

Heritage Impact Assessment:

Proposed Construction of Two Power Lines & Three Substations for the Mainstream Wind Energy Facility

Land Parcel Beaufort West
Remainder of Farm Trakaskuilen No 15, Portion 1 Trakaskuilen No 15,
Portion 1 of Witpoortje No 16

Province of the Western Cape
(HWC - RoD1045 - Case No 1130)



Report prepared for SiVEST Environmental Division
On behalf of their client Mainstream Renewable Power South Africa (Pty) Ltd

February (2016)

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Cape Archaeological Survey

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Executive Summary

This is a specialist heritage report submitted as part of an Environmental Impact Assessment (EIA), in terms of the provisions of Section 38 (8) of the National Heritage Resources Act (Act 25 of 1999). It is submitted to Heritage Western Cape (HWC) for comment, and the Department of Environmental Affairs and Development Planning (DEA&P) for authorization. The report is triggered by an application made by Mainstream Renewable Power South Africa (Pty) Ltd for the construction of 3 sub stations and 2 power lines in a revised layout for the Beaufort West Renewable Wind Farm in the Western Cape. A previous Scoping HIA (2010) reviewed two separate land parcels, a North and South site. It is important to note that only the South site is now being considered by Mainstream and is now identified as the Beaufort West and Trakas sites.

The new sub stations are estimated to have the following footprint. The Linking station footprint is estimated to be 600m x 600m (2 alternatives layouts are considered); the Beaufort West Substation footprint is 500m x 300m (two 2 alternatives are considered); and the Trakas Substation footprint is 500m x 300m (2 alternatives are considered). The Beaufort West and Trakas Power Lines (2 alternatives are considered) will be up to 400kV each with a length of between 4 -7 km and will connect the wind farms with the national distribution network at the existing Eskom Droerivier-Proteus 400 kV power line. The height of the power lines is envisaged within a range of between 20m-40m, or whatever designed specifications Eskom require at the time of construction (Mainstream peers com).

The research for this application was undertaken by Cape Archaeological Survey (CAS) cc and Associates. The initial study was commissioned by Environmental Resource Management (ERM) on behalf of their client, Mainstream Renewable Power South Africa in 2010 (HWC - RoD1045 - Case No 1130).

This report was commissioned by SiVEST Environmental Division, in February 2016 to review the existing 2010 Scoping HIA, updated it, and evaluate the impact that the placement of the new power lines, sub stations and a linking sub-station will have on heritage resources in the cultural landscape. It is important to note, when turbine placement is mentioned throughout this report, it is on the basis that this was

previously authorized during the EIA and Scoping HIA process in 2010 and is cited here only to describe the receiving environment.

This report now forms part of a Heritage Impact Assessment (HIA) in terms of Section 38 (3) of the National Heritage Resources Act (NHRA) that serves to identify key heritage resources, informants, issues and concerns relating to the palaeontological, archaeological, built environment and cultural landscape, as well as key issues relating to the need to address such issues during the impact assessment phase of the HIA process. The report recommends appropriate approaches to high, medium and low-level impacts and issues requiring further investigation. These responses range from high level hotspots areas and appropriate mitigation to medium and low level hotspots.

The proposed footprint of the Beaufort West Wind Farm is considered in this report. Using a time line to review heritage resources in this area each section deals with the most ancient to the most modern artefacts.

- **Palaeontological Resources Identified in the Study Area**

The palaeontological sensitivity of the Beaufort Group sediments in the study area is considered Very High. No field work component has been undertaken for this area of specialization and the current assessment is derived from a desktop study only. Bedrock excavations during construction of the proposed wind energy facility will primarily impact continental sediments of the Abrahamskraal and Teekloof Formations of the Lower Beaufort Group (Karoo Supergroup). These Mid to Late Permian sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils and plants... The Abrahamskraal – Teekloof stratigraphic interval is of special palaeontological significance in that it contains a record of a catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events.

Caenozoic surface sediments in the study area (e.g. alluvium, fluvial gravels, colluvium) are generally of Low palaeontological sensitivity, although sparse fossil

remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here

With mitigation the impact on palaeontological resources is considered Negative LOW.

- **Archaeological Resources Identified in the Study Area**

The field survey undertaken for this project provided a useful opportunity to study an area of the Karoo that has not been well documented in the archaeological record. Several interesting Middle Stone Age (MSA) open sites were discovered. Without exception, these were all positioned on the summit areas of low ridges and koppies on the Trakas site. There was also a general background presence of MSA in the form of occasional flakes or cores seen in the open. No cave deposits were found during the survey which was not surprising as the local geology was not suitable for cave formation. Similarly, no rock art or rock engraving sites were discovered. Surprisingly perhaps, there was little evidence of Later Stone Age (LSA) activity in the area. In terms of colonial period archaeology, there several farm complexes with buildings, historic dumps and derelict structures which could provide information on the development of local farming practice in the Karoo located on the Beaufort West site.

The archaeological landscape of the site comprises flat undulating terrain with low shrubs interspersed with rocky outcrops and hilly areas. The defining character of the Karoo is one of vast open spaces, thinly populated territory and extensive low-yield farms. For this reason, the area has not been systematically studied and very few archaeologically orientated research projects have been carried out. For this reason the archaeological sensitivity of the proposed wind farm on archaeological features should be seen as high.

With mitigation the impact on archeological resources is considered Negative LOW.

- **Heritage Resources and Cultural Landscapes in the Study Area**

In terms of applicable legislation, the report found that Section 27 of the National Heritage Resources Act did not apply as there were no Provincial Heritage Sites in the affected areas. Section 34 of the Act, did apply as there were farm structures and sites in the affected area of older than 60 years. These structures include stone stock

enclosures and ruins which were difficult to date. It was noted however that the affected farms were granted and farmed in the mid nineteenth century and some of the ruins are likely to date from that period

Buildings older than 60 years are contained within farms werfs at Witpoortjie, Trakaskuilen and the farm Amospoortjie (Farm 374) and Dwaalfontein. The latter two sites are outside the study area but within the 5km buffer zone associated with the Beaufort West site. They are likely to be affected by the overall proposal. The stock farming complex at Witpoortjie, and the stone kraal at Trakaskuilen are considered of historical interest rather than outstanding significance. Heritage significance in all cases was considered local. Major issues in relation to visual impacts which occur on farm settlements over 60 years old were ranked High to Medium by virtue of proximity, and because of the contrast in scale and character of the power lines. The power lines and substations should be viewed in the overall context of the placement of the wind turbines and the cumulative impact of these structures in the environment is considered Negative. This was regarded as more of a landscape character issue. With mitigation the impact is considered a Minor POSTIVE impact.

The issue of the cultural landscape, when applied to generally accepted definitions and criteria did not apply. The landscape was flat and consisted of low scrub and bush, with long views across an extensive dry empty landscape, with subtle ridges punctuating the plains. This landscape did not fulfill the criteria of a significant cultural landscape. There were pockets of domesticated farmland, including dams and the farm werfs themselves including graveyards and ruins although the area is dominated by open undomesticated landscapes.

In terms of Section 38(3) [d], the report found that the socio-economic benefits were High with the introduction of investment into a relatively low yield pastoral economy. Sustainable benefits were High relative to the introduction of “clean” energy facilities.

- **Conclusions and Recommendations**

In terms of the heritage assessment there are no absolute constraints identified for the project. The power line corridors, the position of the sub stations and lay-down areas have been negotiated through specialist input and or technical constraints over a period of five years. Overall, this has lead to a reduction in the number of wind

turbines to be erected in the landscape, from an initial estimate of 260 to 140, the removal of photovoltaic (PV) arrays and a reduction in the overall footprint; with the Northern portion of the Beaufort West Land Parcel no longer included in the study area.

The Site layout for the Linking station, alternative 1 and 2, are ranked equally as No Preference. They will result in equal impacts on heritage objects identified in the cultural landscape located in the 5 km buffer zone.

Site layout Beaufort West Power Line Alternative 1 and Substation Alternative 1 is the Preferred option. They are the most appropriate option as they have the lesser visual impact on the character of the environment and the settlements in which heritage resources are located. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts prior to the pre-construction phase.

Site Layout Beaufort West Power Line Alternative 2 and Substation Alternative 2 are ranked as the Not Preferred option. The N12 will be affected but it is not a scenic route. Two wind energy facilities relatively close by will have a cumulative visual impact along the N12. The impact is High on the cultural landscape or landscape character. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts that may be identified during the pre-construction phase.

Site layout Trakas Power Line Alternative 1 and Sub Station Alternative 1 is ranked as the Preferred option. GIS mapping suggest this option will have the least impact on the cultural landscape. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts that may be identified during the pre-construction phase.

Site layout Trakas Power Line Alternative 2 and Sub Station Alternative 2 is ranked as the Not Preferred option. GIS overlays suggest this may impact on MSA archaeological resources that were recorded in the vicinity in the 2010 scoping field survey.

Finally, this study has not considered the visual absorption capacity (VAC) of the receiving landscape. This forms a separate study and should be incorporated in the final assessment of proposed new design layout.

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GLOSSARY OF TERMS AND DEFINITIONS (HERITAGE)

NHRA	National Heritage Resources Act (Act 25 of 1999)
NEMA	National Environmental Management Act (Act 107 of 1998)
AIA	Archaeological Impact Assessment
asl	Above (mean) sea level
BAR	Basic Assessment Report
DEA	Department of Environment Affairs
DEADP	Department of Environment Affairs and Development Planning
DWAF	Department of Water Affairs and Forestry (now the Department of Water and Environmental Affairs (DWEA))
EIA	Environmental Impact Assessment
ESA	Early Stone Age
EMP	Environmental Management Plan
Fm.	Formation
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape: Commenting Heritage Authority Province of the Western Cape.
ka	Thousand years or kilo-annum (10^3 years). Implicitly means “ka ago” <i>i.e.</i> duration from the present, but “ago” is omitted. The “Present” refers to 1950 AD. Generally not used for durations not extending from the Present. Sometimes “kyr” is used instead.
LIG	Last Interglacial Warm period 128-118 ka BP. Relative sea-levels higher than present by 4-6 m. Also referred to as Marine Isotope Stage 5e or “the Eemian”.
LSA	Late Stone Age
ma	Millions years, mega-annum (10^6 years). Implicitly means “Ma ago” <i>i.e.</i> duration from the present, but “ago” is omitted. The “Present” refers to 1950 AD. Generally not used for durations not extending from the Present.
MSA	Middle Stone Age
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
VIA	Visual Impact Assessment

Definitions: National Heritage Resources Act (Act 25 of 1999)

“Archaeology” means remains resulting from human activity, which are in a state of disuse and are in or on land and which are older than 100 years, including artifacts, human and hominoid remains and artificial features and structures

“Conservation” in relation to heritage resources includes protection, maintenance, preservation, and sustainable use of places and objects so as to safeguard their cultural significance.

“Cultural Significance” means aesthetic, architectural, historical scientific social, spiritual, linguistic or technological value or significance.

“Development” means any physical intervention, excavation, or action, other than those caused by natural forces which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influences its stability and future well being.

“Palaeontological” means geological formations older than 1 000 years which contain fossil-bearing material

“Provincial Heritage Resources Authority” insofar as the (NHRA) is applicable in a Province means an authority established by the MEC under Section 23 of the Act. In the case of the Northern Cape this refers to Heritage Northern Cape.

“Structure” means any building works, devices or other facility made by people and which is fixed to land, and includes fixtures, fittings and equipment associated herewith.

Section 1: Introduction & Brief

1.1 General Background

This project was commissioned by SiVEST Environmental Division on behalf of their client, Mainstream Renewable Power South Africa (Pty) Ltd, to undertake a revision of a previously authorized Scoping Heritage Impact Assessment (HIA), for their proposed renewable energy facility in the Western Cape. The development of renewable energy is seen as an extensive global industry with South African resources, such as wind and solar energy, largely untapped. In light of the current energy crisis in South Africa, where serious power and water shortages are experienced due to an over reliance on fossil fuels, the renewable energy industry is seen as a way to meet the energy needs of the economy without compromising climate mitigation change strategies. This is to be achieved by delivering over 500MW of wind energy and solar projects in the Eastern, Northern and Western Cape (Mainstream 2010 pers comm).

Following on from their initial scoping proposal in 2010, Mainstream Renewable Power has conducted preliminary analysis of South Africa's wind and solar resources to understand the impact of introducing larger quantities of renewable energy to the electricity system. The initial results reveal two significant findings. "Firstly, electricity generated from wind and solar resources closely follows the nation's electricity demand profile, meaning they generate power at the time of day it is most needed, secondly, when wind and solar generation are combined the net effect is a significant contribution to base-load power" (Mainstream Southern African: web page 2015).

The current report is triggered by an application made by SiVEST to consider an amended layout for three new sub stations made up with a Linking substation estimated to be 600m x 600m (2 alternatives layouts are considered); the Beaufort West Substation footprint is 500m x 300m (two 2 alternatives are considered); and the Trakas Substation footprint is 500m x 300m (2 alternatives are considered). The Beaufort West and Trakas Power Lines (2 alternatives are considered) will be up to 400kV each with a length of between 4 -7 km and will connect the wind farms with the national distribution network at the existing Eskom Droerivier-Proteus 400 kV power line. The height of the power lines is envisaged within a range of between

20m-40m, or whatever designed specifications Eskom require at the time of construction (Mainstream peers com).

Beaufort West (Southern) land parcel at Trakaskuilen and Witpoortjie in the magisterial district of Prince Albert. The site is located at 32°57'22.51" S and 22° 34' 41.8 "E in the Western Cape (see Figure 1). The project was previously the subject of a Scoping HIA by Cape Archaeological Survey & Associates in 2010 (HWC - RoD1045 - Case No 1130)¹ commissioned by Environmental Resource Management (ERM-Cape Town) following the submission of a draft Environmental Management Plan (EMP) to the Department of Environmental Affairs and Planning. The report highlighted the preliminary results of the preferred turbine layout 2.

The proposed design changes associated with the revised 2016 assessment are made in preparation for Mainstream Renewable Power South Africa (Pty) Ltd for their bid submission to the Department of Energy (DoE) and to obtain approval of these changes by DEA&P.³

The current report is submitted as an HIA undertaken in terms of Section 38(8) of the National Heritage Resources Act and is submitted as one of the specialist studies attached to the EIA. In due course, when the final detail of the design is authorized they will be subject to further studies to mitigate heritage related concerns, including a field work evaluation, during the pre construction and installation phases of the development. This assessment evaluates the overall impact of the proposal on the cultural landscape, including the position of the wind turbines, which have existing EIA/Scoping HIA authorization, in order that an accurate cumulative impact score can be assigned to the project.

For easy of reference the 2010 site layout map is included in this report. See Figure 1.1.

1.2. Terms of Reference

¹ Patrick, M, Atwell, M, Almond, J, Manhire, A, Grey, J. (2010) Scoping Heritage Impact Assessment. Mainstream Renewable Energy Facility – Land Parcels, Beaufort West. Unpublished Report prepared by Cape Archaeological Survey cc and submitted to Environmental Resource Management, Cape Town Branch.

² DEA 12/12/20/1789

³ Thompson, R. (2015) Terms of Reference SiVEST Environmental Impact Assessment for the Proposed Construction of Two New Power Lines near Beaufort West. SiVEST Environmental Management Division. Johannesburg.

The scope of work and project objectives for the study include a range of specialist studies which includes the identification and mapping of a diverse range of cultural resources that are protected by the National Heritage Resources Act (1999) under Sections 27, 34, 35, 36 and 38 (8) respectively. These include:

- Desk top study to collect secondary data on the occurrence and distribution of heritage resources which include paleontological, archaeological, built environment features, cultural landscape analysis and the scientific value or significance of these resources in the project area;
- Explanation of how the different elements of the project during construction, operation and the decommissioning phase may affect any paleontological, archaeological or cultural heritage sites within the project area;
- Describe management measures that may be implemented to avoid or reduce any negative impacts on these sites and enhance benefits of the development;
- Outline any further studies that may be required during or after the EIA process; and:
- Identify all relevant legislation, permits and standards that would apply to the development.

1.3. Baseline Description of the Receiving Environment

This study considers the potential impact of the wind farm in the landscape for the Beaufort West land parcel in the Great Karoo, Western Cape.

The cultural resources considered in the study area include palaeontological, archaeological and historic features, such as individual buildings, towns, farms, historic passes, as well as rural, scenic and wilderness landscapes.

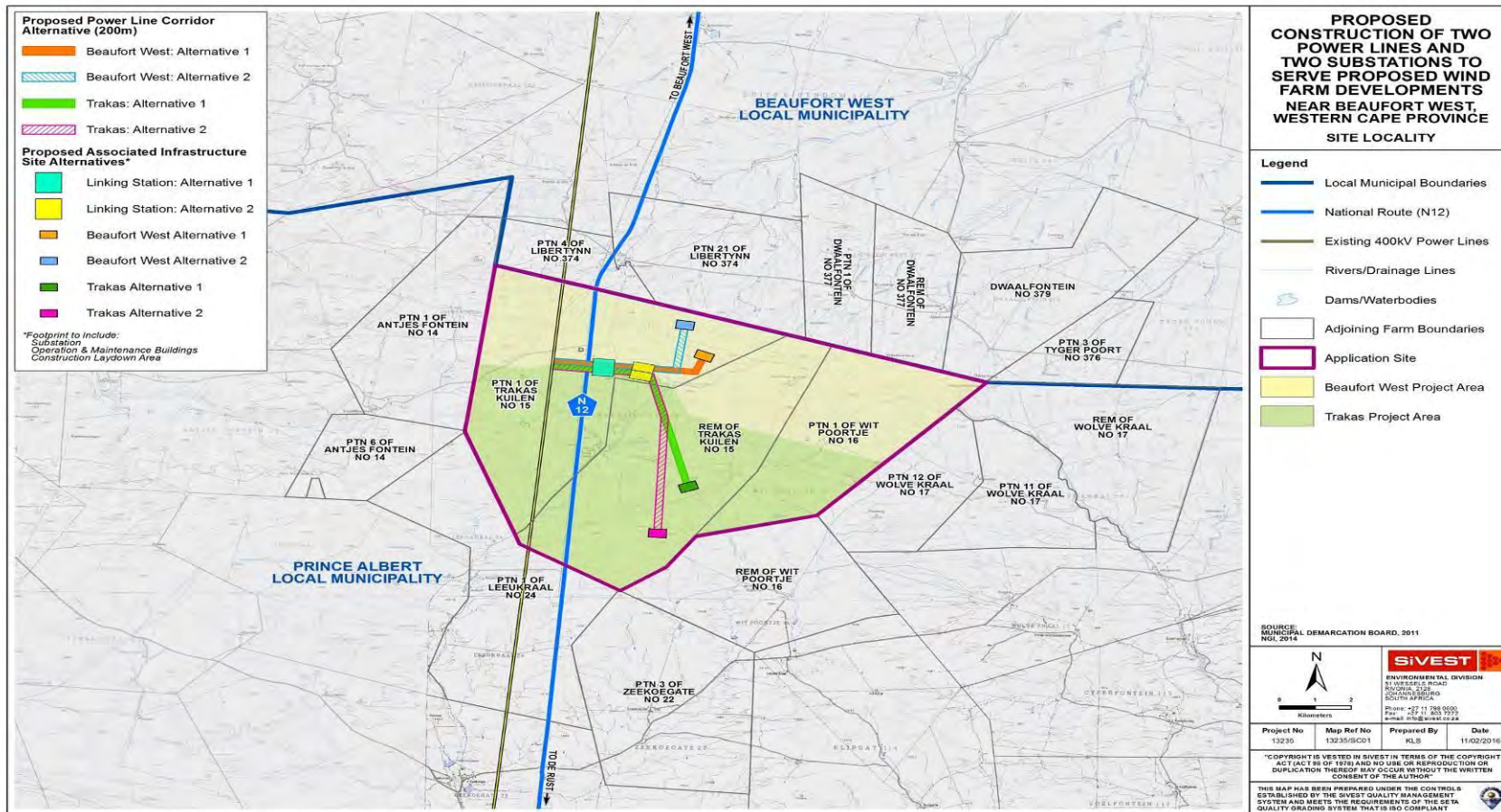


Figure 1: Locality Map for the Trakas and Beaufort West Wind Farm that shows the position of the new Substations and Power Lines, including the preferred and alternative options (Reference: SiVEST 2016).

