

**ADDENDUM: PROPOSED WIND ENERGY FACILITY SITUATED ON
THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN
CAPE PROVINCE**

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

Prepared for:

Holland & Associates Environmental Consultants

On behalf of:

Longyuan Mulilo De Aar 2 South (Pty) Ltd

June 2015



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EXECUTIVE SUMMARY

ACO Associates have been appointed by Holland & Associates Environmental Consultants on behalf of the client, Longyuan Mulilo Renewable Energy (Pty) Ltd (MRE), to provide an Addendum to their original Heritage Impact Assessment (dated December 2011) for the proposed wind energy facility (WEF) situated on the eastern plateau (South) near De Aar (also referred to as the De Aar 2 South WEF).

Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013. The Authorised Option comprises 103 turbines, each with a generation capacity of 1.5MW – 2.5MW.

Longyuan Mulilo De Aar 2 South (Pty) Ltd proposes to increase the generating size of the wind turbine generators (WTG) with the following changes:

- Increasing the hub heights from 100m to 120m
- Increasing blade lengths from 60m to 80m
- Increasing WTG generation size to encompass a range of 2.3MW to 4.0MW

The generation capacity of the WEF would be a maximum of 140MW in accordance with the cap placed on maximum megawatts by the Department of Energy REIPPP Programme. This will result in a reduction of the total number of turbines on De Aar 2 South WEF from 103 turbines to a range of either 61 turbines @ 2.3MW per turbine to 30 turbines @ 4MW per turbine.

The maximum number of turbines, i.e. 61 will be applied for.

Heritage Indicators

The assessment by Webley & Orton (2011) identified the following heritage resources in the study area:

- There is a widespread distribution of Middle Stone Age (MSA) artefacts of patinated hornfels across the top of the plateau. In general the artefacts do not appear to represent *in situ* sites and are of Grade IIIC (low) significance. However, some concentrations of MSA artefacts occur on the farm Knapdaar and appear to be “factory sites” for the production of MSA artefacts. They are of Grade IIIB significance.
- There are a few discrete Later Stone Age (LSA) sites considered of Grade IIIA significance since they represent a pre-ceramic interior variant on the Wilton and/or Smithfield about which very little is known.
- There are a number of stone kraal complexes that may represent seasonal utilisation of the “winterveld” on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau.
- While most of the permanent farmsteads are located below the plateau, there are some farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC.

- No cemeteries or graves were identified on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes.
- The cultural landscape comprises typical Karoo landscape. It is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

Methodology and Limitations

The “Authorised option”, assessed by us in 2011 (GPS track paths and identified sites), was compared with the “Proposed amended option” (2015) in order to determine the proximity of heritage resources and the likely impact of the turbines, cabling, access roads, substations, etc.

This assessment was done as a desktop study using Google Earth. The limitations of Google Earth are that only substantial structures, such as farm complexes and large kraals can be identified. Smaller structures such as shepherd’s structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material. This is a significant limitation in terms of predicting impacts.

General Assessment of Impacts

- With respect the archaeology, impacts are generally considered to be low. However, significant sites have been found on the banks of dry streams and against the lower slopes of valleys, and these may be damaged or destroyed;
- Rock art sites, either paintings in small shelters, or engravings on boulders, may be difficult to identify, and may be damaged or destroyed;
- Colonial as well as pre-colonial stone kraals occur along the lower slopes of valleys and near rivers and springs and they may be damaged by turbines and access roads;
- Farmsteads and associated farm buildings older than 60 years, while generally avoided by the WEF layout, may be negatively impacted by the expansion of access roads;
- Farm graveyards as well as individual graves, including unmarked farm workers graves, may be damaged or destroyed.

General Recommendations

- Avoid constructing access roads along the lower slopes of valleys and along river banks to avoid impacting on significant sites and stone kraal complexes;
- Ensure access roads avoid passing in close proximity to farmsteads and associated farm buildings older than 60 years. In general a 400m buffer should be implemented around farmsteads particularly if the farm buildings are older than 60 years. This buffer can be reduced if the building contains no elements of heritage significance;
- Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist – for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP ;
- All farm cemeteries and individual graves should be avoided. A buffer of at least 15 m should be enforced around them. They are often difficult to identify, and for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP;
- If any human remains are uncovered during the construction phase, work in that area should stop immediately and the South African Heritage Resources Association (SAHRA) must be notified;

- Guarantees for demolition of turbines after their useful life must be in place as a condition of approval.

Desktop Assessment of Proposed Amended Option and Specific Recommendations

There are at least four locations where the amended layout may impact negatively on heritage resources. They are:

- At the proposed 132 kV substation. The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face. There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive. In addition, the access road will run in close proximity to a series of stone kraals identified in the 2011 survey.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- While the Proposed Amended Option avoids the large MSA factory site on Knapdaar, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting WTG47 with WTG46. These kraals vary between 30m and 90m from the stone kraals.

It is not possible to verify whether these stone “circles” reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- The access road for the Proposed Amended Option connecting WTG45 with WTG37 will run within 90m of a series of at least three (3) kraals. The kraals may be associated with a farm building but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

It is not possible from the aerial photography to determine whether these are modern kraals with wire fencing, or older stone kraals. The age of the kraals can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

- The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs 200m from a square kraal, overlooking a dry river. The kraal (?) falls outside the boundaries of the WEF.

The age of the kraal can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

Conclusions

After consideration of the significance of the heritage resources (identified during the 2010 survey), it is concluded that the reduction in the number of WTG is generally positive from a heritage perspective.

If the above recommendations are implemented, then the Proposed Amended Option is supported.

Declaration of Consultants Independence

I, Lita Ethel Webley, author of the De Aar Wind Energy Facility specialist heritage report, hereby declare that I am an independent consultant appointed by Holland & Associates Environmental Consultants to provide specialist input on the Longyuan Mulilo De Aar 2 South (Pty) Ltd. I hereby confirm that I have no business, financial, personal or other interest in the activity, application or appeal in respect of which I 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 my own.



SIGNATURE

NAME: Lita Ethel Webley

June 2015

Lita Webley is an 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 19 years of working experience in heritage throughout southern Africa and joined the Archaeology Contracts Office in 2008. She is accredited with Principal Investigator status (Stone Age, Colonial Archaeology and Shell Midden Archaeology) with the Association of Professional Archaeologists of Southern Africa.

