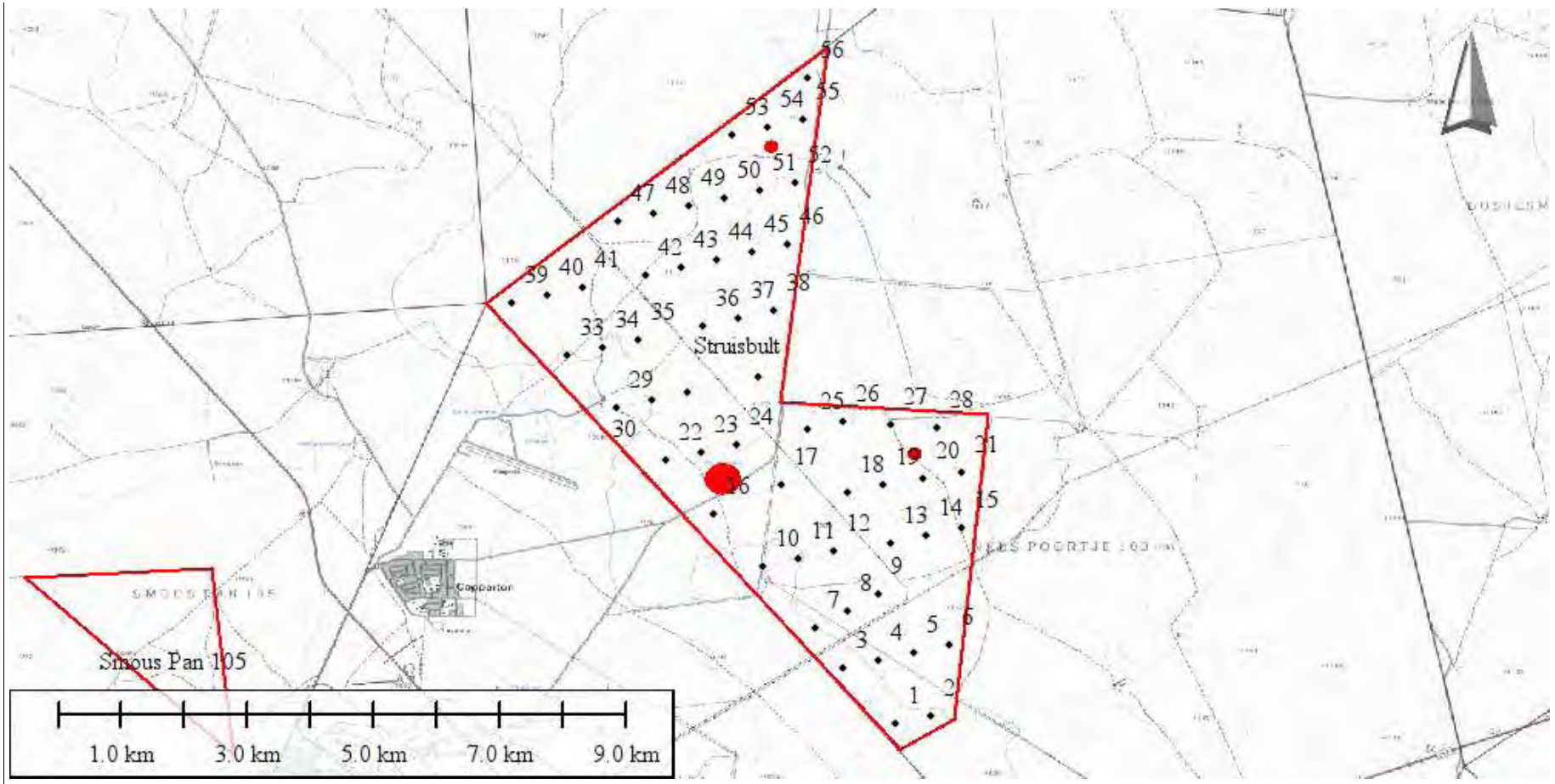
Appendix 1. Google Earth aerial view of the sites documented for the proposed landing strip and wind farm on Smous Pan 105 and Struisbult.



Appendix 2. Google Earth aerial view of the northern corner of Struisbult clearly showing patches of deeper Kalahari sands. This image has been edited with a red line to emphasize the area of deepest aeolian sand burial.



Appendix 3. Plan 8 preliminary wind turbine layout for Struisbult in October 2011 courtesy of Aurecon.



Appendix 4. Plan 8 preliminary wind turbine layout for Struisbult in October 2011 courtesy of Aurecon showing the avoidance of the NO-GO Zones in red. Modderpan has a buffer of 250m from the centre of the pan. Stone kraals have a buffer of 100m each from their centres.