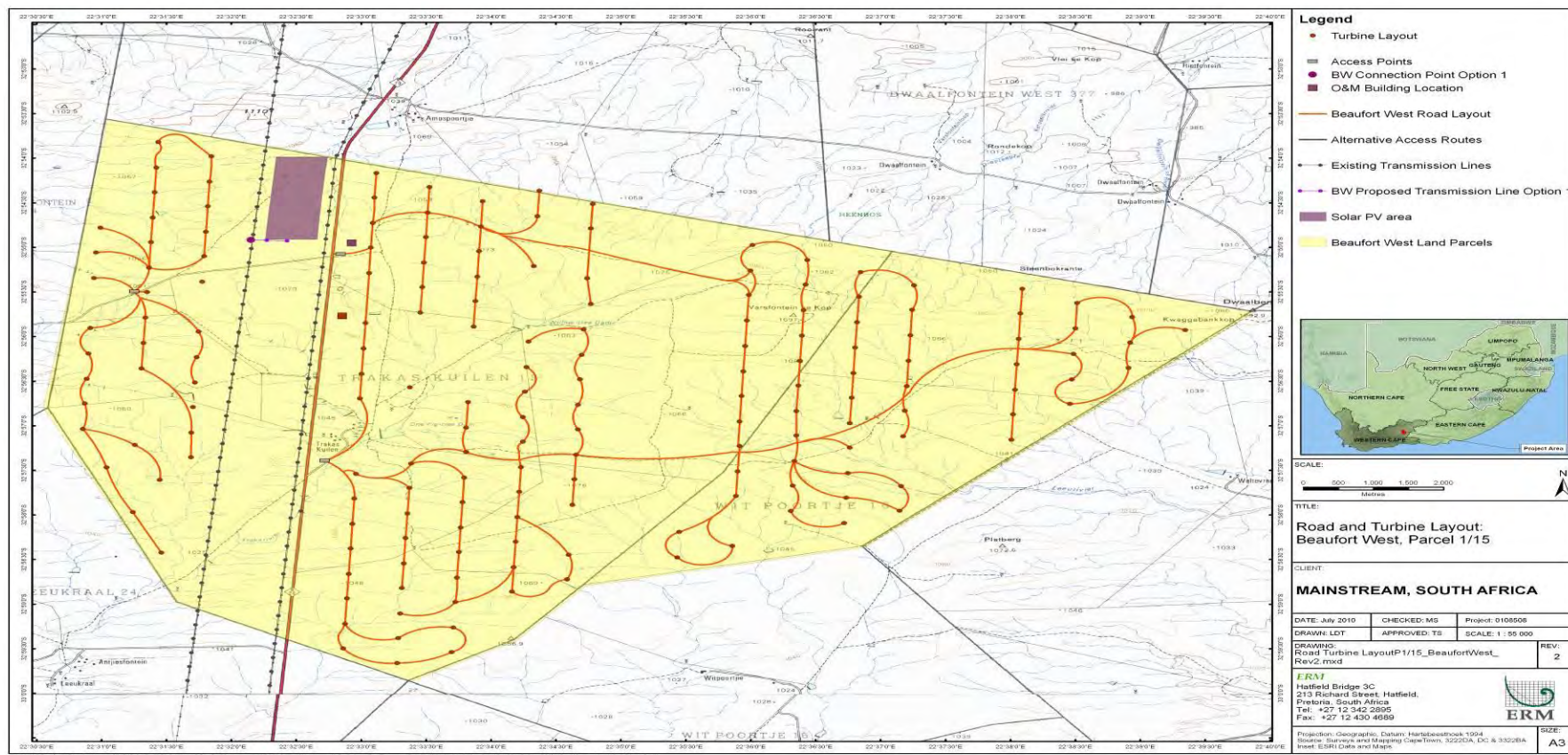


Figure 1.1: Topographical map with the Beaufort West land parcel superimposed showing the position sub stations, transmission lines, arterial routes and solar PV area considered during the Scoping HIA in 2010 (Reference: Mainstream 2010).

Section 2: Methodology

2.1. General Introduction

The Scoping HIA findings are presented as a series of options based on the principle that the project study methodology must meet the minimum standards set for HIA's as outlined in the National Heritage Resources Act (Act No 25: Section 38 (3) and the Heritage Impact Assessment Guidelines (Baumann and Winter 2005) for the Department of Environment Affairs and Development Planning (DEADP).

In addition the heritage study undertook to fulfill the methodological requirements of a previous RoD (HWC - 1045) which was for a fully integrated study involving the mapping and assessment of archaeological, palaeontological and built environment heritage resources, as well as the integrated mapping of sites of relative sensitivity.

This report considers the Beaufort West study site. Work includes:

- The identification and mapping of all heritage resources in the area affected by the development proposals.
- An assessment of the significance of these resources in terms of the criteria prescribed in the NHRA Act.
- An assessment of the negative and positive impact that the development proposal will have on these resources and an evaluation of such importance relative to the sustainable social and economic benefits to be derived from the development.
- The outcome of all public consultation with Interested and Affected Parties (IAPS) regarding the impact of the development on heritage resources.
- The need for a clearly defined Statement of Heritage Significance based on the criteria outlined in the NHRA Act. Arising from this Statement of Heritage Significance, a set of heritage indicators has been formulated to guide the planning and design process and against which the impacts of the proposal have been assessed.
- The need for a multidisciplinary approach to address the range of heritage issues flagged by the proposed development which include:
 - Palaeontology
 - Archaeology
 - Architectural History

- Historical Research
- Landscape character analysis
- Comment on the Visual impact assessment
- Social history

A GIS data recording exercise was undertaken for palaeontological sites older than 1 000 years, archaeological sites older than 100 years, as well as buildings and settlement footprints older than 60 years based on topographical map information dating to 1945 (Union map series, GIS data University of Texas, Council for Geoscience Pretoria – Sheets 3318 Cape Town, 3319 Worcester, 3320 Ladismith, 3220 Sutherland, 3222 Beaufort West and 3122 Victoria West), known conservation-worthy heritage places based on Fransen (2004) and previous heritage surveys (e.g. Drakenstein Heritage Survey 2006, Eskom Gamma Omega HIA 2009), and formally declared provincial heritage sites in terms of the NHR Act.

Historical spatial information dating from the 18th -20th century provided the basis for a chronological map of the expansion of settlement and land use over time and the identification and mapping of potential/known heritage resources including historical routes, VOC outposts, outspans, military installations, agricultural and urban settlements, etc. Historical-spatial information was initially recorded on the 1:50 000 topocadastral map series and then digitized into GIS.

2.2. Project Team

Due to the complex nature of the receiving environment and the range of specialists required to mitigate the heritage resources - both tangible and intangible, along the study corridor the following individuals were consulted in their area of specialization. The details and scope of work of each of the team members are outlined below. Their findings and recommendations have been incorporated into the main body of the report and referenced accordingly, and their reports included in the appendices.

- Project Design & Integration : Mary Patrick
- Cultural Landscape : Melanie Attwell & Nic Botha
- Colonial Period Desktop Study: Jean Gray
- Pre Colonial Period Desktop Study: Tony Manhire
- Palaeontological Desktop Study: Dr John Almond

On completion of the project the specialist sub-consultants were asked to 'sign-off' the findings and recommendations of this HIA report in relation to the following principles:

- To evaluate whether the overall report adequately reflects their individual inputs as defined in their terms of reference and their field of expertise.
- To identify areas of conflict or convergence between the overall findings and recommendations and those of the respective specialists inputs.

2.3. *Palaeontology Methodology*

The RSA has an unusually rich fossil heritage stretching back in time for over 3.5 billion years. Fossil sites of national and international significance occur along the coast as well as throughout much of the interior, including the Karoo, the Cape Fold Mountains and elsewhere. This wealth of palaeontological heritage is protected as a valuable but vulnerable public good by the South African Heritage Resources Act (Act No. 25 of 1999). The various categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance
- palaeontological sites
- palaeontological objects and material, meteorites and rare geological specimens

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations etc) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience. This data is then used to assess the palaeontological sensitivity of each rock unit to development (Provisional tabulations of palaeontological sensitivity of all formations in the Western, Eastern and Northern Cape have already been compiled by J. Almond and colleagues; e.g. Almond & Pether 2008). The likely impact of the proposed development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature of the development itself, most notably the extent of fresh bedrock excavation envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field scoping study by a professional palaeontologist is usually warranted.

The focus of palaeontological scoping work is not simply to survey the development footprint or even the development area as a whole (e.g. farms or other parcels of land concerned in the development). Rather, the palaeontologist seeks to assess or predict the diversity, density and distribution of fossils within and beneath the study area, as well as their heritage or scientific interest (Almond 2010:3).

2.4. Archaeology Methodology

The archaeological methodology included fulfilling the requirements of the National Heritage Resources Act (NHRA) (section 35 and 36) that protects the following features in the landscape:

- Material remains resulting from human activity which are 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;
- Rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- Graves and burial grounds, including ancestral graves, royal graves, graves of traditional leaders, graves of victims of conflict, historical graves and cemeteries, and other human remains not covered by the Human Tissue Act (1983) (Act No 65 of 1983).

A desktop study which included the data bases held at Iziko Museum, Heritage Western Cape and the Archaeological Department at University of Cape Town were perused for information relating to archaeological sites in the general areas of the proposed Wind Farms. Identified sites were listed on an Excel spread sheet along with the map identification numbers, GPS coordinates and a brief summary of the archaeological details. Sites included both pre-colonial and historical locations. Using this body of information it was possible to make a preliminary statement on the types of site and frequency of occurrence within the prescribed Wind Farm areas. In addition to the desktop study, four ecological zones identified in the study corridor, each of which would have produced a distinct human response by prehistoric people living in the landscape (figure 4), was used to provide a predictive index that may assist the impact assessor quantify the likely outcome of searching a particular area.

The desk top study was followed by a field survey that consisted of a comprehensive foot survey of the land parcels designated for the proposed wind turbine sites and the PV array as well as a general appraisal of the surrounding areas. The recording process consisted of written accounts of each location visited, GPS tracks and waypoint locations complemented by an extensive digital photographic record. Access to the proposed wind turbine locations was facilitated by the various farm tracks which crossed the two survey areas as well as by the generally flat terrain.

2.5. Built Environment and Cultural Landscape Methodology

The heritage built environment and cultural landscape study methodology involved fulfilling the requirements of the National Heritage Resources Act (NHRA), (Section 38(8)) and the methodological requirements contained in the RoD issued subsequent to the Notification of Intent to Develop, submitted to Heritage Western Cape by Patrick & Atwell in 2010.

The methodology involved the following:

Desktop studies including:

- Review of secondary material affecting built environment heritage resources (Fransen 2004)
- A desktop survey using the 1:50 000 as a base to examine topography and settlement patterns
- Review of related reports (VIA, Historical report) where available
- Diagram and Deeds analysis
- Mapping and aerial site analysis (Google)
- The identification and assessment of all heritage resources in the affected area
- The identification of built environment heritage resources outside the study area in a 3-5km radius where there may be visual impact.

Site Application

- Site visits and site analysis
- Cultural landscape analysis
- Analysis relative to spatial/historical studies
- Site identification of buildings older than 60 years

- GPS co-ordinates taken of all sites understood by historical map analysis to be older than 60 years
- Grading of such sites according to NHRA criteria
- Identification of further sites of cultural significance, i.e. farm graveyards
- Review of proposals relative to identified sites of significance
- Identification of areas of sensitivity i.e. “hot spot” areas
- Initial proposals for mitigation affecting sites of sensitivity. An assessment of the impact the development on such heritage resources
- An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development
- The consideration of alternatives where heritage resources are adversely impacted upon
- Mitigation proposals where necessary during and after the completion of the proposed project.

2.5.1. Provincial Heritage Sites

Section 27 of the NHRA requires that sites designated as PHS be subject to certain controls in terms of the Act. However, no known PHS's are located either on, or in the broader visual context to the Beaufort West site, and are therefore not affected by this section of the NHRA.

2.5.2. Buildings Older than 60 Years

Section 34 of the NHRA requires that heritage resources broadly identified as structures and sites of cultural significance including structures over 60 years of age be identified to establish their cultural significance and the potential impact of the proposals on their physical contexts.

2.5.3. Cultural Landscapes

The NHRA itself makes no mention of the term “cultural landscape” although the concept of a cultural landscape as a heritage resource has achieved increasing recognition and is now included as part of the lexicon of heritage resources valued by communities. As a result the identification and protection of cultural landscapes in this instance is not a statutory requirement per se. However, the project brief required that identification of significant cultural landscapes where and if affected by the proposed construction. A Cultural Landscape is defined by the World Heritage Committee as “the combined work of nature and man”, and is illustrative of human society and settlement over time within a

distinct geographical area, under the influence of the physical constraints and opportunities presented by their natural environment and successive economic and cultural forces, both external and internal.

The World Heritage Committee has identified and adopted three categories of cultural landscape, ranging from (i) those landscapes most deliberately 'shaped' by people, through (ii) full range of 'combined' works, to (iii) those least evidently 'shaped' by people through qualities of association or for religious and artistic reasons(yet highly valued). ". The categories are identified as:

- (i) "a landscape designed and created intentionally by man";
- (ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
- (iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"¹

Limitations

It should be noted that the Baseline study was limited by the following factors:

- Lack of published historical information affecting the area
- Lack of information on the farm buildings

2.5.5. Visual Impact Methodology

A comprehensive VIA was completed as part of the EIA by Oberholzer & Lawson in 2010. The HIA therefore only focus on the cultural landscape, in particular on heritage features 'red flagged' by the heritage specialist as needing further analysis in the previous review. An independent VIA has been commissioned by SiVEST for the 2015 EIA but does not form part of this study.

¹ UNESCO (2005) Operational Guidelines for the Implementation of the World Heritage Convention UNESCO World Heritage Centre. Paris. Page 83.

Section 3: Description of the Project Considered within the Scope of the Specialist Study

There are various limitations to this study (see below) which relate to design formats within the receiving environment.

3.1. Limitations to the Study

- The assessment does not consider the ancillary project infrastructure and components such as access roads, borrow pits, soil dumps, etc. These components will be assessed in detail during the design phase should the project be implemented.
- The assessment of the palaeontological, archaeological resources and built environment resources cannot be determined in absolute terms: a more precise evaluation can only be undertaken when the final footprint of the windfarms is confirmed and fieldwork sampling techniques implemented.
- Public consultation is limited to consultation with the appellants of the EIA process.
- Access was not gained to certain sites on the periphery of the study area where visual impact may be an issue on heritage resources of significance. In such cases GPS readings were taken and the site photographed outside the cadastral boundaries.
- Lack of specific historical data on sites. In such cases a visual assessment regarding date of construction was made.
- Assessment was based on project information at the time of writing. Decisions regarding the project, remain fluid and may be amended in response to specialist findings

It should be noted that the findings and recommendations arising from this heritage study will need to be integrated with the EIA findings and recommendations. In this regard heritage issues will need to be balanced against social-economic, ecological issues as well as issues of viability and feasibility.

Section 4: Description of the Affected Environment

4.1. Property Description of the Land Parcel

Mainstream Renewable Energy South Africa (Pty) Ltd previously proposed the development of a wind energy facility on the farms Palmietfontein, Brits Eigendom, Amospoortjie and Dwaalfontein in the Beaufort West district, and Farm Trakaskuilen and Witpoortjie in the Prince Albert District located on a northern and southern land parcel. A Scoping HIA was submitted to Heritage Western Cape for approval (HWC: RoD 1045 – Case Number 1130).

The 2016 revised proposal considers only the Trakaskuilen and Witpoortjie wind energy facility (south portion) in the Prince Albert District. The remaining sites have been excluded based on environmental and social constraints.

The sites are situated on the N12 between Beaufort West and Klaarstroom. A full description of the property is given including the extent of the affected property, erf or farm number, magisterial district and the current land use. This is followed by a description of the geological, archaeological features and historical events that shaped the environment in which the wind farms will be situated. This will assist in identifying both the opportunities and constraints presented by the receiving environment.

4.2. The Proposal for the Development of a Wind Energy Facility

It is the intention of Mainstream Renewable Energy South Africa (Pty) Ltd to develop wind farms to generate electricity and reduce the dependence on non-renewable fossil fuel resources. This is in response to the crucial need to reduce the dependence of non renewable energy resources. The Department of Energy's latest draft Integrated Resource Plan (IRP2010), also plans for a considerable amount of wind and other renewable energy sources to power the country during the next 20 years and beyond. The proposal in Beaufort West arises out of these energy initiatives. As a result the Beaufort West proposal may be undertaken in stages.

The key components¹ of the proposed Beaufort West renewable energy facility are listed and discussed, include the following:

- Wind turbine generators;
- Two power lines of up to 400kV each with a length of 4-7 km
- Internal and external electrical connections;
- Three Substations and associated transmission lines;
- Access roads; and
- Operations and maintenance (O&M) building.

The overall footprint is approximately 97.5 square kilometres; made up by the Trakas project, 53.7 square kilometres, and the Witpoortjie project, 43.8 square kilometres. The two new sub stations, Operation & Management buildings, laydown areas and associated infrastructure will have a total footprint of approximately 600m x 600m. Depending on the results of the current data collection phase, and the results of the specialist findings and scientific research, the project may develop to the next phase which is to build between 70 turbines on each site (140 in total) with an individual capacity of 140 MW.

Table 4.1: Description of the southern land parcel at Beaufort West

PROPERTY – BEAUFORT WEST	
Name of property	Farms and farm portions vicinity Beaufort West
Street address or location (e.g. off R44)	Along N12
Erf or farm number/s	Remainder farm Trakaskuilen No15, Portion 1 Trakas Kuilen No 15, Portion 1 of Witpoortje No 16
Town or District	District Beaufort West
Responsible Local Authority	Beaufort West
Magisterial District	Beaufort West
Current use	Partly agricultural
Current zoning	Agriculture 1
Predominant land use of surrounding properties	Agricultural use and wilderness
Extent of the property	97.5 square kilometres

¹ ERM Project Description 2011: 34

4.3. The Power Lines, Sub Stations and Wind Turbines

Three new substations, O&M buildings, laydown areas and associated infrastructure with a total footprint of 600m x 600m, and two power lines, up to 400kV each, with a corridor length of 4-7km will connect the wind farms with the national distribution network at the existing Eskom Droerivier- Proteus 400kV power line (see Figure 4.1).

The turbines, which have existing EIA authorization, form part of the receiving environment and range in hub height from 70m to 120m, with a blade length up to 60m with an overall diameter of 150 m. This specification remains similar to that proposed for the 2010 assessment. However, the turbine number has been reduced based on environmental and social constraints from 219 - 288 turbines with an individual capacity of between 402 MW – 606 MW. The 2016 proposal considered 140 turbines spread over the Trakas and Beaufort West Wind Farm with a individual capacity of 400 MW.

The final detail of the design and placement of the turbines will depend on the model decided upon and the existing ground and altitude conditions. Generally it can be said that the turbines will be supported on reinforced concrete foundations with an approximate area of 325m² to a depth of 2.5m. The foundation will include a concrete plinth at the centre, which projects above ground level and to which the turbine tower is connected. There will be gravel surfaced hard standing of approximately 40m x 20m adjacent to each turbine for use by cranes during construction and retained for maintenance use throughout the life span of the project. Each turbine may have an electrical transformer beside it.

4.4. Electrical Connections

The electrical connections comprise the following:

- The Beaufort West site will be connected to Eskom's national grid on the site, via the existing Droerivier- Proteus 400kV line with a connecting transmission line estimated at 4-7 km

4.5. Access Roads and Site Access

The site can be accessed via the N12 that runs past the land parcels. Some existing public roads may need to be upgraded to facilitate turbine transport.

4.6. The Proposal Process

The project will be divided into a number of phases including:

- Preconstruction
- Construction
- Phased Implementation
- Decommissioning

The initial three activities will have an impact on heritage resources.