ACO Associates cc have considerable experience in assessing the impacts of renewable energy projects on heritage, having completed the specialist studies in excess of 30 renewable energy projects in the Eastern, Northern and Western Cape.

GLOSSARY

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 2 500 000 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.*

Hornfels: *A type of indurated shale used in the production of stone tools in the Karoo.*

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 20 000-300 000 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.*

Pleistocene: *A geological time period (of 3 million – 10 000 years ago).*

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

Smithfield: *This term was coined in 1929 for a number of interior stone tools assemblages, made on indurated shale, and dating to the last 2000 years of the Later Stone Age. Various variants have been identified in different parts of the country but the term has not been clearly defined.*

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.*

Wilton: *A Late Stone Age microlithic industry dating to between 6000 and 4000 years ago.*

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
ECO	Environmental Control Officer
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
WEF	Wind Energy Facility
WTG	Wind Turbine Generators

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1 INTRODUCTION AND BACKGROUND

ACO Associates have been appointed by Holland & Associates Environmental Consultants on behalf of the client, Longyuan Mulilo Renewable Energy (Pty) Ltd (MRE), to provide an Addendum to their original Heritage Impact Assessment, dated December 2011.

In the original assessment, Mulilo Renewable Energy (Pty) Ltd, applied for Environmental Authorisation from the Department of Environmental Affairs (DEA) to establish a Wind Energy Facility (WEF) on a plateau some 20 km to the east of De Aar, Northern Cape. The name of the project is the "De Aar 2 South WEF".

The Authorised Option comprised 103 turbines, each with a generation capacity of 1.5MW – 2.5MW.

The HIA (Webley & Orton 2011) formed part of EIA completed in 2012 and Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013.

1.1 Revised Development Proposals

An application for Amendment of the EA was submitted to DEA in May 2013 to change the SPV name from Mulilo Renewable Energy (Pty) Ltd to Longyuan Mulilo De Aar 2 South (Pty) Ltd. This was granted by DEA.

In July 2014 a further Application was made to DEA for an Amendment of the Environmental Authorisation. The amendment of the EA was granted by DEA.

Longyuan Mulilo De Aar 2 South (Pty) Ltd (the applicant) proposes to amend the project description of the proposed WEF. Holland & Associates Environmental Consultants have been appointed by the applicant to undertake the application for amendment of the Environmental Authorisation.

The De Aar 2 South WEF propose to increase the generating size of the wind turbine generators (WTG) in order to align with current international WTG models while reducing the number of WTG on the WEF. The following changes will be made to the WTG parameters:

- Increasing the hub heights from 100m to 120m
- Increasing blade lengths from 60m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

The generation capacity of the WEF would be a maximum of 140MW in accordance with the cap placed on maximum megawatts by the Department of Energy.

This will result in reduction of the total number of turbines on De Aar 2 South WEF from 103 turbines to 61 turbines @ 2.3MW per turbine to 30 turbines @ 4MW per turbine.

The maximum number of turbines, i.e. 61 will be applied for.

These changes will result in an increase of the turbine tower base diameter from 15m to 20m and an increase in foundation depth from 2m to 3.5m. The construction hardstand pad would remain at 40 x 50m (adjacent to each turbine).

The changes to the WEF layout, the "Proposed Amended Option", are considered at a desktop level below.

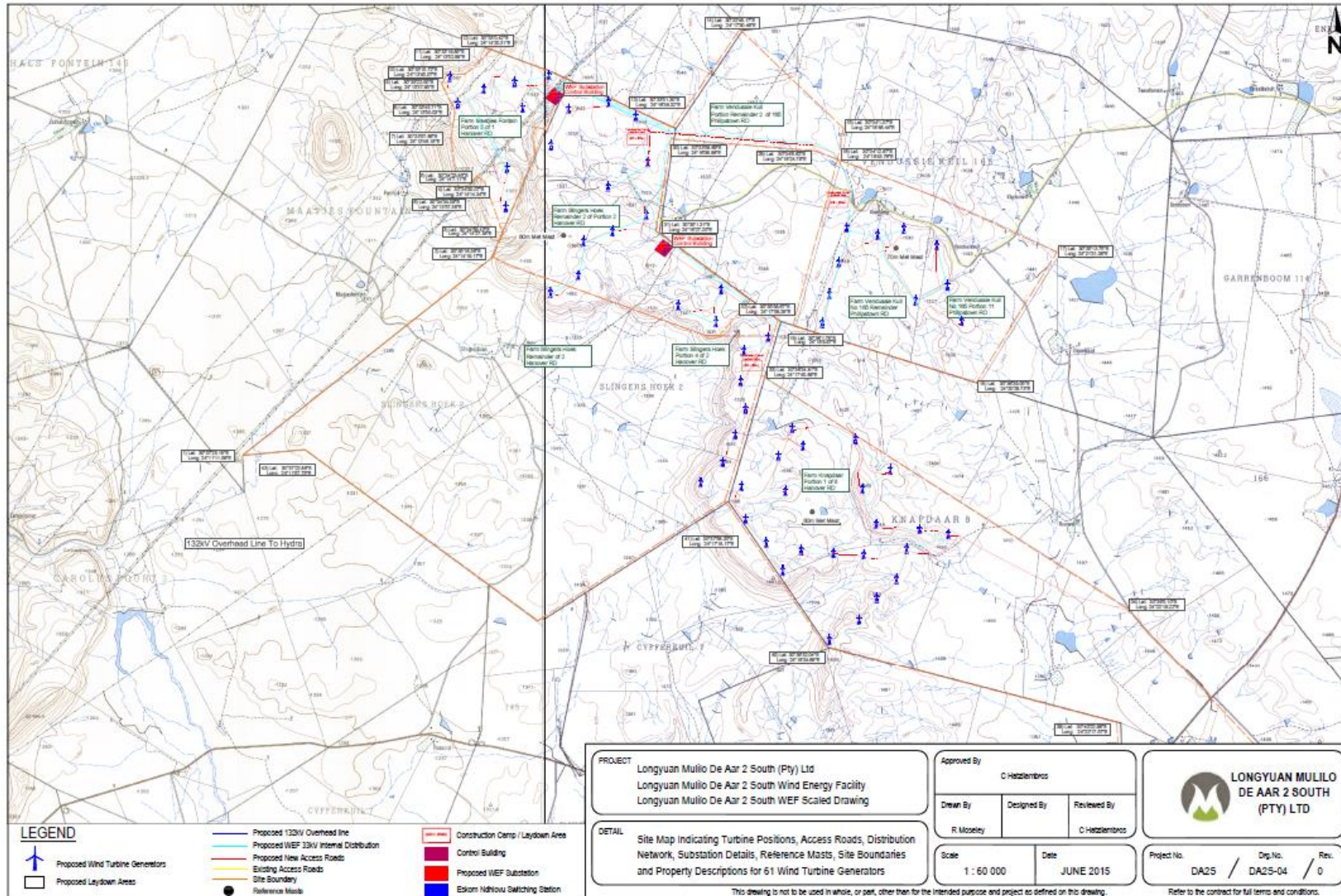


Figure 1: View of the Proposed Amended Option on the Southern Plateau (map supplied by client).