4.7. Site Layout Alternatives

The amended layout for three new sub stations, made up as follows, a Linking sub-station which is estimated footprint of 600m x 600m and considers 2 alternative layouts ; the Beaufort West Substation footprint which is estimated to be 500m x 300m and considers 2 alternative layouts; the Trakas Substation footprint which is estimated to be 500m x 300m and considers 2 alternatives layouts. The Beaufort West and Trakas Power Lines will be up to 400kV each with a length of between 4 -7 km and will connect the wind farms with the national distribution network at the existing Eskom Droerivier-Proteus 400 kV power line. The height of the power lines is envisaged within a range of between 70m and 120m. Two alternatives are considered.

Final layout decisions have not been fixed in relation to heritage and other concerns and may be amended as mitigation strategies are requested.

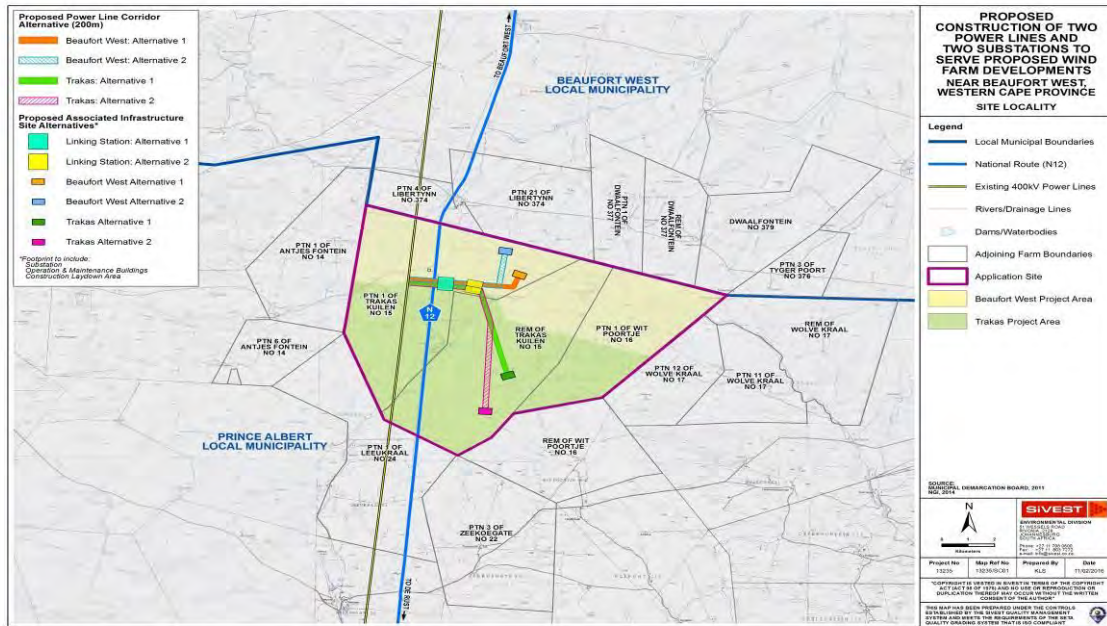


Figure 4.1 Site Locality Map that shows the location of the proposed power lines, and associated sub stations with alternative layouts (Reference SiVEST /SC01).

4.8. Historical Overview of the Study Area

The previous section provided a topographical description of the land parcel using a series of maps that illustrate the primary and secondary positions of the power lines and sub stations that will be located in the receiving environment. This section seeks to describe the historical origins, nature and character of the receiving environment. The overall purpose is defined as follows:

- To define context or “place” in the sense of how settlements – both prehistoric and historic, routes and farm werfs relate to each other and to other aspects of the historical and natural environment.
- To understand the past, the trajectory of change and/or continuity, which has brought the environment to its present state and which provides the catalyst or indicator of the ability and capacity to accommodate future change.
- To provide the ‘big picture’ which can serve as a basis or framework for evaluating interventions and into which a range of interest groups can add their interpretation and views.

Characterisation should thus be regarded as being as fluid and dynamic as the landscape, townscape and environment which it seeks to portray. It contributes to

informed decision-making by providing information to help everyone affected to discuss the implications of proposed changes to the historical, scenic and natural environment and to help shape the future environment. It should thus be regarded as a tool for positive spatial planning (Conservation Bulletin, 47, 2004/5, English Heritage).

Sense of place is generally regarded as the quality created by aspects of scale, colour, texture, landform, enclosure and, in particular, land use. According to Lynch “it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own” (1981 In CKA 2001).

The natural physical and cultural historical elements under this section are described according to the broad morphological zones set out in Figure 1.4 rather than according to political or topocadastral boundaries. An overview of the land parcels, described in section 4.1 are discussed in relation to the formation of the earth surface over the last 540 million years, the evolution of the earth’s plants and animals and the cultural behaviour of prehistoric and modern humans. They represent a number of key events in the earth’s history and the development of the cultural landscape. A brief synopsis of those events is described below using a timeline to flag the antiquity of the receiving environment.

4.9. Inland Palaeontology – Geological Context

The geology of the Beaufort West region is outlined on the 1: 250 000 geology sheet 3222 Beaufort West (see Figures 4.2 and 4.3). The study area is largely underlain by Mid to Late Permian continental sediments of the Lower Beaufort Group (Adelaide Subgroup, Karoo Supergroup). A useful overview of this internationally famous rock succession has been given by Johnson et al. (2006). Two successive formations within the Lower Beaufort Group are represented within the study area: the Mid Permian Abrahamskraal Formation and the conformably overlying Late Permian Teekloof Formation (Rubidge 1995). The latter is represented by a sandstone-rich lowermost interval known as the Poortjie Member. These two rock units are characterized by significantly different fossil biotas separated by a major end-Mid Permian extinction event. The Beaufort Group rocks within the study area are moderately deformed, with numerous small-scale, east-west trending fold axes and minor faults. The younger Poortjie Member sandstones tend to crop out in the cores of elongate synclines, whereas the older Abrahamskraal rocks are preferentially exposed within anticlinal cores.

Geological and palaeoenvironmental analyses of the Lower Beaufort Group sediments in the Beaufort West area have been conducted by a number of workers. Key references within an extensive scientific literature include various papers by Roger Smith (e.g. Smith 1979, 1980, 1986, 1987a, b, 1988, 1989, 1990, 1993a, 1993b) and Stear (1978, 1980), as well as several informative field guides (e.g. Cole & Smith 2008). In brief, these thick successions of clastic sediments were laid down by a series of large, meandering rivers within a subsiding basin over a period of some ten or more million years within the Late Permian Period (c. 265-251 Ma). Sinuous sandstone bodies of lenticular cross-section represent ancient channel infills, while thin (<1.5m), laterally-extensive sandstone beds were deposited by crevasse splays during occasional overbank floods. The bulk of the Beaufort sediments are greyish-green to reddish-brown or purplish mudrocks ("mudstones" = fine-grained claystones and slightly coarser siltstones) that were deposited over the floodplains during major floods. Thin-bedded, fine-grained playa lake deposits also accumulated locally (for a review of the specialist 2015 report see appendix 1).

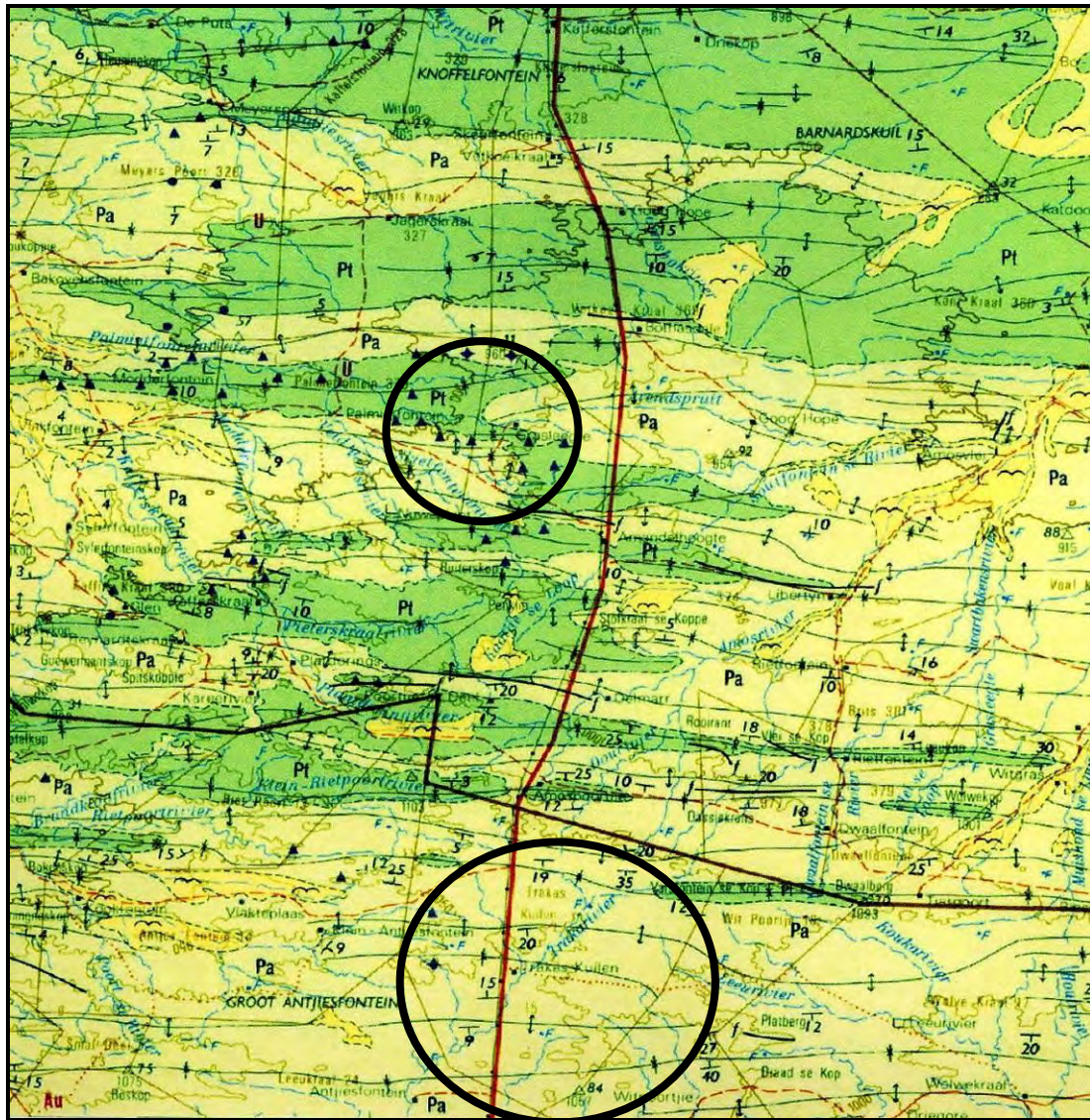


Figure 4.2 Extract from 1: 250 000 geology sheet 3222 Beaufort West showing geology of the study region south of Beaufort West, either side of the N12 national road. The black circles indicate the approximate location of the two component areas of the proposed wind farm. Pa (pale yellow) = Mid Permian Abrahamskraal Formation (Adelaide Subgroup, Lower Beaufort Group). Pt (green) = Teekloof Formation. Dark yellow = Caenozoic (Pleistocene to Recent) alluvium. Note numerous W-E trending fold axes and faults indicated here. Diamond symbols indicate fossil localities within the Tapinocephalus Assemblage Zone. Triangles indicate fossils within the Pristerognathus Assemblage Zone (Reference: Johnson & Keyser 1979).

territories focussed on the available surface water points, and follow the migrations of large herds of springbok. It is here that rock engravings are to be found.

The problem with the Karoo, in archaeological terms, is that we are dealing with vast areas of open country which are known to have rich archaeological resources but have yet to be subjected to systematic analytical research. If you stop anywhere in the open veld you are likely to find extensive scatters of stone artefacts. This is due to the erosional nature of the environment which tends to leave artefacts exposed on the surface rather than buried beneath layers of deposit as happens in many other areas. Thus, prolific numbers of artefacts have lain undisturbed on the surface since time immemorial. The Karoo has a long history of human occupation beginning in the Early Stone Age (ESA) with assemblages of bifacial artefacts dating to as much as a million years ago. Similarly there are Middle Stone Age (MSA) stone tools dating from approximately 100 000 to 300 000 years ago as well as Later Stone Age (LSA) remains dating to the last 30 000 years and rock art sites spanning the last 10 000 years. There are also colonial-era structures which include early farms and historical buildings as well as vestiges of the Anglo-Boer war such as trenches, shells and cartridge cases (for a full review of the specialists report see Appendix 4).

The only pre-colonial sites registered in the desktop study from the general area of the Beaufort West are listed in Table 4.2. Although none of these sites occur within the wind farm development footprint they did provide a very useful indicator of the type of archaeology likely to be encountered. The Karoo is known to have been a focus from Stone Age activity from very early on with extensive scatters of both Early and Middle Stone Age artefacts. Due to the erosional nature of the environment these artefacts have remained on the surface since time immemorial. Later Stone Age people also occupied this part of the Karoo as testified to by the number of cave deposit and rock art sites.

The field work findings from 2010 AIA have been added to this assessment. It both confirms, and highlights, the need for specialist studies to review development footprints prior to the construction phase to raise awareness of archaeological sites in vast, arid landscapes.

Based then on the available evidence of Stone Age locations in the Karoo, the range of possible pre-colonial usage of the area may be summarised as follows:

- Middle Stone Age artefacts dating to within the last 30 000 years.

- Rock art sites dating to within the last 10 000 years.
- The presence of Khoikhoi herders within the area over the last 1 500 years.

In terms of historical (otherwise referred to as colonial) archaeology, the farm buildings at Trakaskuilen, and Amosportjie (in the 5 km buffer zone) are older than 60 years. The presence of further items of historical interest may be summarised as follows:

- Structures or modifications to the landscape within the colonial era including buried residues.
- The presence of unmarked graves dating from the colonial era to the recent past.
- As boer commandos were known to have operated within the area, the presence of structures and/or artefacts relating to the Anglo-Boer war.

These structures are described more fully under the following section, built environment and cultural landscape.

ARCHAEOLOGICAL SITES Desktop Study											
	Windfarm Name	Map Name	Map No.								
	BEAUFORT WEST	AMANDELHOOGTE	3222 DC								
	Report Type	Source & Date	Study Type	Site Name	Site No.	Location	Findings	Relevance	Site / No.	Longitude	Latitude
1	Uranium Prospecting	ACO:2009	AIA	Eerste Water	EW 1 to 9	NE of windfarm area	ESA & MSA, stone walling	Near to Wind Farm	EW 1	22.92856	32.67718
2	Uranium Prospecting	ACO:2009	AIA	Ryst Kuil	RK 1 to 8	NE of windfarm area	ESA & MSA, ruin, graves	Near to Wind Farm	RK 1	22.85646	32.64752
3	Field Survey	Rock art of South Africa (H.C. Woodhouse 1978)	Research	Not Known	N/A	N of windfarm area	Rock Art	Same area as wind Farm			
4	Field Survey	Patrick & Manhire 2010	AIA	Varsfontein Amospoortjie Trakaskulie	Waypoint 1-4	In wind farm footprint	MSA stone tools Historic Dumps	Ridge overlooking Amospoortjie farmhouse and at Trakaskuil en			

Table 4.2 Distribution of known archaeological sites in the Beaufort West land parcel (Ref: Data from Iziko Museum, Patrick & Manhire 2010).

4.10.2. Land Settlement and Settlement Pattern – General Overview

In the previous section an outline of the spatial and design elements of the wind farm are presented. In this section it is intended to predict the possible range and extent of impacts of the proposed wind farms upon the heritage resources and cultural landscapes of the affected environments.

Beaufort West historically was an important centre for sheep farming, trade and transport and there is the potential for impact on sites associated with this centre, travel routes (including those to the Great Karoo and mineral sources) during the 17th 18th and 19th century, as well as blockhouses dating to the Anglo-Boer War. This was also an area of interaction between various cultural groups, namely between the Khoi and permanent farming operations of the Trekboers, the Xhosa and frontier farmers who met at the summer rain boundary.

This section explores these relationships in more depth and maps the spatial distribution and expansion of these various groups in the landscape in relation to river courses that would have formed a corridor for human settlement in the past.

4.10.3. Historical Context - Location and Site Description

This section explores how the wind farm structures would align with known historical, archaeological and palaeontological data. Figure 4.4 shows the Beaufort West site with the relevant Farm names and numbers, Figure 4.5 shows Trekboer and colonial expansion by 1717-1788 in the study area, and Figure 4.6 an 1820 map of the Cape shows the expansion of farmers towards the east and north east Karoo.

The south site straddles the N12 and is centred on the Farm 15 Trakaskuilen and a portion of the Farm 16 Witpoortjie. It is bounded in the northeast by the Dwaalberg and to the North West by the Farm Groot Antjesfontein; to the south west by the Farm Leeukraal and to the south east by the Platberg and the Farm Wolvekraal. The Trakasrivier runs through the Trakaskuilen farm and there are two seasonal farms – the One Fig Tree dam and the Willow tree dam. The area is sparsely vegetated and is generally flat and featureless. Both sites contain farm buildings, farm roads and stone building ruins. These are identified in Section 4.10.4 below.

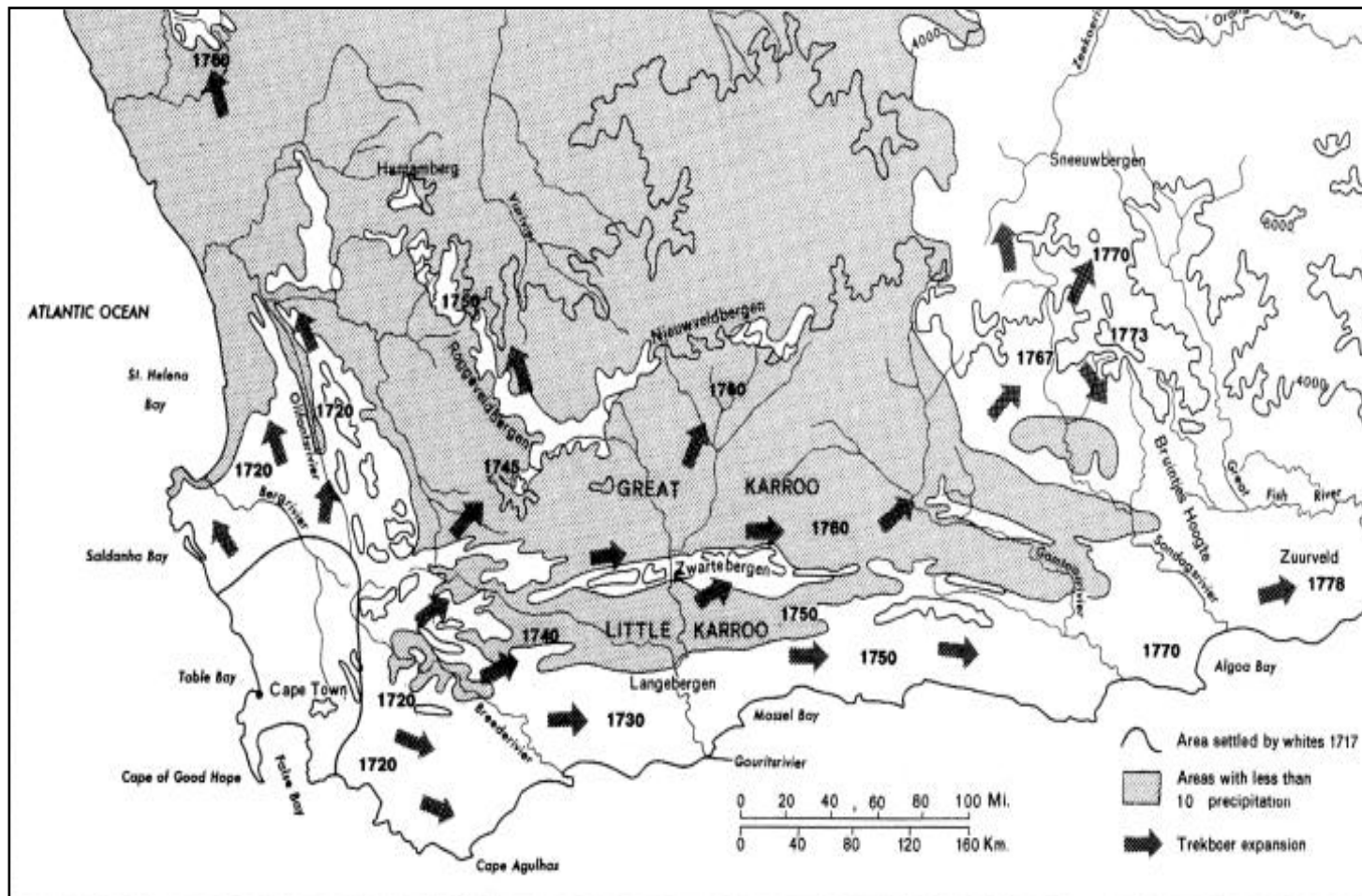
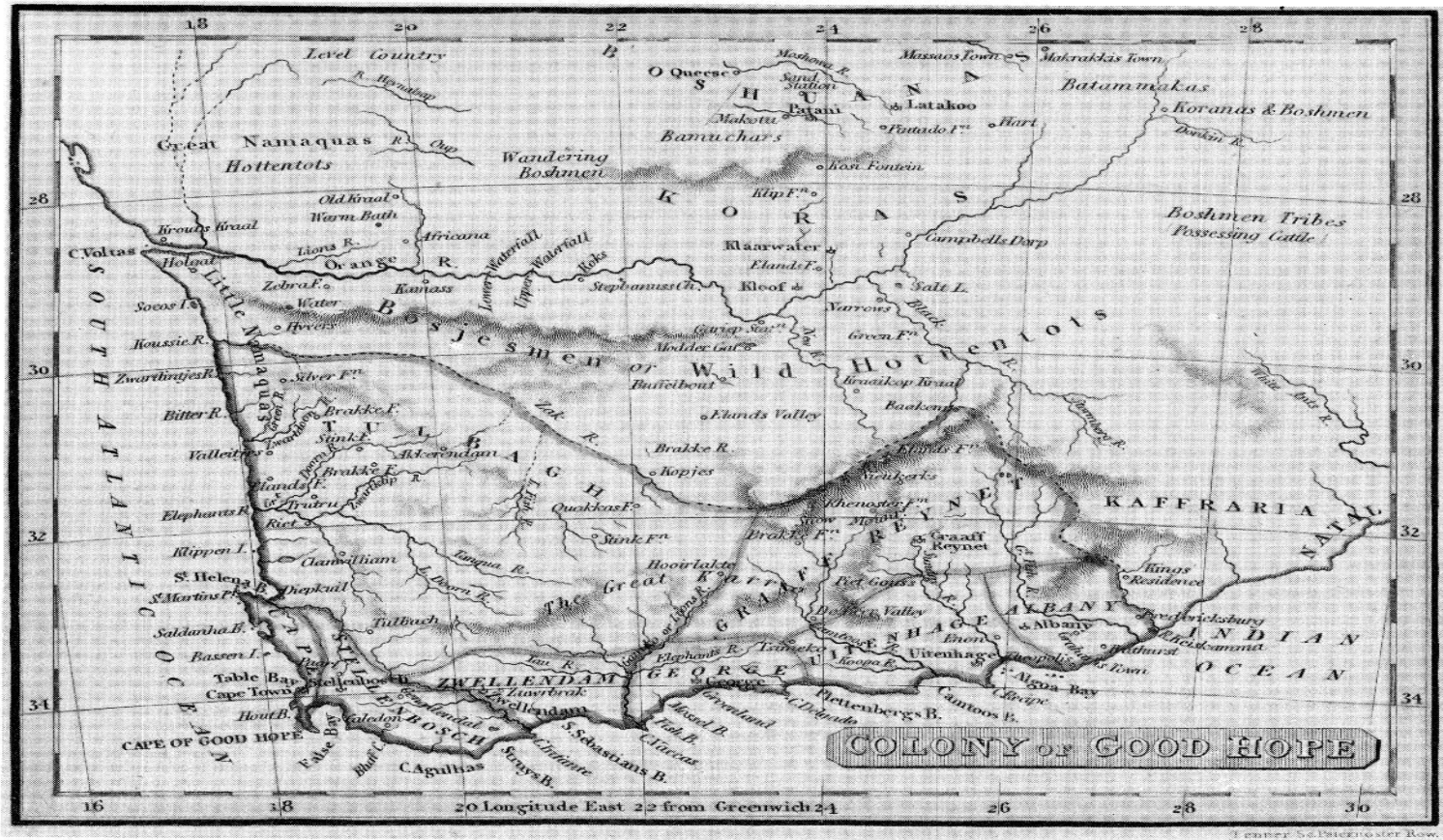


Figure 4.5: Trekboer and colonial expansion by 1717-1788 in the study area (Reference: Guelke & Shell 1992:818).



The Cape Colony, 1820

Figure 4.6: Early map of the Cape showing expansion towards the east and north east Karoo (Reference: Watson, R.L. 1990).

4.10.4 Built Environment and the Cultural Landscape

4.10.4.1 General Background

The position of Beaufort West in relation to historic routes, the presence of Stone Age artefacts in the vicinity as well as the presence of water suggest that it has been a corridor of human settlement and movement, probably through pre-historic times, as well as historically.

The town of Beaufort West was established in 1818 as a sub-Drostdy area for Graaff-Reinet in an attempt to control a generally lawless north-east frontier. The town was laid out along a well-watered strip of land between the Gamka and Kuils Rivers and a church established in 1826. The current church dates from 1894. Beaufort West achieved municipal status in 1837 and it has an important early town hall, one of the earliest civic buildings designed by James Bisset. There are a number of significant buildings in Beaufort West and a number of important architects undertook work in the Town.

4.10.4.2. The Affected Farms and Related Werfs

The farms affected by the proposal are strongly rural in character and are set in remote areas. Some farm buildings date to the mid nineteenth century. Historical evidence suggests that the affected farms i.e. Trakaskuilen- Farm 15, Amospoortjie - Farm 374, (now called Brits Eigendom originally consisted of 36892 morgan with relevant portions within in the 5 km buffer zone between, and around, the land parcels designated Trakaskuilen 15 and Witpoortjie 16) were granted settled and used by the early to mid nineteenth century (see Gray 2010: Appendix 2).

Both sites are sparsely settled and consist of arid typical Karoo landscape with very few scattered farmhouses set in a long low undulating manner. Vegetation is low Karoo scrub and bush. There are a number of mature trees around the settled areas (Oberholzer 2010). The farms are large and generally low yield, used largely for grazing herds of sheep. There are a number of stone ruins of earlier abandoned structures and kraal walls, as well as the presence of graveyards. Cadastral history is summarised below:

Trakaskuilen had its origins in a large quitrent grant of 18756, probably used for seasonal stock-farming. When it was surveyed in 1872 it contained a dam which suggests previous use. By 1873 the site contained farm roads as well. No buildings are shown on affected diagrams. This is no indication however the early buildings did not exist as this was standard surveying practice. The diagram (7) attached to Portion 3 of Palmietfontein called Knapdraai indicates a buildings although this may be older than the diagram is dated 1951.

Witpoortjie: registered under Dgm 765/1873 with an area of 5168M 300 Sq. R. The farm was granted on 1st July 1879 to Johannes Mattheus Christian Horn (½ share) and Jacobus Cornelis Johannes Swanepoel (½ share) under Prince Albert Quitrents Vol. 2 no. 26 dated 1/7/1879. The farm was probably used for seasonal stock-farming.

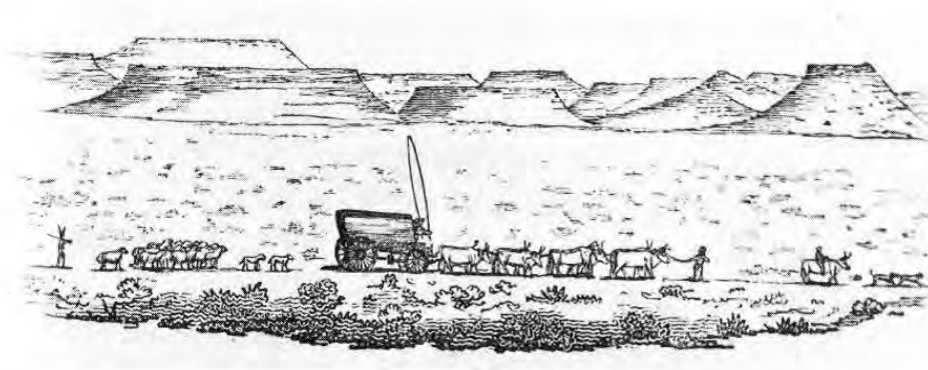


Figure 4.7: Early nineteenth century illustration of the route across a typical Karoo landscape (Burchell 1822 as quoted in Grey 2010).

4.10.4.3. Buildings of Significance Outside the Affected Areas: Amospoortjie Farm 374 or Brits Eigendom

This site as a whole and its relevant remainders and portions, falls partially into the 3km to 5km buffer zone between and around the land parcels designated on Farm Palmietfontein 370 and Farms Trakaskuilen 15 and Witpoortjie 16. It appears that on the first grant on the 18/08/1906 (Dgm 2928/1906 BW Qts. 17 No 18) to Matthys Michael Barend Brits. The diagram attached i.e. SG 2311/1906 shows a well developed farm with farm tracks, dams and a quarry for building stone.

⁶ SG Diagram 764/1875

⁷ Attached to DT 16481/1956.

Section 5: Identification of Policies, Legislation, Standards & Guidelines

5.1. Statutory Framework: the National Heritage Resources (Act 25 of 1999)

The NHRA has applicability, as the study forms part of an overall Heritage Impact Assessment (HIA) in terms of the provisions of Section 35, 36 and 38 of the National Heritage Resources Act (Act 25 of 1999) and forms part of a heritage scoping study that serves to identify key heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and cultural landscape, as well as the need to address such issues during the impact assessment phase of the HIA process.

5.2. Section 35 – Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act, palaeontological heritage impact assessments (PIAs) and archaeological impact assessments (AIAs) are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

Depending on the sensitivity of the fossil and archaeological heritage, and the scale of the development concerned, the palaeontological, and archaeological impact assessment required may take the form of (a) a stand-alone desktop study, or (b) a field scoping plus desktop study leading to a consolidated report. In some cases these studies may recommend further palaeontological and archaeological mitigation, usually at the construction phase. These recommendations would normally be endorsed by the responsible heritage management authority, Heritage Western Cape, to whom the reports are submitted for review. Tables 5.1 to 5.3 summarize the permitting requirements to mitigate these resources during the various phases of specialist studies. Depending on the sensitivity of the heritage resources no person may, without a permit issued by the responsible heritage resources authority:

Table 5.1: Permitting requirements for fossils, built environment and Stone Age archaeology.

PERMIT APPLICATION SECTION 35 – FOSSISLS, BUILT ENVIRONMENT FEATURES, SHIPWRECKS & STONE AGE ARCHAEOLOGY (Ref : NHRA 1999: 58)
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite

5.3. Section 36 – Burial Grounds & Graves

A section 36 permit application is made to the South African Heritage Resources Agency (SAHRA) which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is requires under the following conditions:

Table 5.2: Permitting requirements for burial grounds and graves older than 60 years to Heritage Western Cape (prehistoric) and historic burials to the South African Heritage Resources Agency.

PERMIT APPLICATION SECTION 36 – BURIAL GROUNDS & GRAVES (REF: NHRA 1999 : 60)
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves.
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
(d) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

5.4. Section 38 HIA as a Specialist Study within the EIA in Terms of Section 38(8)

A NHRA Section 38 (Heritage Impact Assessments) application to HWC is required when the proposed development triggers one or more of the following activities:

Table 5.3: Permitting requirements for demolition of built environment features

PERMIT APPLICATION SECTION 38 (Ref: NHRA 1999 : 62)
(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50 m in length;
(c) any development or other activity which will change the character of a site (i) exceeding 5 000 m2 in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) the re-zoning of a site exceeding 10 000 m2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the EIA for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

5.5. Heritage Impact Assessment (EIA) Section 38(8)

This is a Heritage Impact Assessment submitted to the relevant authority (DEA) in terms of Section 38(8) of the National Heritage Resources Act. The commenting authority is heritage Western Cape. The authorising government agency is the Department of Environment Affairs.

The National Heritage Resources Act requires a heritage assessment in certain categories of development (see Table 5.3).

A Heritage Impact Assessment report is required to identify, and assess heritage resources as defined by the Act, assess the impact of the proposal on the said heritage resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

- The identification and mapping of heritage resources in the area affected
- The assessment of the significance of such resources
- The assessment of the impact of the development on the heritage resources
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits
- Consideration of alternatives if heritage resources are adversely impacted by the proposed development
- Consideration of alternatives
- Plans for mitigation in the future

Section 34 of the NHRA (8) requires that heritage resources broadly identified as structures and sites of cultural significance including structures over 60 years of age be identified and assessed to identify their cultural significance and the potential impact of the proposals on their context.

The requirements of Section 35 and Section 36 (Burials), which respond to archaeological requirements, are dealt with in a separate attached archaeological study. It should be noted that farm graveyards were identified in terms of the site survey.

For a list of sites and structures identified see Section 4.7 together with their relative assessments in terms of cultural significance.

Section 27 of the NHRA affects the management of designated Provincial Heritage Sites. There were no Provincial Heritage Sites identified on the affected sites or in the environs.

5.6 Related Policy Frameworks: Heritage Constraints in Relation to Wind Farms

Currently no National Policy framework exists for the assessment of impacts of wind farm development upon heritage resources, as defined. However the Department of the Environment, Australia has developed a policy statement in relation to the Wind farm industry (EPBC Act Policy Statement 2.3.)

¹ Section 34 NHRA 1999.

It recommends that wind farms be kept away from World Heritage Sites, national heritage places and Ramsar Wetland areas. It identified negative impact as any action that is expected to result in a loss degradation or damage to any of the values of the heritage place. These values can be natural, cultural, historical, indigenous, social, spiritual technical or aesthetic.

The New South Wales (NSW) Heritage office identifies a wind farm as any land used to generate electricity by wind force. It identifies renewable energy as important in the global and national context. It identifies impact as largely visual, which increase in significance if the site has heritage value. As a result there is a strong link between visual impact and identified heritage value.

A draft report developed by C N deV Africa for the Western Cape⁹ outlines criteria for the evaluation of wind farm development in areas of sensitivity. It is however a draft and can be used as a guide only. It makes little reference to heritage constraints however.

The report states that in the rural context, large extensive open landscapes would be preferred. The report also states that wind energy facilities should be excluded from landscapes of aesthetic value and wilderness areas. This is likely to include cultural landscapes of outstanding aesthetic value

The report recommends that Wind Energy facilities should preferably be located in the following areas:

- In large concentrated wind farms rather than scattered throughout a landscape to reduce visual impact
- Where they are well located in terms of visual impact
- Distance between wind farms should be between 30kms to 50kms apart
- Located in already visually disturbed environments for example where there are overhead power lines

⁹ C NdeV Africa: 'A Strategic Initiative to Introduce Commercial and Land Based Wind Energy Development to the Western Cape' (2006) as quoted in *Draft Proposed Renewable Energy Facilities in the Westerns and Northern Cape by Mainstream SA Visual Baseline Report*, prepared by B Oberholzer and Q Lawson, July 2010, page 15.

Relevant criteria contained in the report affecting heritage resources and cultural landscapes include the following:

- National Roads where the road is a scenic route
- Ridgeline and skyline issues.

5.7 Comment

The sites identified fulfil the requirements as laid down in the draft policy framework. For the following reasons:

- The N12 is not a scenic route and the landscape is not regarded as possessing outstanding scenic qualities
- There are power lines in the vicinity i.e. the landscape is visually disturbed
- The turbines are concentrated in contained areas

However it should be noted that two wind energy facilities relatively close by will have a cumulative visual impact along the N12.

Section 6. Heritage Statement & Specifications of Relevant Thresholds

6.1 Degree of Significance of Heritage Resources

The specification of relevant thresholds for development must be informed by the degree of significance of the heritage resources affected by the proposals, i.e. by means of a heritage statement (Statement of Cultural Significance).

6.1.1 Cultural Significance

The purpose of establishing cultural significance is to determine the degree and type of value ascribed to the site, and as a result, to ensure that responses in development terms are appropriate and do not adversely impact on the cultural significance of the site. In terms of the NHRA Definitions 2 (vi), cultural significance means: “aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.” Aesthetic significance includes spatial significance.

6.1.2 Grading of Sites of Cultural Significance

The grading of sites in terms of their significance is undertaken to inform development planning, prioritize the use of resources to ensure their appropriate management and, where necessary, ensure their protection. In order to determine the degree of significance of a site, a grading system in terms of NHRA Section 7 is applied. This requires distinction between Grade 1 (sites of national significance), Grade 2 (sites of regional / provincial significance) and Grade 3 (sites of local significance). No sites of either national or provincial / regional significance are identified in this study. Grade 3 sites are further distinguished as follows in terms of HWC’s ‘A Guide to Grading’, 2007, viz.:

- Grade 3A: Sites of high local significance (including excellent and/or rare examples);
- Grade 3B: Sites of marginally lesser significance than Grade 3A sites; and
- Grade 3C: Sites of local significance that essentially contributes to the character of significance of their environs. All of the buildings and built sites at Konstabel, where graded, fall within this category.

The heritage statement for the Beaufort West wind farm site is therefore structured in terms of the definition and grading of cultural significance referred to above, i.e. as follows:

6.1.3 Aesthetic / Spatial Significance

A Cultural Landscape is defined by the World Heritage Committee as “the combined work of nature and man”, and is illustrative of human society and settlement over time within a distinct geographical area, under the influence of the physical constraints and opportunities presented by their natural environment and successive economic and cultural forces, both external and internal. (Refer also to Section 2.5.3 of this study).

The World Heritage Committee has identified and adopted three categories of cultural landscape, ranging from (i) those landscapes most deliberately ‘shaped’ by people, through (ii) full range of ‘combined’ works, to (iii) those least evidently ‘shaped’ by people through qualities of association or for religious and artistic reasons (yet highly valued). The categories are identified as (UNESCO 2005):

- (i) “a landscape designed and created intentionally by man”;
- (ii) an “organically evolved landscape” which may be a “relict (or fossil) landscape” or a “continuing landscape”;
- (iii) as “associative cultural landscape” which may be valued because of the “religious, artistic or cultural associations of the natural element”.

In addition to the above the following criteria have been used to determine degree of scenic significance, with particular reference to views from the N1:

- **Distinctiveness:** The degree to which the landscape as a whole can be regarded as having features that make it special, rare and/or unusual in relation to others within the sub-region or further afield;
- **Sense of Place:** Whether or not the landscape as a whole can be regarded as having a special sense of place, (for e.g. as a destination, as opposed to being an area for passing through);
- **Representivity:** The degree to which the principle scenic characteristics of a particular class of natural or man-made landscape are represented;
- **Intactness:** The degree to which these classes of natural/man-made landscape remain intact;

- Drama: Whether or not the landscape is characterized by dramatic contrasts in scale and/or pattern, and whether it possesses spectacular panoramic or expansive outlooks and vistas;
- Cohesion and Balance: The degree to which the various elements of a landscape can be regarded as being in a state of balance and harmony, as opposed to being visually fragmented and/or in a state of visual tension and imbalance;
- Landmark quality: The degree to which views within the landscape are characterized by the presence of landmarks or other distinctive features;
- Aesthetic quality: The degree to which a landscape exhibits aesthetic characteristics valued by a community or cultural group;

6.1.4 General Description of Site and Environs

The cultural landscape in the Beaufort West area may be described as a partially organically evolved landscape through farming although there are strong elements of an undomesticated Karoo environment. The overriding quality is one of remoteness - wide extensive landscape morphology typical of the Karroo environment. The landscape is low extending to flat plains, with rocky outcrops.

The Karoo landscape consists of a flat undulating terrain with low shrubs rocks and sand. There are rocky outcrops in places. The general quality is one of vastness with a predominance of horizon and sky with long views. The area is thinly populated and marginal cultivated areas cling to valley and seasonal stream beds.

The vegetation is classified as Karoo Gamka type¹⁰ which is a sparsely vegetated environment of low shrub.

In terms of the farmsteads they are situated in contained watered and partially domesticated environments with planting delineating spatial definitions.

A characteristic feature of the cultural landscape is the presence of windmills. While they do not greatly enhance the cultural landscape and give it unique aesthetic qualities, they do lend themselves to a distinct rural quality of the Great Karoo.