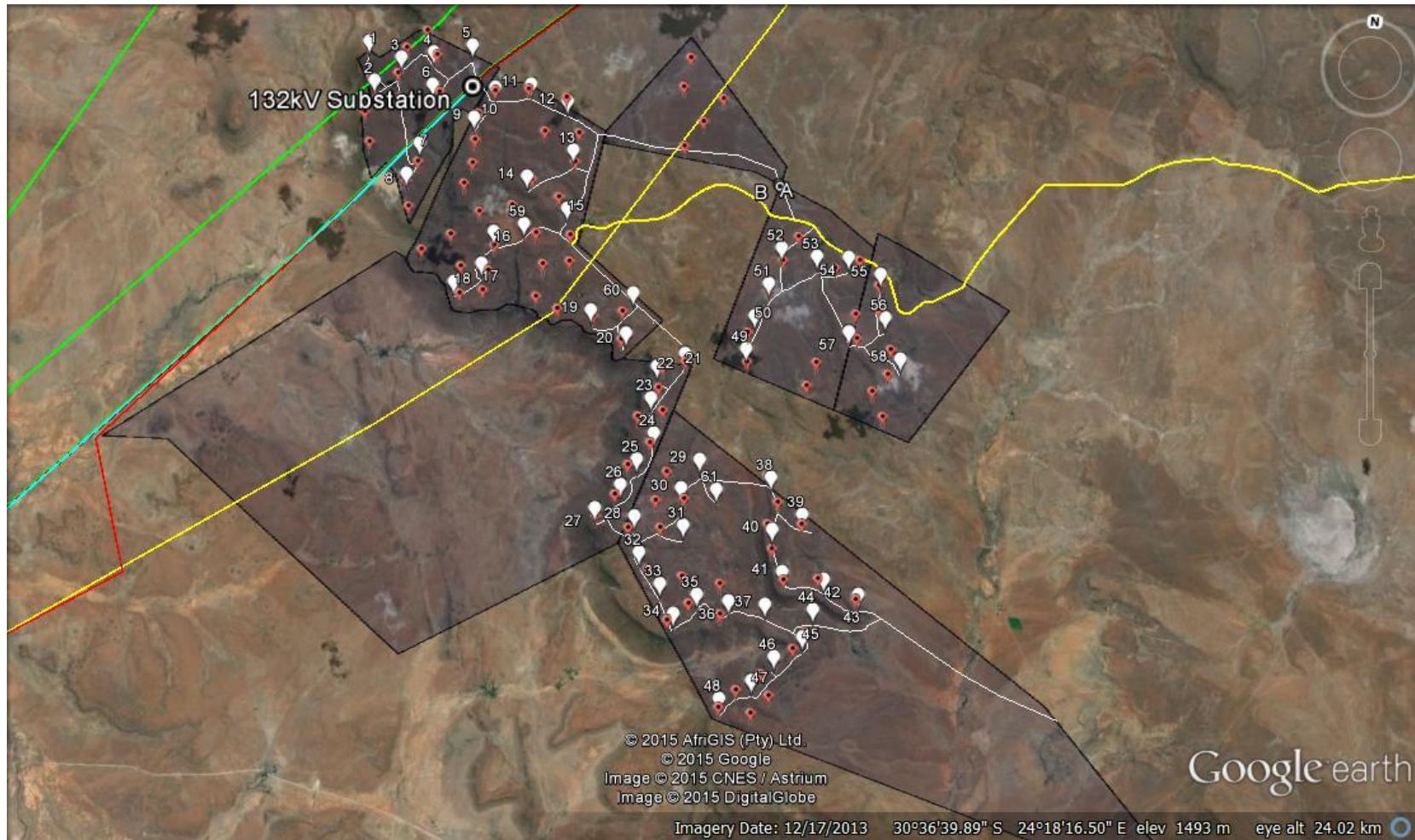


Figure 2: View of the Proposed Amended Option on the South Plateau (map supplied by client). The red icons indicate the approved WTG, while the white icons are the proposed amended WTG locations. The existing road is indicated in yellow and the new access roads in white.

The no-go alternative consists of maintaining the status quo.

2 TERMS OF REFERENCE

ACO Associates cc has been instructed to compile an addendum to the specialist heritage report addressing the following:

- The implications of the proposed amendments in terms of the potential impact(s);
- A re-assessment of the significance (before and after mitigation) of the identified impact(s) in light of the proposed amendments (as required in terms of the 2014 EIA Regulations), for the construction and operational phases, including consideration of the following:
 - Cumulative impacts;
 - The nature, significance and consequence of the impact;
 - The extent and duration of the impact;
 - The probability of the impact occurring;
 - The degree to which the impact can be reversed;
 - The degree to which the impact may cause irreplaceable loss of resources;
 - The degree to which the impact can be avoided, managed or mitigated;
- The addendum to your report must include an impact summary table outlining the findings of the re-assessment in terms of the abovementioned assessment criteria;
- A statement as to whether the proposed amendments will result in a change to the significance of the impact assessed in the original EIA for the proposed project (and if so, how the significance would change). The advantages and disadvantages associated with the proposed change;
- A detailed description of measure to ensure avoidance, management and mitigation of impacts associated with the proposed changes;
- The re-assessment must take into must take account and address public comments received during the Public Participation Process (PPP) relating to your area of expertise.

3 LEGISLATION

The National Heritage Resources Act (No 25 of 1999) provides protection for the following categories of heritage resources:

- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Human remains older than 60 years and located outside of a formal cemetery administered by a local authority (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi));
- Landscapes with cultural significance are also protected under the definition of the National Estate (Section 3 (3.2d)).