¹⁰ Oberholzer B and Thom Q *Draft Proposed Renewable Energy Facilities in the Westerns and Northern Cape* by Mainstream SA Visual Baseline Report, prepared by B Oberholzer and Q Lawson, July 2010.

These qualities, to a large extent, may be described as rural and remote. The presence of ruins is a strong character in the landscape, showing common themes of isolation, desolation and abandonment. On the basis of the current information it appears that the landscape morphology is typical of the North Central Karoo rather than rare. On account of its low human footprint cannot be considered an “organically evolved landscape” although it does show landscape features very typical of the Karoo.

6.1.5 Palaeontological Significance

A brief outline of the known and expected fossil heritage within the main geological units represented in the study area is given below.

6.1.5.1 Fossil Biotas of the Beaufort Group

The overall palaeontological sensitivity of the Beaufort Group sediments is high to very high (Almond et al. 2008). These continental sediments have yielded one of the richest fossil records of land-dwelling plants and animals of Permo-Triassic age anywhere in the world (MacRae 1999, Rubidge 2005, McCarthy & Rubidge 2005). Bones and teeth of Late Permian tetrapods have been collected in the Beaufort West area since at least the 1820s and this region remains a focus of palaeontological research in the Great Karoo.

A chronological series of mappable fossil biozones or assemblage zones (AZ), defined mainly on their characteristic tetrapod faunas, has been established for the Main Karoo Basin of South Africa (Rubidge 1995, 2005). Maps showing the distribution of the Beaufort assemblage zones within the Main Karoo Basin have been provided by Keyser and Smith (1979, and Rubidge (1995, 2005) – see Figures 6.1 and 6.2.) Two successive assemblage zones are represented within the study area, viz. the Middle Permian Tapinocephalus AZ and the Late Permian Pristerognathus AZ (see Figure 6.2 Keyser & Smith 1977-8).

6.1.5.2 Abrahamskraal Formation

The fossil biota of the greater part of the Abrahamskraal Formation is assigned to the Tapinocephalus Assemblage Zone of Mid Permian age on the basis of key vertebrate fossils, notably large dinocephalian therapsids plus smaller carnivorous therocephalians. The main categories of fossils expected within the Tapinocephalus

fossil biozone (Keyser & Smith 1977-78, Anderson & Anderson 1985, Smith & Keyser 1995a, MacRae 1999, Rubidge 2005, Almond 2010) include:

- isolated petrified bones as well as rare articulated skeletons of tetrapods (i.e. air-breathing terrestrial vertebrates) such as true reptiles (notably large herbivorous pareiasaurs like *Bradysaurus*, small insectivorous millerettids), rare pelycosaurs, and diverse therapsids or “mammal-like reptiles” (e.g. numerous genera of large-bodied dinocephalians (see Figure. 6.3), herbivorous dicynodonts, flesh-eating biarmosuchians, gorgonopsians and therocephalians)
- aquatic vertebrates such as large temnospondyl amphibians (*Rhinesuchus*, usually disarticulated), and palaeoniscoid bony fish (*Atherstonia*, *Namaichthys*, often represented by scattered scales rather than intact fish)
- freshwater bivalves (*Palaeomutela*)
- trace fossils such as worm, arthropod and tetrapod burrows and trackways, coprolites (fossil droppings) and plant root casts.
- vascular plant remains (usually sparse and fragmentary), including leaves, twigs, roots and petrified woods (“*Dadoxylon*”) of the *Glossopteris* Flora, especially glossopterid trees and arthropytes (horsetails).

In general, tetrapod fossil assemblages in this zone are dominated by a wide range of dinocephalian genera and small therocephalians plus pareiasaurs. While relatively few dicynodonts can be expected. Vertebrate fossils in this zone are generally much rarer than seen in younger assemblage zones of the Lower Beaufort Group, with almost no fossils to be found in the lowermost beds.

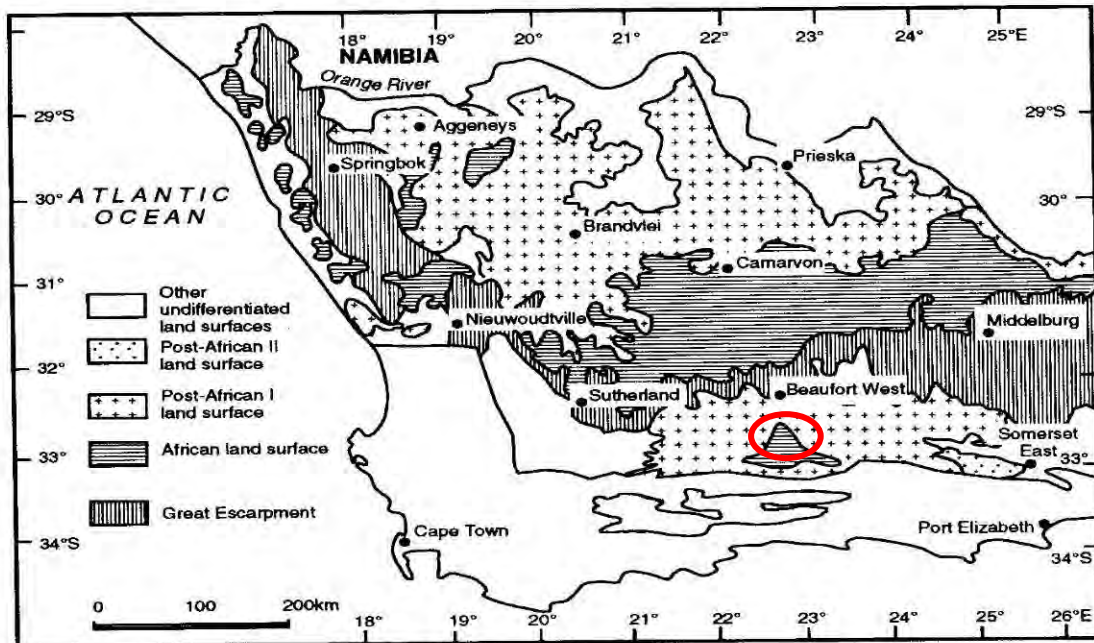


Figure 6.1 Map of south western Africa showing major geo-morphological zones (From Watkeys 1999, after Partridge & Maud 1987). The Karoo study area lies on a relict patch of the Miocene African land surface south of Beaufort West (small red circle).

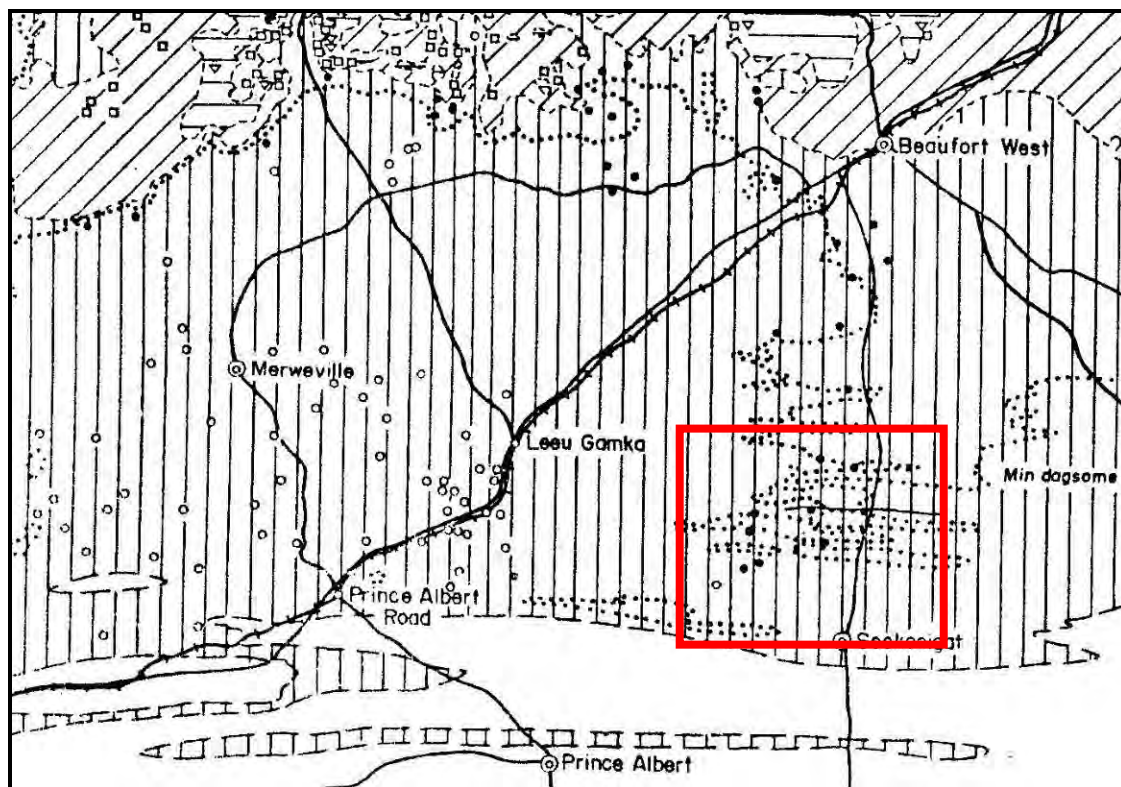


Fig. 6.2 Position of vertebrate fossil localities within the Lower Beaufort Group in the study region, south of Beaufort West. Tapinocephalus Assemblage Zone specimens are found in the far south (small open circles) and Pristerognathus Assemblage Zone fossils (black dots) are associated with outcrops of the lowermost

Teekloof Formation (Poortjie Member) south of town (Map abstracted from Keyser & Smith 1977-78).

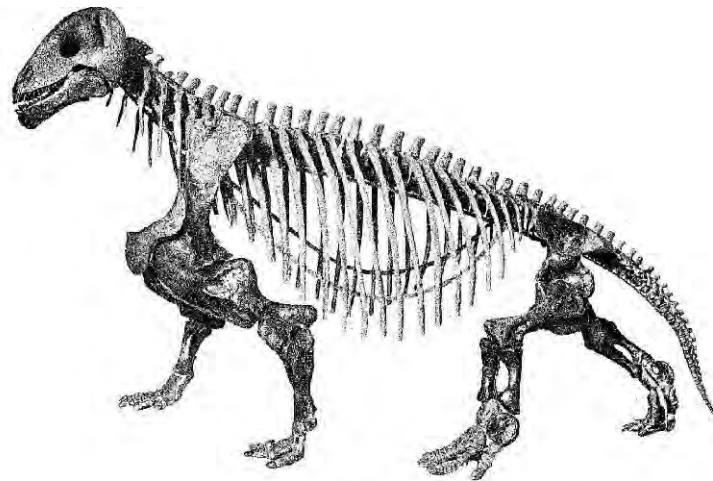


Figure. 6.3 Skeleton of the tapinocephalid (thick-skulled) dinocephalian Moschops, a rhino-sized herbivorous therapsid that reached lengths of 2.5 to 3m and may have lived in small herds.

For the evaluation of the palaeontological impact it is the extent/scale of the deeper excavations to be made that are the main concern, mainly the foundations for the wind turbines, the trenches for connecting cabling and foundation trenches for buildings, latrine pits, dump pits, etc. These large excavations are very likely to uncover fossil and archaeological material, particularly as there will be a considerable number of them positioned over a wide area.

The cabling trenches, although probably quite narrow and shallow (~1.0 m deep) are likely to be of considerable length in crossing the area to the substation. This increases the likelihood of fossil and archaeological material being uncovered. The footings of the transmission line pylons that connect to the grid are likely to be minor in scale and have the least likelihood of fossil finds, although not altogether absent.

These specific thresholds need to be taken into account during the engineering design, construction and operational phases. This will require contingency planning, in the form of an EMP that addresses the accidental discovery of palaeontological and archaeological features and the strategies required to mitigate these finds in order to comply with the NHRA. These may take the form of monitoring briefs or trial excavations.

6.1.5. 3 Archaeological Significance

As discussed previously it is the evaluation of the extent / scale of the excavations to be made on these sites that are the main concern, mainly the foundations for the power lines, sub stations and the trenches for connecting cabling and foundation trenches for buildings, latrine pits, dump pits, etc.

This section identifies the archaeological sites, which were recorded during the survey. For the sake of convenience, they have been divided into sites attributable to the Stone Age and sites belonging within the historical era. Each of the sites was recorded as a waypoint with the GPS coordinates.

Pre- Colonial Sites

Waypoint: MSA 1

The site is at the small koppie, named Varsfontein se Kop on the map, situated on the eastern side of the southern area. There was a fairly dense scatter of artefacts along the summit area of the koppie (Figures 6.4 and 6.5). The assemblage comprised cores (including radial cores), flakes (some of which were thick in section and triangular in shape) and a few blades. No formal tools were seen. Most of the raw material used was a fine grained chert with a reddish outer patina but grey in colour when flaked. The lack of any diagnostic formal tools prevented exact definition but the assemblage was MSA in character.



Figure 6.4 Waypoint MSA 1.
Artefacts amongst stones.
flakes.



Figure 6.5 Waypoint MSA 1.
Artefacts, mainly chert

Waypoints: AM 1 to 4

These four waypoints are situated along the ridge overlooking the Amospoortjie farmhouse and fall into the 5 km buffer zone. They mark the position of an extensive scatter of MSA artefacts which extends for some distance along the ridge (Figures 6.6 and 6.7). The assemblage comprises mostly debitage and resembles the previously described site at Varsfontein se Kop. Most of the artefacts consist of cores (mostly irregular), a variety of flakes (including core rejuvenation flakes) and a few blades. Chert is the most common raw material along with some quartzite. One of the intriguing features was the presence of several roughly arranged stone arrangements utilizing quartzite blocks. It is difficult to assess what, if any, connection these had with the artefact scatter. The bedrock geology of the Amospoortjie ridge which included bedrock quartzite, chert and weathered dolerite as well as quartz would have provided ample raw material for hunter-gatherer exploitation.



Figure 6.6 Waypoint AM 3 View of ridge.



Figure 6.7 Waypoint AM 3 Artefacts amongst stones on the surface.

Waypoint: MSA 2

This site is located on top of a low ridge on the farm track leading from Amospoortjie to Poortjie se Dee in the 5 km buffer zone, close to the line of electricity pylons. The farm track crosses over the low ridge and the stone artefact scatter stretches along the flat top on either side of the road (Figure 6.8). This was the densest artefact scatter recorded and appeared to be a raw material acquisition site due to the bands of quartzitic rock outcropping on the surface. The scatter was characterized by large quantities of debitage and the absence of any formal tools. The assemblage consisted mainly of chunks, cores, flakes and blades (Figure 6.9) but also contained smaller chip elements which suggested working areas. Most of the raw material consisted of quartzite grading into chert.



Figure 6.8 Waypoint MSA 2. mainly chert.



Figure 6.9 Waypoint MSA 2. Artefacts,

Waypoint: MSA 3

The site is located on a low ridge to the south of Trakas Kuilen (Figure 6.10). There was a thin scattering of artefacts on the slope leading up the ridge and a much denser concentration on the flat centre at the top (Figure 6.11). This was an interesting assemblage as it was very different from all the other examples seen in the area. It consisted of cores (fairly small) and some flakes but was characterized by many relatively small blades. Again there was an absence of formal tools although some of the blades evidenced utilisation and retouch. Chert was the most common raw material.



Figure 6.10 Waypoint MSA 3. View of artefacts. top of the ridge.



Figure 6.11 Waypoint MSA 3. Chert

6.1.5.4 Colonial Period Sites

Trakaskuilen (Waypoint: TK)

This is a well known historical farm complex with a variety of buildings of mainly 20th century origin along with more modern structures (Figures 6.12 and 6.13). An interesting feature was the presence of fossil water-made ripple marks in the bedrock mudstones.



Figure 6.12 Waypoint TK. View of the farmhouse.
Waypoints: Dump 1 & Dump 2



Figure 6.13 Waypoint TK. View of farm workers' cottage.

On the farm track between Trakaskuilen and Varsfontein there was a farm activity area consisting of a mixture of contemporary and older structures. It neither marked nor named on the 1: 50 00 map of the area. The more recent structures included a sheep dip and two large stone walled kraals but the most interesting features were two historical dumps (Figures 6.14 and 6.15). Visible on the surface were ceramic fragments (20th century), broken glass and pieces of rusty iron. A single Martini-Henry cartridge was noted.



Figure 6.14 View of Dump 1.
Dump 1.



Figure 6.15 Near Waypoint
View of stone kraal.

Sites Outside the Proposal Area within the 5 kms Radius with Possible Impact Implications

Weltevrede (Waypoint: WEL)

This site is outside the designated area but included some old farm cottages, the remains of brick and dung walling (Figure 6.16) and a ruined house (Figure 6.17).



Figure 6.16 Waypoint WEL. View of dung and brick walling.



Figure 6.17 Waypoint WEL. View of ruined house.

Amospoortjie (Waypoint: AM)

Amospoortjie is a large farming complex with a mixture of modern and older structures. Perhaps the most interesting architectural features are a series of large, stone-walled kraals, with the tops painted white, adjacent to an old barn (Figure 6.18). In terms of historical archaeology the occurrence most worthy of note is the widespread scatter of debris on the terrace above the farm (Figure 6.19). This included ceramic pieces, broken glass, rusted iron and burnt bone, most of which is attributable to the 20th century. There was also a minor Stone Age presence with occasional chert artefacts.



Figure 6.18 Waypoint AM. Stone kraals of terrace with white painted tops.



Figure 6.19 Waypoint AM. View

Dwaalfontein (Waypoint: DW)

Situated along the road east from Amospoortjie, the farm settlement included a well preserved mid to late 20th century house (Figure 6.20) and old farm buildings (Figure 6.21) as well as a general scatter of glass and ceramics.



Figure 6.20 Waypoint DW.
View of farmhouse.



Figure 6.21 Waypoint DW.
View of farm building.

Waypoint: Graves 1

Located just outside the study area, in the 5 km buffer zone to the west of Poortjie se Deel, several stone covered burial mounds were noted close to the road and near a small water course (see Figure 6.22). This appeared to be an informal grave area as there was no enclosure and no headstones. There are the remains of a ruined settlement close by. It is neither marked nor named on the 1: 50 00 map of the area.

Waypoint: Graves 2

Close to Poortjie se Deel in the 5 km buffer zone a mound of natural stones close to the road thought to include a possible burial site (Figure 6.23)... There was a thin scatter of blue glass and ceramic fragments around the mound.



Figure 6.22 Waypoint Graves 1.



Figure 6.23 Waypoint Graves 2.

6.2 Architectural/ Historical Significance & Conservation-Worthiness

6.2.1 South Site: Trakaskuilen and Portion Witpoortjie (Trakas Project Area)

General description

This site straddles the N12 that runs south from Beaufort West to the Swartberg Mountains. The site is situated within a flat dry plain typical of the Great Karoo with a vast isolated landscape punctuated by shallow depressions and ridges. The Trakasrivier runs in a south west direction across the site. The main Trakaskuilen farm is centrally situated along the river.

The area is dry and featureless; the only significant visual landmarks are the power lines that run parallel to the N12 on its west side. To the south, the view is framed by the distant Swartberg Mountains which create a striking contrast to the sandy shale rock and sparse scrub of the Karoo. More prominent ridges lie to the north of the property, with the highest koppie (identified as Varsfontein) offering sweeping views to the north and south. From here one can just make out the mountains bordering Beaufort West and the Great Karoo National Park (see Figures 6.24 and 6.25).



Figure 6.24: Panorama looking north-east towards Beaufort West from the top of Varsfontein.



Figure 6.25: Panorama looking south to the Swartberg Mountains from the top of Varsfontein.

Farms and/or structures within a 5km radius of this area include Amospoortjie, Dwaalfontein, Tierpoort, Kwaggabank, Weltevreden, Leeuwrvier, Leeuwkraal, Kapteinskraal, Groot Antjiesfontein and Platdoorns. The first three lie to the north of the Varsfontein ridge which may partially mitigate the visual impact of the turbines and are described more fully in section 6.2.6.