Since the project is subject to an Environmental Impact Assessment, the South African Heritage Resources Agency (SAHRA) has provided comment on the proposed project in order to facilitate final decision making by the Department of Environmental Affairs (DEA).

This Addendum to the HIA considers: Archaeology, the Built Environment, Graves and the Cultural Landscape. The palaeontology of the area forms part of a separate study.

3.1 Heritage Grading

The NHRA makes provision for a three-tier system for grading heritage resources, namely Grades I, II and III. However experience has shown that most heritage resources fall into Grade III. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

Table 1: Grading of heritage resources (Source: Baumann & Winter 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.

Heritage specialists use the grading system to express the relative significance of a heritage resource. This is known as a field grading or a recommended grading. Official grading is done by a special committee of the relevant heritage authority, however heritage authorities rely extensively on field gradings in terms of decision making.

4 METHODOLOGY

4.1 Literature survey

The source of information utilised in this Addendum is primarily based on the original field survey undertaken by Webley & Orton (2011). However, published archaeological reports and unpublished Archaeological, Heritage and Palaeontological Impact Assessments for the general area provide an important supplement to this report. The SAHRA Report Mapping Project (2009) and the South African Heritage Resources Information Systems (SAHRIS) database was consulted for Cultural Resource Management (CRM) reports from the De Aar area.

4.2 Field survey

A physical survey of the project area, based on a 2011 layout, was undertaken by Lita Webley and Jayson Orton in November 2011. The positions of the turbines and access roads were loaded onto hand-held GPS receivers (on the WGS84 datum) which enabled us to target the relevant areas. Data collection also took place in the field as landowners were

consulted regarding the whereabouts of heritage on their property (old buildings, cemeteries, settlement, San (bushman) engravings and archaeological sites). Farm buildings were visited and assessed for heritage significance; archaeological sites were recorded, mapped and photographed. The list of heritage resources identified in the initial field survey is provided in the original HIA compiled by Webley & Orton (2011).

4.3 Desktop assessment

The “Authorised option”, assessed by us in 2011 (GPS track paths and identified sites), was compared with the “Proposed amended option” (2015) in order to determine the proximity of heritage resources and the likely impact of the turbines, cabling, access roads, substations, etc. This assessment was done as a desktop study using Google Earth.

4.4 Assumptions and Limitations

This desktop assessment of the “Proposed amended option” relies on the initial November 2011 field survey.

Only a small percentage of actual turbine positions were reached during the initial survey. The reasons for this are:

- The terrain is mountainous and the majority of the areas were only accessible by four wheel drive. There are very few roads on the escarpment and some farms, such as Matjiesfontein, could only be reached with great difficulty. A thorough survey would require several weeks, and this was not feasible in terms of the budget allocation;
- The field assessment took the form of targeted searches of particular locations with a view towards maximising our understanding of the heritage landscape and enhancing our chances of correctly assessing the impacts of the proposed facilities on the heritage resources.

The limitations of Google Earth in assessing the presence of heritage resources, is that only substantial structures, such as farm complexes and large kraals can be identified. Smaller structures such as shepherd’s structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material. This is a significant limitation in terms of predicting impacts.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The farms that have been selected for the proposed wind energy facility are sited on an elevated plateau to the east of De Aar with views across the surrounding plains of the central Karoo. The plateau rises at least 100 m above the surrounding plains.

The landscape is covered in Karoo shrub and grasses and dominated by open, rolling hills with interspersed high steep hills and mountains. The open, hilly plateaus are crossed by ephemeral streams and dry water courses resulting in deeply incised valleys. Viewpoints on the higher elevations provide long, open vistas with high hills and mountains as distant backdrops.

Traditionally, the landscape has been used for small stock farming. Only a few patches of land are under cultivation and are usually near farm buildings where there is permanent water. There are a few isolated farm settlements lying in secluded valleys. The farm complexes are generally surrounded by stands of exotic trees such as poplars, and some of the farm buildings, retain late 19th century elements that in addition to sheds and kraals,

provide a rural charm to the landscape. There is evidence of earlier occupation at higher altitude marked by abandoned farmsteads and stockposts. Farming infrastructure includes stock camp fences, tracks, windmills and reservoirs.

6 DESKTOP ASSESSMENT OF “PROPOSED AMENDED OPTION”

The Webley & Orton (2011) assessment identified the following heritage resources in the study area:

- There is a widespread distribution of Middle Stone Age (MSA) artefacts of patinated hornfels across the top of the plateau. They are spread across the open plateau, in slight depressions or pans and on the lower slopes of hills. In general the artefacts do not appear to represent *in situ* sites and are of Grade IIIC (low) significance. However, some concentrations of MSA artefacts occur in association with the flaking of bedrock outcrops on the farm Knapdaar (Figure 5). These sites appear to be “factory sites” for the production of MSA artefacts and they are of Grade IIIB significance.
- There are a few discrete Later Stone Age (LSA) sites of Grade IIIA significance since they represent a pre-ceramic interior variant on the Wilton and/or Smithfield about which very little is known. They occur in the valleys, often on the banks of dry water courses. The aggregation of material along the river bed on Knapdaar includes “freshly” flaked hornfels duckbill and end scrapers, as well as grindstones and ostrich eggshell pieces.
- There are a number of stone kraal complexes that may represent seasonal utilisation of the “winterveld” on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau. The stone kraals are often found against the lower slopes of valleys and dry river courses but there are some which are situated on the exposed plateau.
- While most of the permanent farmsteads are located below the plateau, there are some farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC. They are often located near springs or dry water courses.
- No cemeteries or graves were identified on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes.
- The cultural landscape comprises typical Karoo landscape which has been slightly modified by its use for agricultural purposes. Taking into consideration the comments above, and the proximity of other wind and solar facilities, it is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

6.1 Potential impacts to heritage resources

As indicated under Section 4.3, large areas of the southern plateau could not be reached during the 2011 survey.

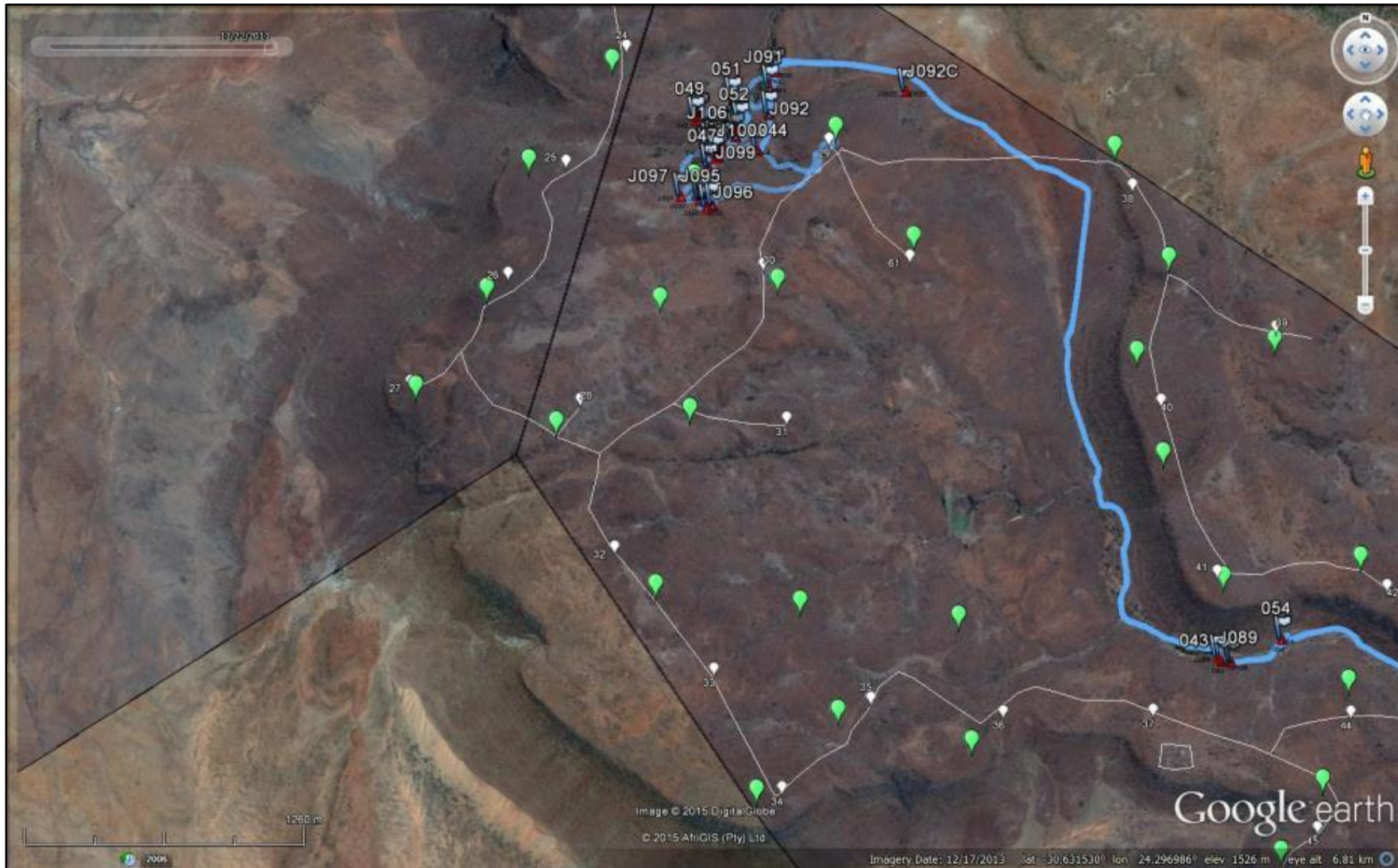


Figure 3: Map illustrative of the coverage achieved during the 2011 survey, with the green icons indicating the WTG of the Authorised Option and the blue line the GPS survey tracks. The white icons and white lines indicate the WTG and roads of the Proposed Amended Option.

132 kV substation

The proposed 132 kV substation is located in proximity to an abandoned settlement described in Webley & Orton (2011) as a “complex of stone ruins on the farm Matjiesfontein”. The complex is close to a dry river bed. Immediately across river, and around the hill from the settlement, is another complex of stone kraals which have been negatively impacted by the construction of the current powerlines (Figure 4).

The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face (see yellow circle in Figure 4). There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive.

In addition, the access road will run in close proximity (pale green circle in Figure 4) to a series of stone kraals identified in the 2011 survey.

Without a foot survey, it would be impossible to determine whether the proposed access road will impact on potential heritage resources.

If the access road is re-aligned southwards, crossing the dry river bed to the south of the proposed 132 kV substation (dark green arrow in Figure 4), then potential impacts may be avoided. While it is possible that heritage resources may also occur in this area as well, it appears to be of less sensitivity than the Proposed Amended Option.

Recommendations:

- **A walk down of the access roads must be undertaken as part of the condition of the EMP, to identify any constraints and to propose alternative options.**

Kraals 1 – 3 on Knapdaar

The 2011 survey of the Authorised Option identified a large MSA factory site with signs of more recent LSA flaking on the top of a hill overlooking the plains on the farm Knapdaar. This site was graded of medium to high significance (a provisional Grade IIIB grading) and it was recommended that the site be either avoided or mitigated. Nearby, are the remains of a stone kraal (Figure 5).

The Proposed Amended Option (Figure 5) avoids these heritage resources, as WTG46-48 is located further to the north-west. However, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting these turbines. Those within the yellow circle (Figure 5) are 90m to the south-west, while those within the green circle (Figure 5) are 30m to the south-west of the road.

It is not possible to verify whether these stone “circles” reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

If the access road linking WTG47 with WTG46 is moved some 50 m to the north-west, it will avoid potential impacts to stone features.