Site 1: Trakaskuilen

This werf consists of the main house (Figure 6.26) and a small shed, surrounded by three small labourers' cottages, one larger labourer's cottage, and a shearing shed with attached kraal. Further out is an abandoned building, nearby which are small ruins and rubble piles. There are two dams to the west and east of the main house. Plantings are restricted to around the main house and labourers' cottages. Further out on the south ridge are ruins of a kraal and shepherding hut (Figure 6.27). All are ungraded.



Figure 6.26: Trakaskuilen Farmhouse, gable ends dated 1957 and 1975. Not older than 60 years. Ungraded. (GPS: 32,57.0434 S 22,32.8995E) within a cluster.

- Farmhouse: Not older than 60 years, ungraded.
- GPS: 32,57.0434S 22,32.8995E
- Shed: Small corrugated iron shed: Mostly cement brick: Not older than 60 years, ungraded. GPS: 32,57.0434S 22,32.8995E
- Labourers' cottages: A group of 4 pitched roofed rectangular labourer's cottages adjacent to a large eucalyptus tree. Largest dated 1990. Not older than 60 years, not graded. GPS:32,57.1118S22,32.8990E

- Stone kraal, disused dwelling and shearing shed. The kraal is composed a flat local shale with cement mortar, set with cement. The shearing shed has partial stone walls. The east gable is dated 1954, ungraded not older than 60 years.
GPS: 32,57.0056S22,32.9488E

Adjacent ruins: There are a number of adjacent ruins, which indicate that the farm werf at Trakaskuilen was abandoned, and the farm werf rebuilt in its current location between 1950 and 1970. These ruins are likely to be the site of the original werf considering the road and service line lead to this point. The ruins of the small structures consist of crumbling sun dried brick and stone. Probably older than 60 years but not graded. GPS: 32,56.9817S 22,33.0979E



Figure 6.27: An example of one of three ruined structures close to the current Trakaskuilen werf.

Site 2: Witpoortje

This farm was consolidated into the Trakaskuilen estate in the 1950's. Its current status is as an outlying sheep shelter and windmill site. The werf consists of a dipping kraal, a modern sheep shelter, two large stone kraals and a stone shepherding hut. All have fallen into disrepair.

In between the stone kraals and the modern shelter is a dam, lined by mature trees. The site has no direct line-of-site with the main homestead of Trakaskuilen, but does enjoy sweeping views of the surrounding veld, with a clear distant view of the Swartberg.



Figure 6.28: Dipping kraal: a low-walled rectangular structure made of local stone. It has two entrances, one leading to a small pool. Adjoining fences indicate its likely use as a dipping kraal. Graded 3c. GPS:32,56.9691S22, 36.9005E

There are two large stone kraals used as cattle pens (Figure 6.28) in the vicinity of the dipping pen, now partially collapsed. Nearby is a stone shepherding hut (Figure 6.29), with surrounding debris to indicate use into the mid-20th century. These together with the dipping kraal are interesting pastoral remnants but have not necessarily of cultural significance particularly as their age is unclear. This early ensemble is of interest as a record of early pastoral farming activity and therefore is of historical economic significance at a local scale. Ensemble graded 3c. GPS:32,56.9366S22,37.029E



Figure 6.29: Stone ruins: ruins of small rectangular building. Building construction typical of the period. Date unclear, ungraded. (GPS: 32,57.6409S 22,39.6747E)

Most of the farmhouses consist of a very modest layout – a main homestead, a storage shed or barn, a few labourers' cottages of small scale, and a shearing shed with attached kraals. This arrangement was most significant at Amospoortjie, though also seen at Trakaskuilen.

The site identified for the wind farm covers the farm of Trakaskuilen, the edge of which is intersected by the N12 highway. Parallel to this highway, on the west side, are two rows of power lines. From the N12 the landscape of the site is a typically expansive one, with soft undulations and the occasional ridge. With the main homestead of Trakaskuilen situated in close proximity to the highway, the power lines, substations and turbines on the farm would be highly visible but would require an independent viewshed analysis to rank the overall impact. The land rises to a distinct high ridge on the northern border of the farm, the high point known as Varsfontein. From atop this ridge there is a considerable drop down to a plain that extends towards the mountains of the Karoo National Park. To the south the line of the Swartberg is highly visible, both mountain lines forming a frame to the expanse of the Karoo. The Swartberg range is the more distinct of the two, being most visible along the N12 travelling south from Beaufort West. There are impressive views of the quartzite banding of the range, and the contrast of the typical 'folds' of the Cape's mountains with the landscape make for a fairly iconic view. Trakaskuilen enjoys a clear view of the Swartberg, along with Leeuwkraal.

From the Varsfontein ridge, the farms on the plain below include Amospoortjie, Dwaarsfontein, and Tierpoort. The last two have the best view of Varsfontein, and would like be most affected by the turbines would they be sited on the ridge. Amospoortjie itself is situated on a separate ridge to the north of the Varsfontein ridge, though they are part of the same formation. Its view is exclusively north-facing, and lying alongside the N12 it provides a striking ensemble of farm buildings and overall werf design. Were turbines to be placed on the Varsfontein ridge, they would be most visible from the south-travelling approach of the N12i.

6.2.2. Sites Outside the Proposal Area but within the 3-5 kms Radius with Possible Visual Impact Implications (Beaufort West site)

Farm at Dwaalfontein

This site lies outside the affected but is assessed by virtue of its proximity to the affected area. The site is situated within an area (i.e. the Varsfontein Ridge) that may be affected visually by the proposed wind turbines it should also be noted that the Varsfontein Ridge has been identified as being of high archaeological significance. The farm consists of a series of three separate but connected sites with the shed being in close proximity. There are sweeping views to the north, and to the south is a distinct view of the Varsfontein ridge. The first site is located on a river, but at present

contains nothing but derelict and empty structures. It also includes a corrugated iron sheep shelter and a windmill, neither of which are older than 60 years.

The second Dwaalfontein site is a grouping of modern wood cabins, bordering a property with a game fence. These are not older than 60 years and not conservation worthy and consequently are not listed and mapped.

The sites older than 60 years include the following:

The Main house, a simple late nineteenth century rectangular farmhouse with a corrugated iron roof and veranda which extends the full length of the front façade. Steel framed windows have replaced earlier fenestration. The house is situated within a partially treed environment and faces the road (Figure 6.30). The building is older than 60 years but is currently empty and abandoned. It is of conservation significance on account of its age and the fact that it is an example of a simple stock farmer's house. The layering adds to its value as an indication of the changes made to buildings over time. It should be noted that the site has been graded in architectural/historical terms, but if the process of decay continues, further decay may affect its significance and the building as well as related outbuildings may lose their 3c grading as a result. Grading: 3c GPS: 32,54.4734S 22,39.2376E



Figure 6.30: The main house at Dwaalfontein, a simple late nineteenth century farmhouse with a corrugated iron roof and verandah. **Graded 3C.** GPS: 32,54.4734S 22,39.2376E

There is an additional outlying structure of note, a flat roofed stone shed (Figure 6.31, 6.32). This may be the oldest structure in the ensemble and is considered part of the grade 3c ensemble. Grading: 3c GPS: 32,54.4913S 22,39.2687E



Figure 6.31: Shed – a rectangular metal pitch-roof structure with repairs to the east wall. This structure together with the shed and farmhouse may be considered a grade 3c as an ensemble but is of little intrinsic worth as has been substantially changed over time. **Graded 3c.** (GPS: 32,54.4929 S 22,39.2731E).



Figure 6.32: Outlying structure, a flat-roofed stone shed.

Other buildings in the dispersed group are not considered noteworthy and are not listed not graded.

Ruins at Leeuwrivier, Farm Wolwekraal

These sites lie outside but adjacent to the Beaufort West study area in the 5 km buffer zone. Overhead powerline, and an inoperative windmill indicate this farm was used in the mid to late-20th century, but the structures that remain are ruinous. They are placed in a linear fashion along the river and materials of the ruins vary from local stone to baked clay bricks. There is strong evidence of a substantial farmhouse with “bakoond” as part of the ruins. The structure is older than 60 years, outside study area. Ungraded. GPS: 32,57.9854S 22,40.5933E

Farm at Amospoortjie

The site lies outside but adjacent to the Beaufort West study area in the 5 km buffer zone. It is close to the N12 where there are clear views of the werf and north of the study area. This werf represents the most unique collection of historic buildings in the area.

The site has a number of structures dating from the mid to late 19th century until the present. There is a distinct sense of layering of the buildings, and the care of the site, especially in the care of the graveyard, indicates a strong connection by the family with the place, and an enduring commitment to it and the structures. The buildings are sited north-facing on a ridge that runs perpendicular to the highway (Figure 6.33 and 6.34). On the other side of the ridge is the Wen Dam. The approach from the N12 is formally planted with aloes, and is flanked by old stone walls. This leads to a barn, behind which is the main house. To the west of the main house is the graveyard, and to the east are the labourers’ cottages. West of the barn and below the labourers’ cottages is a shed with three large stone kraals attached. Buildings are limewashed with the early house (now the barn) being a simple T-shaped building with a pitched roof and flanking flat roofed wings used as sheds. These appear to be more recent.

With its south views restricted, the farm enjoys north and west views, which include a series of ridges. The main house is more recent and has no historic or architectural merit.



Figure 6.33: Farm at Amospoortjie. **Graded 3b.** (GPS: 32,53.4986 S 22,33.3615E)



Figure 6.34: Graveyard: parts of which are older than 60 years **Graded 3c.** (GPS: 32,53.55 94 S 22,33.3224 E).

6.3. Heritage-Related Thresholds for Development

The following constraints and thresholds are considered. They are informed by field visits by Manhire and Botha and a desktop evaluation by Patrick, Atwell and Gray in 2010. The revised of proposal is considered by Patrick and Attwell in 2016.

The heritage statement in Section 6.1 of this report; the draft Visual Baseline Report for Beaufort West (Oberholzer & Lawson 2010); Clarke 2011 and CNdV Africa's draft report for the Provincial Government Western Cape (PGWC) on the assessment of wind farms, as addressed in Section 5.4.2 of this document.

Visual impacts from the proposed wind farm will not have a significant heritage impact on the various historical structures and settlement sites within and around the property given their low (Ungraded or Grade 3C) heritage status (Section 6.1). However, given that the site and its overall physical context is of some scenic significance, thresholds relating to visual impact are of some relevance. These development thresholds are based on an underlying recognition that the wind farm would, at least to some extent, redefine the Beaufort West landscape as a technological landscape, without negatively impacting on other possibly more visually sensitive landscapes beyond. Development thresholds would include the following:

6.3.1. Power Lines

Although the overall shape and form of the power lines are pre-determined by their function, choice of location, distribution of units and colour they can be significant factors in mitigating visual impacts to some degree. More specifically:

- Setbacks from the N1 for closest units (particularly for the proposed 20-40 m power lines to be located within an area with 80 m high pylons) should be sufficient to avoid over-scaling the N12 view corridor within what is still essentially a remote rural area. Guidance should be sought from the EIA VIA in this respect. Noise and flicker are not addressed here, as these factors would potentially have negative land-use, rather than negative heritage-related consequence. Potentially negative land-use consequences are, however, dealt with as part of the EIR.
- Distribution of units: Units should be distributed with enough space in between, to avoid visual clutter, and allow views through units towards the hill and mountain backdrops. Guidance should be sought from the EIA VIA in this respect.
- Relationship to built heritage: Power lines and Sub Stations should be positioned so as not to interfere / intrude upon backdrops to historic buildings, farm werfs and other historical precincts of high architectural and aesthetic significance (e.g. Amospoortjie and the Balie Graveyard).
- Relationship to biophysical heritage: Power lines and Sub Stations should avoid all areas of high biophysical significance including areas containing critically endangered botanical and faunal species. Guidance from the specialist botanical and faunal studies prepared in terms of the over-arching EIA should be sought in this respect.

- Relationship to palaeontological & archaeological heritage: Power lines and Sub Station should avoid areas of high palaeontological / archaeological significance, i.e. where mitigation through careful recovery and recording is not an option.
- Relationship to skylines: Power lines Sub Stations should be positioned so as to be framed by mountain backdrops wherever possible, the purpose being to merge with such backdrops. No units should be located on the crests of hills or mountains so that they break the skyline.
- Finishes: Metallic and highly reflective finishes are to be avoided. Colours contrasting strongly with the surrounding landscape are to be avoided. This would include white. Muted tones of grey are generally found to be least obtrusive for support structures, power lines, O&M buildings, sub stations, as well as the turbine pylons and turbine blades, particularly when framed by mountain backdrops.

6.3.2. Substations and Ancillary Structures

As in the case of the wind turbine units, choice of location and colour finishes of the various support installations can be significant factors in mitigating visual impacts. In addition, landscaping and building envelope configuration can also be important mitigating factors. More specifically:

- Location and orientation of structures: Because of the coverage, size and clustered nature of these structures, these should preferably be screened from the N1 behind outcrops or located in depressions that would reduce their visual profiles as seen from the N12. Landscaping measures including berms as screening or partial screening elements could also be considered. Where this is not possible due to other environment considerations (e.g. botanical, faunal, archaeological, etc.) such structures should preferably be located at least 2 km from the N1 or as otherwise informed by the VIA. Buildings should present as low a profile as possible to the N1. Construction on slopes involving anything other than minor cut and fill should be avoided. Construction on skylines is to be avoided at all costs.
- Massing and scale: Structures that exceed the general scale, massing and spatial distribution characterising the werfs may require partial or full screening as mentioned previously. Structures that are low scales and configured to hug the ground would be encouraged. Hard jagged roof profiles and large gable ends

facing the N1 are to be avoided in favour of simple pitched roofs or, in the case of larger structures, bow-shaped roof silhouettes where possible.

- Relationship to built heritage: Such structures should be positioned so as not to interfere / intrude upon backdrops to buildings, farm werfs and other historical precincts or architectural and aesthetic significance – even though some the farm werfs are of lesser significance.
- Relationship to biophysical heritage: Such structures should avoid all areas of high biophysical significance including areas containing critically endangered botanical and faunal species.
- Relationship to palaeontological & archaeological heritage: Such structures should avoid areas of high palaeontological / archaeological significance, i.e. where mitigation through careful recovery and recording is not an option.
- Finishes: Metallic and highly reflective finishes are to be avoided for all masts and substation gantries. Colour finishes contrasting strongly with the surrounding landscape are to be avoided. This is particularly applicable to large roof areas. Muted tones of grey should be considered. These are generally found to be least obtrusive.

6.3.3. Roads

- Cuts into hillsides: Service and other roads that cut extensively into hillsides (i.e. where the resulting embankments cannot be rehabilitated to match the surrounding topography) are to be avoided. All embankments created by minor cuts must be rehabilitated in accordance with an applicable conservation management plan.
- Road surfacing: Roads are to be surfaced to blend with the existing topography, i.e. preferably natural local gravel.

Section 7. Identification of Key Issues and Heritage Hot Spots

In the previous section the cultural significance of heritage resources was determined and a value ascribed to each of the sites discussed to ensure that responses in development terms are appropriate and do not adversely impact on the heritage significance of the development footprint.

In this chapter key issues that require consideration are set out as a series of observations.

7.1 Key Issues

Key issues identified as part of this heritage assessment include the following:

- Identifying and establishing the significance of heritage resources within the study area;
- Establishing the extent of palaeontological objects and material, meteorites and rare geological specimens
- Establishing the extent of human activity , both prehistoric and historic, in the landscape that has left an archaeological footprint likely to be impacted by the proposal;
- Establishing the extent to which built heritage resources are likely to be impacted on by the proposals, both physically and visually;
- Establishing the extent to which the scenic quality of the area would be affected, with particular attention to views from the N1;
- Establishing the extent to which the sense of place of the Beaufort West area is likely to be affected by the proposals;
- Establishing the extent to which the abovementioned impacts are capable of being viably mitigated;
- Differentiating between heritage impacts and land use impacts; and
- Offsetting potential negative impacts against sustainable socio-economic benefits to be derived from the proposals (in accordance with NHRA 38 (3) (d)).

The following interim observations can be made on the basis of the data collected during the desktop studies/ filed survey and are set out in Figure 7.1.

7.2 Observations Relating to Palaeontological Heritage Resources

It is imperative that there is palaeontological fieldwork input into the project before construction takes place, including the power line routes and footings for the pylons. Valuable fossils are found at the surface as a result of natural erosion and weathering and are risk of damage in the pre construction phase unless mitigation measures are in place.

Bedrock excavations during construction of the proposed wind energy facility to the south of Beaufort West will primarily impact continental sediments of the Abrahamskraal and Teekloof Formations of the Lower Beaufort Group (Karoo Supergroup). These Mid to Late Permian sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (e.g. trackways) and plants (e.g. petrified wood).

Observation: The Abrahamskraal – Teekloof stratigraphic interval is of special palaeontological significance in that it contains a record of a catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago. For this reason the palaeontological sensitivity of the Beaufort Group sediments in the study area is consequently very high.

The Caenozoic surface sediments (e.g. alluvium, fluvial gravels, colluvium) are generally of low palaeontological sensitivity, although sparse fossil remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here.

7.3 Observations Relating to Archaeological Heritage Resources

The results from the desktop study and fieldwork indicated that archaeological residues relating to Early Stone Age and Later Stone Age periods are notably scarce in this part of the Karoo. However, several Middle Stone Age open artefact scatters were recorded during the field survey with much of the activity seemingly revolving around raw material acquisition strategies. There was a distinct lack of formal tools in the assemblages encountered, most of the artefacts being flakes, chunks and cores. There was also a general MSA presence in the form of occasional artefacts seen across the open veld.

Observation: The site at Varsfontein se Kop situated on the southern area has a fairly dense scatter of artefacts along the summit area of the koppie. The assemblage comprised cores (including radial cores), flakes (some of which were thick in section and triangular in shape) and a few blades. No formal tools were seen. Most of the raw material used was a fine grained hofels with a reddish outer patina but grey in colour when flaked. The lack of any diagnostic formal tools prevented exact definition but the assemblage was MSA in character. There is a possibility that further sites, in particular sub-surface in nature, may exist and for this reason the archaeological footprint of the site is deemed of medium sensitivity

In terms of colonial period archaeology, there several farm complexes which have been in operation for a long period as evidenced by the presence of buildings of historical value along with dump areas containing a wide variety of ceramic and glass artifacts.

7.4 Observations Relating to Built Environment and Precincts as Heritage Resources

The site contained remnants of early history and settlement. The structures throughout the southern sites show signs of layering and changes which make historic fabric hard to assess. Notable (3b) heritage sites were found on the periphery of the affected areas which are of social/historical significance. While not physically affected by the proposal there were likely to be visual impacts in terms of siting of the power lines and turbines. All impacts were likely to be visual in nature. Heritage significance in all cases was considered local.

Observation: It is noted that many of the sites viewed and identified as older than 60 years were ruinous in nature and uninhabited and could not be graded.

Observation: The power lines, turbines and sub stations close to these farm settlements are likely to have a high impact on the landscape character of the site. Impacts on these precincts from a land-use perspective (i.e. as affecting local property owners) may, however, be of greater significance and would need to be dealt with separately.

Observation: In terms of the farmsteads, most are relatively modern having possibly replaced earlier stone farmhouses, and are situated in contained environments with some planting of trees delineating spatial definitions. This is restricted by the dryness of the environmental conditions however. The landscape qualities may be described as rural and remote. In the case of the abandoned farms and buildings, there is also a quality of dereliction.

7.5 Observations Relating to the Scenic Qualities of the N12 as an Heritage Resource

The N12 Route, which passes through the area, although an important arterial, is not considered an important scenic route along this particular stretch.

7.6 Observations Relating to the Beaufort West Cultural Landscape as an Heritage Resource

The strict definitions of cultural landscape have been applied in this report as per the World Heritage Convention. In terms of this definition the entire site is not part of a cultural landscape despite its scenic and remote qualities. The landscape was flat and consisted of low scrub and bush, with long views across an extensive dry empty landscape, with subtle ridges punctuating the plains. The overriding quality is one of remoteness - wide extensive landscape morphology typical of the Karroo environment. The landscape is low extending to flat plains, with rocky out-crops.

Observation: This landscape did not fulfill the criteria of a significant cultural landscape. There were pockets of domesticated farmland, including dams and the farm werfs themselves including graveyards and ruins although the area is dominated by open undomesticated landscapes.