Recommendations:

- **A walk down of the access roads must be undertaken as part of the condition of the EMP, to identify any constraints and to propose alternative options.**

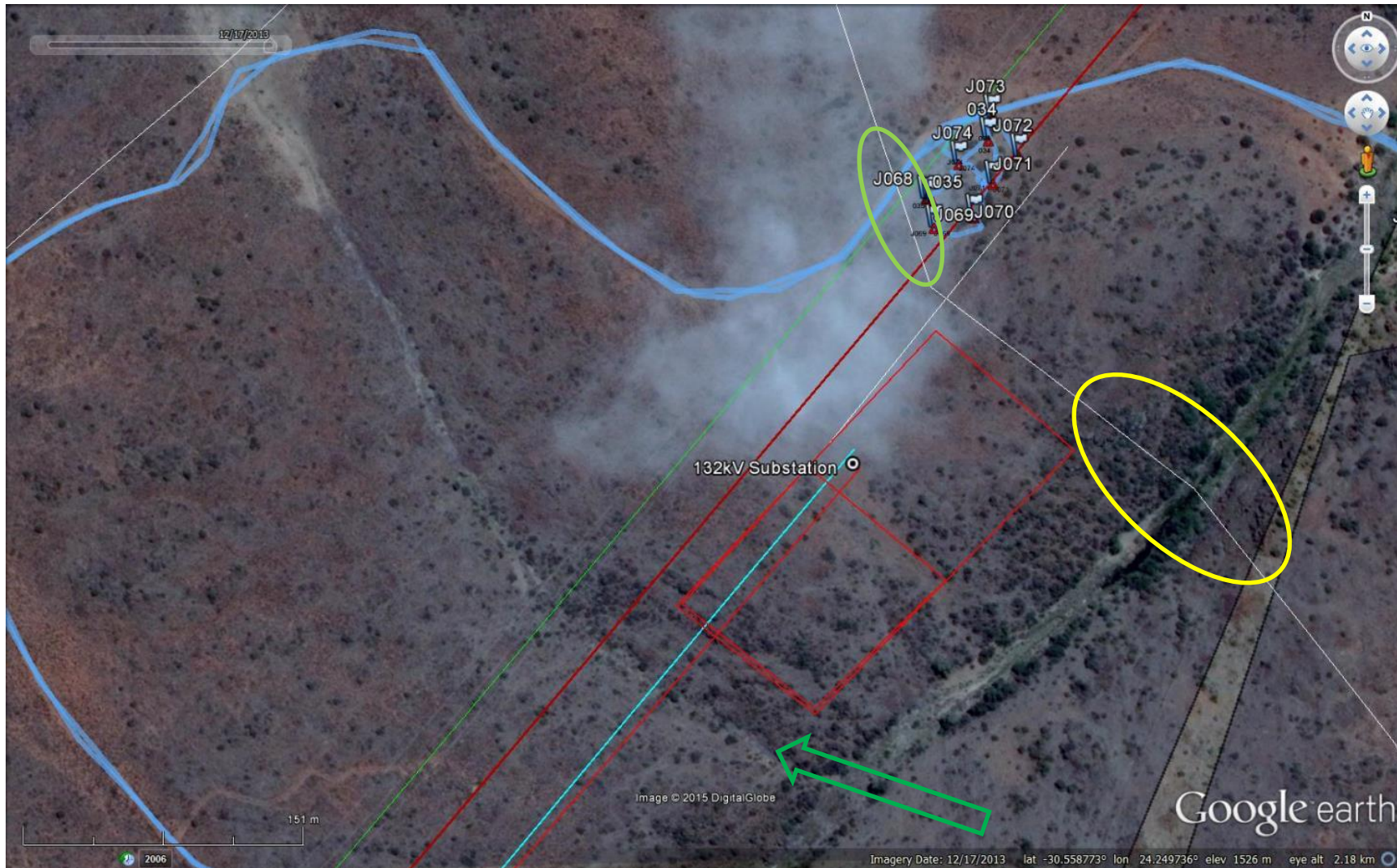


Figure 4: The proposed 132 kV substation is shown as a red rectangle. The existing powerline is a red diagonal line. The proposed access road is indicated as a white line. The GPS tracks from the 2011 survey are shown in blue. Areas of potential concern are indicated in the yellow and pale green circles. The dark green arrow shows the preferred position for the river crossing.



Figure 5: The 2011 survey (shown as a blue line) identified an MSA factory site (064-066) as well as some stone walling (J120 – J121) along the Authorised Option. The Proposed Amended Option avoids these sites but there may be further stone kraals/features in this area on the farm Knapdaar (inside green and yellow circles). The green arrow indicates the preferred route of the access road linking WTG47 and WTG46.

Stockpost/kraal near Turbine 37

The access road for the Proposed Amended Option connecting WTG45 with WTG37 runs along the edge of the escarpment. The road will run within 90m of a series of at least three (3) kraals (Figure 6). It is not possible from the aerial photography to determine whether they are modern kraals with wire fencing, or older stone kraals. The kraals may be associated with a stockpost but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

The age of the kraals can only be determined from a field assessment.

Recommendations:

- That the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down of the revised layout will be required.

Kraal near Access Road connecting WTG21 and WTG60

The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs along the escarpment and crosses over a small, dry river course (Figure 7). There is a square kraal some 200m from the proposed access road, overlooking the river.

The kraal and the road are outside of the land which forms part of the WEF.

The age of the kraal can only be determined from a field assessment.

Recommendations:

- That the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraal, then a walk down of the revised layout will be required.



Figure 6: The access road for the Proposed Amended Option connecting WTG45 with WTG37 runs along the edge of the escarpment, some 90m from a series of at least three (3) kraals outlined in white.



Figure 7: The access road linking WTG21 with WTG 60 crosses over a small, dry river course some 200m from a square kraal.

7 ASSESSMENT OF IMPACTS

7.1 General impacts expected during the construction phase of the WEF

During the construction phase the following physical impacts to the landscape and any heritage that lies on it can be expected:

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometers of linear trenches for cables;
- Erection of a 132 kV power line (pole design not finalized);
- Construction of electrical infra-structure in the form of one or more sub-stations.

7.2 General impacts expected during the operation of the WEF

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region.

7.3 Nature and extent of Impacts to Heritage Resources

In terms of impacts to heritage resources, archaeological sites which are highly context sensitive are most vulnerable to the alteration of the land surface. The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. In the case of the proposed activity the main source of impact is likely to be the construction of access roads, lay-down areas and excavation of the footings the turbines.

It is expected that impacts will be limited (local). There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. The 2011 survey of the study area has shown that the extent of impacts is likely to be localised with no regional implications for heritage of this kind.

Impacts to the Built Environment can include the destruction of farm buildings (in particular ruined buildings), kraals, etc. which are not identifiable from a desktop aerial survey. Similarly, the adaptive re-use of existing farm buildings as part of the proposed WEF, may result in alterations to the structure which may have negative impacts on the heritage resource.

Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive, in that changes to the surrounding landscape will affect their significance.

Farm cemeteries as well as isolated graves have not been identified on the plateau. However, they may occur and may be damaged during construction of the WEF.