Observation: The site demonstrates a strong landscape character where the rural and dramatic natural landscape predominates, and farmsteads and related agricultural activity remain dwarfed by the extent and expansive nature of the mountain uplands and the granite outcrops.

Observation: It follows that (unmitigated) heritage impacts from the proposed wind farm on the sit's built precincts are likely to be of medium significance.

7.7 Observations Relating to Socio-Economic Benefits to be Derived from the Proposals

In terms of Section 38(3) [d], the report found that the socio-economic benefits were high with the introduction of investment into a relatively low yield pastoral economy. Sustainable benefits were high relative to the introduction of “clean” energy facilities.

Observation: The proposed new wind generation facility is likely to provide not only sufficient power for local needs, but also surplus energy for the national grid. The local authority would be keen to use such surplus funds for skills development and other social upliftment programs via a specially created trust. Given the high degree of unemployment and rural poverty in the area, this would appear to be a significant consideration.

Observation: More recently (2015) Mainstream Renewable Power has “conducted preliminary analysis of South Africa’s wind and solar resources to understand the impact of introducing larger quantities of renewable energy to the electricity system. The initial results reveal two significant findings; firstly, electricity generated from wind and solar resources closely follows the nation’s electricity demand profile, meaning they generate power at the time of day it is most needed. Secondly, when wind and solar generation are combined, the net effect is a significant contribution to base-load power” (Mainstream Southern African Web Page 2015).

7.8 Observations Relating to the EIA VIA (2010)

An integrated approach to both the VIA and the HIA in the assessment of cultural landscapes and heritage resources was undertaken 2010 at the request of HWC. It further required that consideration be given to the impact of the proposal on PHS including possible historic farmsteads.

Observation: The report has identified that there are no PHS in the affected area although there are sites of cultural significance, which may be affected by the proposal. A VIA (baseline study) was undertaken by Oberholzer and Lawson in 2010. VIA data for the 2015 revised proposal does not form part of this assessment and is subject of a separate study commissioned by SiVEST. Nevertheless, the study

analysed the landscape of the affected environment and provided a review of the likely visual impact on the receiving environment. The following were referred to in that assessment with heritage comments added by the authors of the HIA:

The following was the assessment.

- The character of the site would likely be significantly altered by the proposed facilities
- Because of the low extensive views the development would be seen from a considerable distance away.
- Despite the reduction in the number of wind turbines two additional power lines, each with a range of 4-7 km and associated pylons would have a significant visual impact where they are located on ridges or skylines
- This would be offset to some extent by the remoteness of the site and the fact that there are existing power-lines along the N12 corridor.
- The N12 Route, which passes through the area, although an important arterial, is not considered an important scenic route along this particular stretch.
- The visual effect on specific farmsteads in the area will need to be determined during the PPP and visual impact assessment.
- The site is reasonably remote, with few major visual constraints.
 - *Comment* The spaces required to accommodate the pylons for the new power lines will only be ascertained during the detailed design phase of the EIA and will vary according to the terrain and other factors which will determine the span distance. Pylons could be incorporated in the river corridors and will ultimately be determined by prevailing wind directions, but should follow the grain of the land as far as possible
 - *Comment* The area is topographically varied, and therefore the micro-siting of the substations and internal access roads should take the direction of ridgelines, drainage courses and contours into account.

The following exclusion zones were identified:

Infrastructure: The proposed substations and O&M building should be sited at least 500m from the N12 Route, and concealed by topography or vegetation if possible. All structures should be grouped together to minimise a scattered effect. Proposed power-lines should be located at least 1.0km from the N12.

- No power lines should be located on any ridges, including minor ridges in the open landscape, or in drainage courses, including dry drainage courses. Setbacks from drainage courses need to be determined by a hydrologist.
- A setback of 1.0km from the N12 is recommended on this particular site.
- A minimum setback of 500m from farmsteads is recommended.
- A 250m setback from farm boundaries should be observed.

Built Environment: The town of Beaufort West and the Karoo National Park is located 45km to the north beyond the zone of visual influence of the proposed energy facilities. Only small farm settlements, including a game farm, occur within the viewshed of the site. An Eskom power line runs adjacent to the N12.

- *Comment:* The flat, open nature of the landscape means that any structures and associated lights will be seen over long distances, particularly if these are located on ridgelines. The environment is regarded as **of moderate** relative scenic significance.

Landscape character: The site would likely be significantly altered by the proposed facilities.

- *Comment:* It is noted that pylons for the power lines close to farm settlements are likely to have a **high visual** impact on the landscape character of the site.
- This may be offset where there are power lines
- *Comment:* Existing power lines bisect the development area to the east of this site and as such constitute an existing visual intrusion.
- The proposed power lines and sub stations would have a significant visual impact where they are located on slopes or skylines
- *Comment:* The development thresholds identified in the HIA recommend that skylines and exposed slopes be avoided in order to reduce visual impact.
- There is a potential impact on farms, ecotourism, and game farming which will need further investigation
- *Comment:* Potential impacts on farms, ecotourism and game farming are not considered heritage impacts in terms of the HIA and need to be explored more fully under the EIA.
- Heritage sites increase scenic values
 - *Comment:* No heritage sites of any great significance have been identified. Scenic values are, as a partial consequence, regarded as **of MODERATE** heritage significance.

7.9 Observations Relating to the Heritage VIA (2011)

The results of the new VIA study, conducted by an independent specialist, will specifically address the power lines and substation placements, and should be incorporated into the EIA report by the environmental consultant.

The specialist report on the cultural landscape notes:

Buildings older than 60 years are contained within farms werfs on the farm Amospoortjie (Farm 374). These sites were outside the study area but are likely to be affected visually by the proposal.

Observation: Amospoortjie Farm lies more than a kilometer from the southern portion of the proposed wind farm. The view from the farm is to the north therefore the wind farm is outside the dominant view and will be more visible from the approach to the farm on the N12.

The distance of the wind farm from the Amospoortjie farmstead and approach, the poor visibility of pylons and the lack of impact of the wind farm on the dominant landscape of the farm combine to make the overall visual impact score LOW (farmstead) to VERY LOW (approach). The tips of the visible pylons will be silhouetted along the valleys ridgeline however the existing 132kV and 400kV powerlines running between the farmstead and proposed wind farm add clutter to the landscape and reduce visibility of the turbines.

Overall heritage observations arising from the above:

Given that there are sites of heritage significance within the study area, and given that the Beaufort West cultural landscape has been identified as of moderate heritage significance, it follows that the rating of visual impacts in terms of this HIA could differ from the rating of visual impacts in terms of the VIA. Nonetheless, the following heritage hot spots and/or 'no-go' zones for development are identified bearing in mind the VIA constraints in Section 7.1.5 above and Figure 7.1.

7.10 Heritage Hot Spots and No-Go Areas for Development

Heritage hot spots are identified as those areas in which impacts on heritage resources (in this case the cultural landscape, palaeontological and sites of biophysical significance) would be particularly sensitive. This data is set out in figure 7.4. In such areas, detailed study including possible archaeological excavations and commissioning of watching briefs where sufficient prior investigation would not be possible, would be required before construction could commence.

No-go areas for development are identified as areas that are so sensitive, that no development whatsoever is recommended there.

The following areas are considered:

Palaeontological and Archaeological Sites

Although palaeontological desktop investigations have so far shown the site to have medium /high potential, the palaeontological impact and has yet to be properly confirmed by fieldwork; sub surface deposits may be exposed during the construction of the power lines and sub stations , or the development of other infra structure features. Until this is done, all proposed development areas must be considered provisional HOT SPOTS until such time as further study discounts these areas as sensitive, or until at least appropriate watching briefs have been concluded.

Archaeological sites are not considered hot spot as sub surface artifacts are unlikely to occur in a deflated landscape.

Biophysically Sensitive sites

All biophysically significant sites as identified in the botanical, faunal and avian specialist studies, are to be regarded as heritage HOT SPOTS. The portion of the site in which critically endangered species are located are identified as NO-GO areas for development.

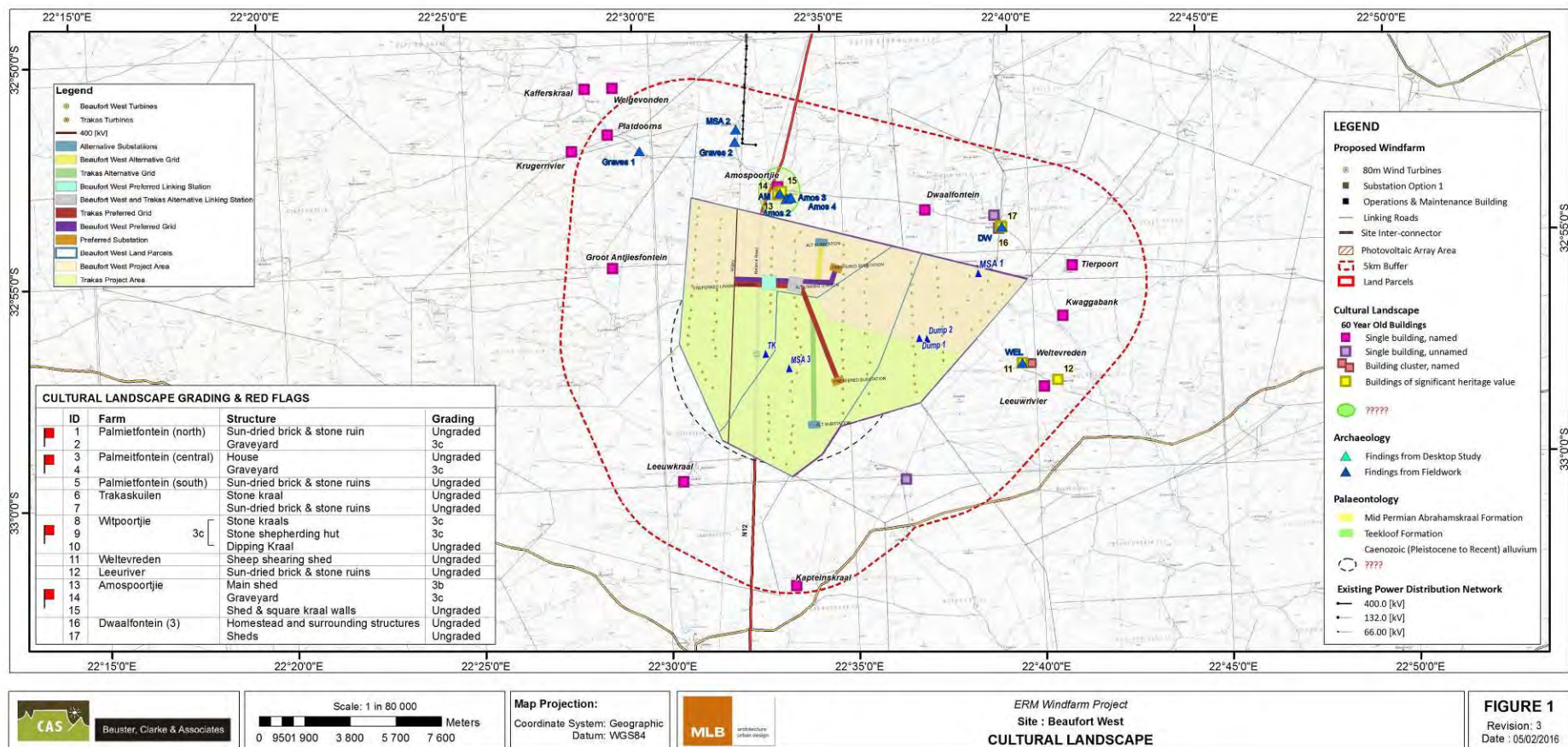


Figure 7.1: Site location map that identifies **heritage objects** located on the Beaufort West land parcel, including within the 5 Km buffer zone. These include palaeontological, archaeological and built environment features that have been evaluated and graded (Reference Patrick & Clarke 2010 and Lawson 2016).

Section 8: Scenarios Considered in the Impact Assessment

8.1. Assessment of Heritage Resources

From the proposed location of the power lines and sub stations it is clear that the cultural significance of some geological formation, archaeological features, farmsteads, graveyards, and their context may be impacted by proximity to these ancillary structures. The report considered that the NHRA criteria were applicable in certain instances within the study area and on its perimeter where visual impact is an issue. This grading applied to sites of significance which were older than 60 years

Fossils, archaeological remains and cultural landscapes are rare objects, often preserved due to unusual circumstances and are non-renewable resources. When a development is proposed and specialist studies are undertaken as part of the wider evaluation of heritage resources, desktop / field studies, as well as excavation, they furnish “windows” of opportunity into a depository that would not otherwise exist. In this sense the impact is POSITIVE for palaeontology, archaeology and the cultural landscape provided that efforts are made to preserve or mitigate heritage resources in the study footprint, prior too and during the construction phase of the development. For this reason four development scenarios, informed by EIA constraints are considered in this study, including the no-development / no-go option.

The general nature of impacts from the proposed development will be visual with regard to spatial and built heritage, and physical with regard to biophysical, palaeontological and archaeological heritage resources. Final layout decisions have not been fixed in relation to heritage resources and other concerns and may be amended as mitigation measures are implemented. The project alternatives are presented in Figure 8.1 with a brief summary concerning the development design of the layout plan. Section 9 of this report presents the extent, duration and intensity of the impacts on all heritage resources.

The aim of considering layout alternatives was to balance the technical and financial objectives of maximizing the output of the proposed facility with the other critical

environmental and social constraints including visual, noise, botanical, faunal, heritage and avifaunal.

8.1.1. The No- Go Alternative

Environmental and heritage legislation requires the consideration of the no-go option. There will be impacts as the project would not proceed. There would also be no socio-economic benefits or increase in energy generation of renewable energy sources (see Section 5 of this report for a full description of the legal requirement).

8.1.2. General Description and Implications

The no-go alternative implies that the proposed project would not be implemented and the renewable facility would not be developed at the proposed site.

8.1.3. Observations

There will be impacts if the project would not proceed. The implication of this is that there would be “no increase in electricity generation from the facility, no CO2 offsets associated with the proposed development and no economic benefit to the landowners or additional socio-economic benefits associated with the potential income generated through the construction and operation of the facility. National and provincial government has set renewable energy targets and made commitments to reducing their reliance on coal, the no-go would not contribute to achieving these goals” (Draft EMP Revision 2: January 2011).

8.1.4. The Alternatives

The Beaufort West land parcel assumes 140 turbines on site. Figures 8.1 show the position of the power line corridors and substations in relation to heritage resources identified during the Scoping HIA phase. The proposed infrastructure footprint to be authorised during the EIA includes: 1 Linking station, 2 substations and 2 power lines.

Table 8.1 ranks the impact of the site layouts according to the overall impact that the development footprint will have on heritage resources. Final layout decisions have not been fixed in relation to heritage and other concerns and may be amended as mitigation strategies are requested during the EIA process.

- 1 Linking station (600m x 600m). There are 2 alternatives being considered.

- 1 Beaufort West Substation (500m x 300m). There are 2 alternatives being considered.
- 1 Trakas Substation (500m x 300m). There are 2 alternatives being considered.
- 1 Trakas Power Line. There are 2 alternatives being considered.

The site layout for the Linking station Alternative 1 Alternative 2 is ranked as No Preference. They will result in equal impacts in the cultural landscape in respect of build heritage features located in the 500m buffer zone.

Site layout Beaufort West Power Line Alternative 1 and Substation Alternative 1 is the preferred option. They are the most appropriate option as they have the lesser visual impact on the character of the environment and the settlements in which the heritage resources. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts prior to the pre construction phase.

Site Layout Beaufort West Power Line and Substation Alternative 2 is the not preferred option. The N12 will be affected but it is not a scenic route. Two wind energy facilities relatively close by will have a cumulative visual impact along the N12. The impact is High on the cultural landscape or landscape character. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts that may be identified during the pre construction phase.

Site layout Trakas Power Line and Sub Station Alternative 1 is ranked as the Preferred option. GIS mapping suggest this option will have the least impact on the cultural landscape. However, it should be noted that specialist input in terms of heritage, palaeontology and archaeology will require amendments and repositioning of development sites to protect sensitive heritage and archeological impacts that may be identified during the pre construction phase.

Site layout Trakas Power Line and Sub Station Alternative 2 is ranked as the Not Preferred option. GIS overlays suggest this may impact on MSA archaeological resources that were recorded in the vicinity in the 2010 scoping field survey.

Key:

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons
LINKING STATION		
Linking Station Alternative 1	No Preference	GIS overlays suggest that the substation is not located close to known heritage resources
Linking Station Alternative 2	No Preference	GIS overlays suggest that the substation is not located close to known heritage resources
BEAUFORT WEST		
Beaufort West: Power Line Alternative 1, and Substation Alternative 1	Preferred	Less impact on the cultural landscape and not located close to known archaeological sites
Beaufort West: Power Line Alternative 2, and Substation Alternative 2	Not Preferred	The N12 will be affected but it is not a scenic route. Two wind energy facilities relatively close by will have a cumulative visual impact along the N12. The impact is High on cultural landscape or landscape character. Medium with mitigation including appropriate placement of power lines, sub stations and turbines.
TRAKAS		
Trakas: Power Line Alternative 1, and Substation Alternative 1	Preferred	GIS overlays suggest this alternative will have the least impact on the cultural landscape
Trakas: Power Line Alternative 2,	Not Preferred	GIS overlays suggest this alternative may impact on

Alternative	Preference	Reasons
and Substation Alternative 2		MSA archaeological resources recorded in the vicinity in the 2010 scoping field survey

Figure 8.1: Comparative assessment table regarding the alternatives.

8.2. General Description

The power line corridor and sub stations locations were developed from available data from specialist studies during the EIA and the proposals proximity to the existing Eskom Droerivier – Proteus 400 kV power line.

Palaeontology

The palaeontological sensitivity of the Beaufort Group sediments in the study area is considered **Very High**. Sub surface clearance in the pre construction phase, and bedrock excavations during construction of the proposed wind energy facility will primarily impact continental sediments of the Abrahamskraal and Teekloof Formations of the Lower Beaufort Group (Karoo Supergroup). These Mid to Late Permian sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (e.g. trackways) and plants (e.g. petrified wood). This stratigraphic interval is of special palaeontological significance in that it contains a record of a catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago

Caenozoic surface sediments in the study area (e.g. alluvium, fluvial gravels, colluvium) are generally of Low palaeontological sensitivity, although sparse fossil remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here.

Although the direct impact will be Local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events.

Palaeontological resources across the entire site will be impacted by the development, regardless of the position of the turbines. On the South site the impact will be the highest on the Abrahamskraal Formation which is a very thick (c. 2.4km) succession of fluvial deposits laid down in the Main Karoo Basin by

meandering rivers on an extensive, low-relief floodplain during the Mid Permian Period, some 266-260 million years ago.

Archaeology

Several interesting Middle Stone Age open sites were discovered. Without exception, these were all positioned on the summit areas of low ridges and koppies on the Southern site, as well as in the 5 km buffer zone. There was also a general background presence of MSA in the form of occasional flakes or cores seen in the open. No cave deposits were found during the survey which was not surprising as the local geology was not suitable for cave formation. Similarly, no rock art or rock engraving sites were discovered. Surprisingly perhaps, there was little evidence of Later Stone Age activity in the area. In terms of colonial period archaeology, there several farm complexes with out buildings which could provide information on the development of local farming practice in the Karoo district.

Impacts on archaeological features therefore are likely to be negative and permanent as the nature of the resources is non renewable.