7.4 Duration of Impacts and extent to which impact can be reversed

Archaeological sites are by their very nature, non-renewable. This means that once they are destroyed, they cannot be renewed. Similarly, when historic buildings are destroyed, they may be re-built but they will not be an authentic structure again. Cemeteries and graves are particularly vulnerable, as the exhumation of human remains and destruction of graves is considered by many societies to be sacrilegious. In other words, impacts to tangible heritage resources cannot be reversed and impacts are therefore permanent.

There is no indication from the field assessments conducted on the plateau to the east of De Aar (Webley & Orton 2011; van der Walt 2014) that the construction of either the “Authorised Option” or the “Proposed Amended Option” will result in an irreplaceable loss of resources.

7.5 The significance and probability of impacts occurring

The significance of the various heritage resources identified during the 2011 survey have already been discussed but is briefly repeated here.

No heritage resources of Grade 1 (national) or Grade II (Provincial) significance were identified.

The archaeological resources on the plateau have been graded as low to medium local significance (i.e. Grade IIIC and Grade IIIB). MSA material is widespread but ephemeral and not in primary context. This reduces the information that it provides the archaeologist and therefore its significance (Ungraded and Grade IIIC). However, some of the MSA sites on Knapdaar are considered “factory sites” for the production of material and they are considered of Grade IIIB significance. It is likely that some scatters of MSA artefacts will be destroyed because of their widespread distribution.

The concentration of small amounts of LSA material, which appear to represent a variant on the interior Wilton and/or Smithfield, along some of the river valleys on Knapdaar are sufficiently scarce to be graded as Grade IIIA. They are of archaeological interest. For this reason, river valleys should be avoided during construction if this is at all possible.

In terms of buried archaeological material (including graves), one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be low if the appropriate mitigation measures are employed.

The abandoned and ruined stone kraal complexes on the top of the plateau represent a seasonal utilisation of the “winterveld” on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau.

While most of the permanent farmsteads are located below the plateau, there are a few farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC. It is

unlikely that the Built Environment (such as farmhouses, sheds, etc) will be destroyed if the Proposed Amended Option is followed.

The possibility exists that the construction of the WEF may result in the destruction of colonial, but particularly pre-colonial stone kraals. Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist.

The Webley & Orton (2011) survey did not identify any cemeteries or graves on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes. They are considered of high local significance.

The 2011 survey also noted the cultural landscape comprising a typical Karoo landscape which has been modified by its use for agricultural purposes. It is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

7.6 The degree to which impact can be avoided, managed to mitigated

The best way to manage impacts to archaeological material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas.

The MSA factory sites on Knapdaar and the important LSA sites along the dry river bed on Knapdaar have been avoided in the Proposed Amended Option (Figure 5).

Table 2: Summary of impacts to archaeological material

NATURE OF IMPACT: Impacts to archaeological material (including stone artefacts, rock engravings and paintings and pre-colonial kraals) could involve localised displacement of material at turbine footings, access roads, etc.		
	Without mitigation	With Mitigation
Extent	Local	Site specific
Duration	Permanent (archaeological sites are non-renewable)	No impact
Magnitude	Medium	Zero
Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility		No, once archaeological sites are destroyed, they cannot be replaced.
Irreplaceable resources?	loss of	Yes, once archaeological sites are destroyed, they cannot be replaced.
Can impacts be mitigated?		Yes, impacts can be mitigated.
Mitigation: The Proposed Amended Option avoids the most significant archaeological sites identified in the 2011 survey. No further mitigation is required.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in the loss of MSA archaeological scatters of low significance.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the archaeological landscape		

Table 3: Summary of impacts to Built Environment

NATURE OF IMPACT: The construction of access roads in close proximity to aspects of the Built Environment, such as sheds, workers' cottages, etc. could result in accidental damage and/or vandalism.		
	Without mitigation	With Mitigation
Extent	Site specific	Site specific
Duration	Permanent (heritage sites are non renewable)	No impact
Magnitude	Moderate	Very Low
Probability	Probable	Unlikely
Significance	Medium (buildings of Grade III C significance)	Low
Status (positive or negative)	Negative	Neutral
Reversibility	No, once buildings are destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once buildings are destroyed, they cannot be replaced.	
Can impacts be mitigated?	Yes, impacts can be mitigated	
Mitigation: Turbines should be placed at least 500m from heritage sites, i.e. buildings older than 60 years. Old buildings should be fenced off during construction to avoid vandalism. If buildings are re-used during the construction of the WEF, they should be assessed and a permit from SAHRA may be necessary if they are renovated.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in a loss of the built environment.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the built environment.		

Suggestions for the avoidance of stone kraals (identified on Google Earth) have been presented in Figures 4, 5, 6 and 7.

In the absence of clearly established guidelines in the Northern Cape for the minimum distance between turbines and buildings/structures older than 60 years, this report supports the guidelines of the Western Cape Provincial Government. They recommend that turbines are placed at least 500m from heritage sites. This would presumably include buildings which are older than 60 years and protected by the NHRA. An appropriate buffer should be established between the infrastructure of the wind energy facility and both occupied and abandoned homesteads. In the case of the North Plateau, no farm buildings are threatened by the present distribution of turbines.

The farm buildings within the De Aar 2 south WEF will not be demolished. If there are any intentions to renovate any of these structures so that they may be utilised as offices or staff quarters for the WEF, then an assessment of the heritage significance of the structures will be required. A permit may be required from SAHRA if the renovations include changes to the external façade.

Table 4: Summary of impacts to Cemeteries and Graves

NATURE OF IMPACT: The excavation of turbine footings, access roads, etc may result in the destruction of cemeteries and graves which are not clearly marked.		
	Without mitigation	With Mitigation

Extent	Regional	Local (severity can be mitigated)
Duration	Permanent	Permanent (even with mitigation, graves uncovered accidentally are still likely to be destroyed).
Magnitude	High	Very Low
Probability	Probable	Unlikely
Significance	High	Moderate
Status (positive or negative)	Negative	Neutral
Reversibility	No, no graves have been destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once graves are destroyed, they cannot be replaced.	
Can impacts be mitigated?	No, difficult to mitigate in advance, as locations of graves cannot be predicted in advance. Only mitigation is to ensure proper procedures are followed when graves uncovered.	
Mitigation: If graves are uncovered, work must stop in that area immediately and the SAHRA Burials Unit notified. An archaeologist will be asked to investigate, and various procedures may be proposed, including covering up the human remains and moving the turbines, etc. elsewhere. If exhumation is approved, this may be a lengthy process and costs will be for the developer.		
Cumulative Impacts: The cumulative impact of several wind farms in the area enhances the likelihood of uncovering human remains.		

If any human remains (including cemeteries or isolated graves) are encountered during the construction of the WEF, then work should stop in that area immediately and the ECO should contact SAHRA immediately.

Table 5: Summary of impacts to the Cultural Landscape

NATURE OF IMPACT: The construction of turbines, substations and overhead transmission lines may have a negative visual impact on the cultural landscape.		
	Without mitigation	With Mitigation
Extent	Local	Site specific
Duration	Long-term	Construction period
Magnitude	Medium	Low
Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility	Yes, once the turbines are removed after 25 years, the landscape will return to its approximate earlier state.	
Irreplaceable loss of resources?	No, once the turbines are removed, the landscape qualities will return to their earlier condition.	
Can impacts be mitigated?	Yes.	
Mitigation: The Proposed Amended Option includes 61 WTG, which is a substantial reduction from the 103 WTG in the Authorised Option. This reduction will have a positive impact on the visual impacts of the WEF on the Cultural Landscape.		

Cumulative Impacts: The cumulative impact of several wind farms in the area will increase the visual impact on the cultural landscape of the Karoo.
Residual Impacts: None.

The reduction of the number of WTG from 103 to 61, will result in a positive impact on the Cultural Landscape of the area.

8 CUMULATIVE IMPACTS

To all intents and purposes the Karoo has the qualities of an intact natural area but indications are that this situation is changing rapidly. There are numerous proposals for the establishment of renewable energy facilities around De Aar (both solar and wind) which will have a significant impact in terms of industrialisation of the landscape. According to the DEA webpage on Renewable Energy Applications (dea.maps.arcgis.com), there are at least two proposed wind energy facilities to the north-east of De Aar, including the Longyuan Mulilo De Aar 2 North WEF (which has received approval) and the Castle WEF (to the east of the plateau) as well as at least one wind energy facility which has received EA to the south-west. There are also at least 8 solar energy facilities located to the north-east of De Aar.

These projects have received Environmental Authorisation and have either proceeded into the construction phase, or are expected to be constructed in the future. If all these projects proceed, then the De Aar 2 South WEF will be built in a landscape where wind turbines and solar facilities will be common features on the landscape.

Given that the visual impacts of the turbines and associated infrastructure cannot be effectively mitigated, the cumulative impact on a regional level will be considerable. While normal stock farming may be able to continue, the increased industrialisation of the landscape may stifle development that derives value from the wilderness experience i.e. hunting-related tourism, and may impede the development of the hospitality industry and sterilise any prospects of developing new wilderness areas/conservation areas or parks on any land with a radius of 10 km from any of the WEFs.

However, the positive outcome of this amendment has been the reduction in the number of turbines initially authorised for the project.

9 CONCLUSION

It is important to note the limitations of this desktop study. Namely that only substantial structures, such as farm complexes and large kraals, can be identified on Google Earth. Smaller structures such as shepherd's structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material.

This is a significant limitation in terms of predicting impacts.

However, after consideration of the significance of the heritage resources (identified during the 2010 survey), it is concluded that the reduction in the number of WTG is generally positive from a heritage perspective.

General Recommendations

- Avoid constructing access roads along the lower slopes of valleys and along river banks to avoid impacting on significant sites and stone kraal complexes;

- Ensure access roads avoid passing in close proximity to farmsteads and associated farm buildings older than 60 years. In general a 400m buffer should be implemented around farmsteads particularly if the farm buildings are older than 60 years. This buffer can be reduced if the building contains no elements of heritage significance;
- Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist – for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP ;
- All farm cemeteries and individual graves should be avoided. A buffer of at least 15 m should be enforced around them. They are often difficult to identify, and for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP;
- If any human remains are uncovered during the construction phase, work in that area should stop immediately and the South African Heritage Resources Association (SAHRA) must be notified;
- Guarantees for demolition of turbines after their useful life must be in place as a condition of approval.

Desktop Assessment of Proposed Amended Option and Specific Recommendations

There are at least four locations where the amended layout may impact negatively on heritage resources. They are:

- At the proposed 132 kV substation. The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face. There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive. In addition, the access road will run in close proximity to a series of stone kraals identified in the 2011 survey.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- While the Proposed Amended Option avoids the large MSA factory site on Knapdaar, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting WTG47 with WTG46. These kraals vary between 30m and 90m from the stone kraals.

It is not possible to verify whether these stone “circles” reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- The access road for the Proposed Amended Option connecting WTG45 with WTG37 will run within 90m of a series of at least three (3) kraals. The kraals may be associated with a farm building but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

It is not possible from the aerial photography to determine whether these are modern kraals with wire fencing, or older stone kraals. The age of the kraals can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

- The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs 200m from a square kraal, overlooking a dry river. The kraal (?) falls outside the boundaries of the WEF.

The age of the kraal can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

10 REFERENCES

Aurecon. 2011. Proposed Wind Energy Facility (North & South) situated on the Eastern Plateau near De Aar, Northern Cape: Draft Scoping Report, Report No.5755.

Baumann, N. & Winter, S. 2005. Guideline for involving heritage specialists in EIA process. Edition 1. CSIR report No ENV-S-C 2005 053E. Provincial Government of the Western Cape: Department of Environmental Affairs and Developmental Planning.

Hart, T.J.G. 1987. Haaskraal and Volstruisfontein: Later Stone Age events in the Zeekoe Valley, Great Karoo, South Africa. Unpublished MA Thesis: University of Cape Town.

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

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

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

Sampson, C.G., 1992. Stylistic boundaries among mobile hunter-gatherers in the Zeekoe Valley, Eastern Cape. Washington, Smithsonian Institution Press.

Sampson, C.G., Sampson, B.E. & Neville, D. 1994. An early Dutch Settlement pattern on the north east frontier of the Cape Colony. Southern African Field Archaeology 3: 74-81.

Smit, A.P. 1963. Kerkoring teen die treinspoor deur. Gedenkboek by the Goue Jubileum van die Ned. Geref. Kerk De Aar 1913-1963.

Van der Walt, J. 2014. Archaeological Impact Assessment for the proposed Castle Wind Energy Facility, De Aar, Northern Cape. Unpublished report for Savannah Environmental (Pty) Ltd.

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