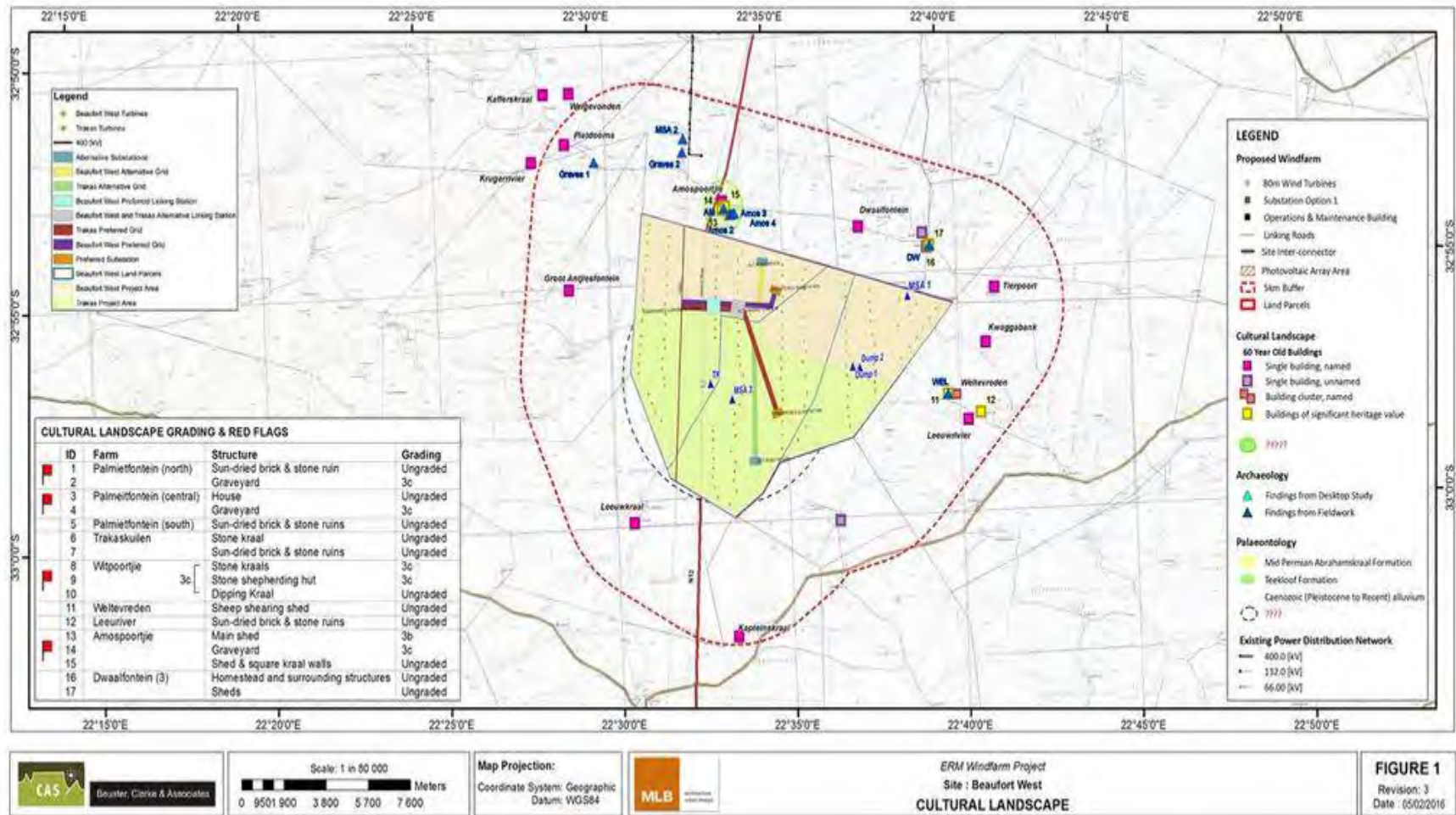


Figure 8.1: Site plan that shows the alternative positions for the power lines and substations in the study footprint with heritage resources identified by desktop study and field observation (Reference: CAS (2010) MDL Architects (2016) and SiVEST (2016).

8.3 Cultural Landscape Issues

There are buildings identified as older than 60 years on the Beaufort West Site and in within its 5km buffer zone.

There are structures and ruins older than 60 years and sites of cultural significance within and in the immediate vicinity of the proposed power lines, sub stations and wind turbines and they will be visually affected (see table 8.1). However apart from Amospoortjie, they are not considered of sufficient cultural significance. Impact of power lines, sub stations and turbines on such sites is likely to be visual and affect the character of the context.

- There is a characteristic sense of remoteness in the Great Karroo area. This is related partly to the flatness of the land and subtle ridges elements with distant views in part of the Swartberg. However these landscape exhibit very little qualities of use over time and as a result cannot be considered significant cultural landscapes.
- The placement of power lines and turbines will have a strong visual impact on the landscape because of the height and concentration of turbines. This however is not necessarily an adverse impact depending on how the turbines are placed and ordered. In terms of cultural landscapes however there is little impact because by definition the landscape is not considered substantially noteworthy.
- Placement of any power lines and turbines close to the Amospoortjie and Dwaalfontein werf may impact on heritage resources
- There is no possibility of hiding or mitigating the impact of the power lines or turbines other than through placement. Placement close to farms will impact visually on the environment.
- The N12 will be affected but it is not a scenic route.
- Skylines are affected owing to the predominance of the skyline in the landscape

Site GPS	Name	Cultural landscape	Grading	Comment
32,53.4986S 22,33.3615E	<i>Farmhouse outbuildings and adjacent graveyard</i> Amospoortjie	<i>Mid nineteenth century farmhouse now shed and family graveyard</i>	<i>3b and graveyard 3c</i>	<i>Farm remnant representing early farming period. Local, architectural/historical significance.</i>
32,56.9691S 22,36.9005E 32,56.9366S 22,37.029E	<i>Ensemble: Dipping and stock kraals at</i> Witpoortjie	<i>Early stone stock enclosures, shepard's hut, and dipping shed. Now abandoned</i>	<i>3c</i>	<i>Local economic and historical significance, associated with early farming methods</i>
32,57.0434S 22,32.8995E 32,56.9817S 22,33.0979E	<i>Farmhouse: Not older than 60 years at</i> Trakaskuilen <i>with older</i> <i>Adjacent ruins: which indicate that the farm werf was abandoned, and rebuilt in its current location between 1950 and 1970. These ruins are likely to be the site of the original werf considering the road and service line lead to this point.</i>		<i>ungraded.</i>	<i>The ruins of the small structures consist of crumbling sun dried brick and stone. Probably older than 60 years. Not graded but of local historical significance associated with settlement of early farms.</i>
32,54.4929S 22,39.2731E 32,54.4913S 22,39.2687E	<i>Farmhouse and outbuildings</i> Dwaalfontein	<i>Simple I shaped farmhouse (modified) and related outbuildings</i>	<i>3c</i>	<i>Some local/historical significance although such significance may be adversely affected by further deterioration of the buildings</i>

Table 8.2: Heritage resources identified and graded during fieldwork assessment 2010 for the cultural landscape.

In terms of the scoping heritage assessment there are no absolute constraints identified for the project. The proposed corridor for Beaufort West power lines and the position of the two sub stations has been negotiated through specialist input and or technical constraints. The results of the integrated EIA and specialists reports will highlight the overall preferred option for the powerline corridors and substations.

Section 9: Provisional Impact Assessment

9.1 Assessment Criteria

The assessments of heritage impacts are set out in Tables 9.1 – 9.9. Note that these assessments are provisional and may change as a result of more detailed follow up investigations, where required.

The evaluations of impacts was undertaken, as stipulated in the EIA Regulations published by the DEAT (April 1998), in terms of the Environmental Conservation Act (No. 73 of 1989) and the NHRA making use of the definitions and criteria detailed below.

Nature of the impact:

Description of the type of effect the activity would have on the affected environment

Geographical Extent:

Reflects the importance of the environment on a local (site area and its surroundings), province/ regional (Western Cape), or on an International/national scale.

Probability of occurrence:

- **Improbable** (25% likelihood of the impact occurring);
- **Possible** (25 to 50% possibility of the impact occurring);
- **Probable** (50% to 75 % chance the impact will occur).
- **Definite** (greater than 75 % chance the impact will occur regardless of any prevention measures)

Reversibility:

Describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.

- *Completely Reversible (with implementation of minor mitigation measures)*
- *Partly Reversible (partly reversibly with more intense mitigation measures)*
- *Barely Reversible (unlikely to be reversed even with intense mitigation)*
- *Irreversible (the impact is irreversible and no mitigation measures exist)*

Irreplaceable Loss of Resources:

Describes the degree to which the resources will be irreplaceably lost as a result of a proposed activity.

- No loss of resources (the impact will not result in the loss of any resources)
- Marginal loss (the impact will result in marginal loss of resources)
- Significant loss (the impact will result in significant loss of resources)
- Complete loss (the impact will result in a complete loss of all resources)

Duration:

- **Short term** (0-2 years);
- **Medium term** (2-10 years);
- **Long term** (10-50 years);
- **Permanent** (mitigation, either human or natural, will not occur in such a way or in such a time span that the impact can be considered transient-indefinite).

Cumulative Effect:

A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.

- Negligible cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

Accumulative impact:

Consideration must be given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts must be evaluated with an assessment of similar developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

Degree of confidence in predictions:

It is necessary to state the degree of confidence (low, medium or high) in the predictions based on the available information and level of knowledge and expertise.

Intensity:

- **Low** (affects the environment such that heritage impacts are not affected – or not degraded significantly more than their present state);
- **Medium** (affected heritage environment is altered but, in a modified/ increasingly modified way and maintains general integrity);
- **High** (heritage resources are altered to the extent that they will temporarily or permanently cease. High cost of rehabilitation and remediation).
- **Very High** (integrity and functionality of the system permanently ceases and is irreversibly impaired. Often unfeasible due to extremely high cost of rehabilitation and remediation).

Significance of impact:

Significance is determined through the synthesis of impact characteristics. It is an indication of the importance of the impact in terms of the both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula:

(extent + probability + reversibility + irreplaceability + duration + cumulative effect + magnitude/intensity).

Table 9.1: Significance Ratings

Points	Impact Significance	Description
6 to 28	Negative Low Impact	The anticipated impact will negligible negative effects and will require little to no mitigation
6 to 28	Positive Low Impact	The anticipated impact will have minor positive effects
29 to 50	Negative Medium Impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures
51 to 73	Negative High Impact	The anticipated impact will have significant effects and will require significant mitigation to achieve an acceptable level of impact
51 to 73	Positive High Impact	The anticipated impact will have significant positive effects
74 to 96	Negative Very High Impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered “fatal flaws”
74 to 96	Positive Very High Impact	The anticipated impact will have highly significant positive effects

The HIA is being undertaken in two parts – a heritage assessment and an impact assessment phase. This report forms part of a heritage scoping study and therefore focuses on the identification, mapping and significance of heritage resources affected by the proposed wind farms and the ‘red-flagging’ of key heritage issues and concerns requiring detailed assessment during the impact assessment phase of the study. This included the flagging of sensitive or ‘hot-spot’ areas requiring further consideration in terms of the placement of power lines, sub stations, wind turbines and ancillary structures.

This section seeks then to identify potential impacts (direct, indirect or cumulative) associated with activities during the construction, operational and decommissioning phases of the proposed development. The consequence of the impact is identified, where sufficient data is made available and considers the extent to which this will contribute or undermine the achievement of the client’s sustainable development objectives.

9.2. The Proposal Process

The project will be divided into a number of phases including:

- Preconstruction
- Construction
- Phased Implementation
- Decommissioning

The initial three have an impact on the heritage study.

9.3. Impact on the Palaeontological Environment

Potential impacts include the destruction of Caenozoic surface fossils during surface clearance activities (for access roads, laydown areas, field camps) and bedrock excavations during construction of the proposed wind energy facility to the south of Beaufort West will primarily impact continental sediments of the Abrahamskraal and Teekloof Formations (see tables 9.2 and 9. 3). These Mid to Late Permian sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (e.g. trackways) and plants (e.g. petrified wood). The Abrahamskraal – Teekloof stratigraphic interval is of special palaeontological

significance in that it contains a record of a catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago. The palaeontological sensitivity of the Beaufort Group sediments in the study area is consequently very high.

Caenozoic surface sediments in the study area (e.g. alluvium, fluvial gravels, colluvium) are generally of low palaeontological sensitivity, although sparse fossil remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here.

Environmental Parameter	This report evaluates the proposal for two 400kv power lines 4-7km long connecting the Beaufort West and Trakas wind farm to the national distribution network at the Droerivier - Proteus power line, 1 Linking substation, 2 substations, lay-down areas and associated infrastructure with a footprint of 600m x 600m. Two alternatives are considered. Figure 8.1 shows the spatial layout of heritage objects in the landscape in relation to the development footprint.		
	Pre Construction & Construction	Operational	Decommissioning
Environmental Impact; (4)	Requires PIA field assessment. The impact is likely to be negative , and will occur from the workers camp in terms of vehicle traffic, waste management and maintenance programme on the fossil bearing continental sediments of the Abrahamskraal and Teekloof Formations. These sediments contain an important record on the fossil biota of the ancient Karoo and the Permian mass extinction event. Destruction of Caenozoic surface fossils during surface clearance activities (for access roads, laydown areas, field camps).	Significant impacts to fossil heritage are largely confined to the construction phase, with little further impact during the operational and decommissioning phases.	Not Applicable
Extent :	The greatest impact would be local at the site but collateral damage could be National and international	The greatest impact would be local at the site but collateral damage could be National and international	Not Applicable
Reversibility	Partly reversible with intense mitigation	Partly reversible with intense mitigation	Not Applicable
Duration	Medium Term: The duration of the impact is considered by some EAPs confined to the construction phase.	Medium Term	Not Applicable
Cumulative Effect	High Impact on palaeontological resources	High impact but medium with mitigation during pre construction	Not Applicable

<i>Intensity/Magnitude</i>	<i>High to Medium</i>	<i>Medium</i>	<i>Not Applicable</i>
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Table 9.2: Impact Ratings for Inland Palaeontology during the Pre Construction and Construction Phase for the Beaufort West and Trakas Power Lines and Sub Stations evaluated from desktop study research.

	Pre Mitigation Impacts	Post Mitigation Impacts	Decommissioning
Extent	Province/Region (3)	Province/Region (3)	<i>Not Applicable</i>
Probability	The impact will likely occur (50% to 70% Chance of occurrence (3))	The chance of the impact occurring is low, less than 25% chance of occurrence (1)	<i>Not Applicable</i>
Reversibility	The impact is unlikely to be reversed even with intense mitigation (3)	The impact is partly reversible but intense mitigation measures are required (2)	<i>Not Applicable</i>
Irreplaceable Loss	The impact will result in significant loss of resources (3)	The impact will result in marginal loss of resources (2)	<i>Not Applicable</i>
Duration	The impact will and its effects will last for 2- 10 years (2)	The impact will and its effects will last for 2- 10 years (2)	<i>Not Applicable</i>
Cumulative Effect	High Cumulative Effect (4)	The impact would result in minor cumulative effects (3)	<i>Not Applicable</i>
Intensity/Magnitude	Impact affects the continued viability of the system High cost of rehabilitation and remediation (3)	The system functions in a modified way but maintains general integrity with some impact on integrity (2)	<i>Not Applicable</i>
Significance Rating	21 x 3	15 x 3	<i>Not Applicable</i>
	51- 73 Negative High Impact	6-28 Negative Low Impact	<i>No Applicable</i>
Mitigation Measures	<ul style="list-style-type: none"> ▪ <i>PIA field assessment of rock exposures in the study area</i> ▪ <i>Construction environmental management plan (EMP) to be drawn up prior to construction, with details affecting palaeontological watching brief</i> • <i>Site Monitoring of</i> 	<ul style="list-style-type: none"> • <i>Site Monitoring, recording and collection of fossil material</i> 	<ul style="list-style-type: none"> • <i>Unlikely to encounter additional palaeontological material but consider site monitoring, recording and collection of fossil material for accidental finds.</i>

	<i>excavations during construction phase</i> <ul style="list-style-type: none"> • <i>Recording and collection of fossil material and geological data</i> 		
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Table 9.3: Pre and Post Mitigation Impact Ratings for Inland Palaeontology - Beaufort West and Trakas Power lines, Sub Stations and Linking Stations.

9.4. Impact on the Archaeological Environment

The results from the field survey indicated that archaeological residues relating to Early Stone Age and Later Stone Age periods are notably scarce in this part of the Karoo. However, several Middle Stone Age open artefact scatters were recorded with much of the activity seemingly revolving around raw material acquisition strategies. There was a distinct lack of formal tools in the assemblages encountered, most of the artefacts being flakes, chunks and cores. There was also a general MSA presence in the form of occasional artefacts seen across the open veld.

In terms of colonial period archaeology, there several farm complexes which have been in operation for a long period as evidenced by the presence of buildings of historical value along with dump areas containing a wide variety of ceramic and glass artefacts. The historical buildings are discussed in more detail in the section 9.5.

The perceived impact to archaeology at the Beaufort West site can be seen as both an opportunity and a constraint and are set out in Tables 9.4 and 9.5. The status of the potential impact for archaeology is not neutral or negligible. If managed effectively, prior to construction, further archaeological investigations will increase our knowledge of the Karoo environment and preserve aspects of human interaction and technology as a record and part of the National Estate for future generations, as well as make available this data to the wider scientific community.

When excavations are made they furnish a “window” into the Karoo depository that would not otherwise exist and provide access to reviewing early human technology. The impact is positive for archaeology, provided that efforts are made to watch out for and rescue archaeological artifacts.

If earthmoving occurs without a monitoring archaeologist significant observations will be lost. In the absence of these management actions, to mitigate the recovery of artifacts and the contexts in which they are exposed, this will result in a loss of scientific data will be irreversible. Archaeological artefacts are rare objects, often preserved due to unusual circumstances and are non renewable resources. The recommendations for the proposed Beaufort West wind farm development include the preservation in perpetuity of the major MSA artefacts assemblages, the

avoidance of any destruction of important historical structures during construction and earth moving activities.

	Pre Construction & Construction	Operational	Decommissioning
<i>Environmental Impact;</i>	Potential impact on the archaeological landscape where know MSA site occur through site clearance for access roads, infrastructure development and from daily maintenance and unsupervised collection	<i>Possible damage during maintenance work</i>	<i>Negligible - Low impact</i>
<i>Extent</i>	<i>The greatest impact would be local at the construction site but collateral damage could be National and International</i>	<i>The extent of the impact would be greatest near the sites but collateral damage could be National and International</i>	<i>Negligible - Low impact</i>
<i>Probability</i>	Definite and irreversible to heritage resources which are non renewable	Definite and irreversible to heritage resources which are non renewable	<i>Negligible - Low impact</i>
<i>Reversibility</i>	<i>Unlikely to be reversed even with intense mitigation</i>	<i>Unlikely to be reversed even with intense mitigation</i>	<i>Negligible - Low impact</i>
<i>Duration</i>	<i>Medium Term</i>	<i>Medium Term</i>	<i>Medium Term</i>
<i>Cumulative Effect</i>	<i>High Impact on the archaeological landscape but medium with mitigation prior and during the construction phase</i>	<i>High impact</i>	<i>Low Impact if mitigation undertaken during pre construction and construction phase</i>
<i>Intensity/Magnitude</i>	<i>High to Medium</i>	<i>High to Medium</i>	<i>Low</i>

Table 9.4: Impact Ratings for Archaeology - Beaufort West and Trakas Power Lines and Sub Stations.

	Pre Mitigation Impact Rating	Post Mitigation Impact Rating	Decommissioning
Extent	The impact will only affect the site (1)	The impact will only affect the site (1)	The impact will only affect the site

			(1)
Probability	There is 50% - 75% chance of an impact (3)	The impact is possible 25% -50% (2)	The chance of the impact occurring is unlikely, less than 25% (1)
Reversibility	The impact is partly reversible with intense mitigation measures (2)	The impact is reversible with minor mitigation measures (1)	The impact is completely reversible with minor mitigation measures (1)
Irreplaceable Loss	The impact will result in significant loss of resources (3)	The impact will result in marginal loss of resources (2)	The impact will not result in the loss of resources (1)
Duration	The impact will be mitigated by direct human action within 2 -10 years (2)	The impacts will disappear with mitigation in a span shorter than the construction phase 0-1 years(1)	The impacts will disappear with mitigation in a span shorter than the construction phase 0-1 years(1)
Cumulative Effect	The impact would result in a high cumulative effect (4)	The impact would result in minor cumulative effects (3)	The impact would result in minor cumulative effects (2)
Intensity/Magnitude	High Impact affects the integrity of the system, high rehabilitation/ remediation costs (3)	Medium impact, the system maintains general integrity (2)	Medium impact, the system maintains general integrity (2)
Significance Rating	18 x 3	12 x 2	9 x 2
	51- 73 Negative High Impact	6 -28 Negative Low Impact	6- 28 Negative Low Impact
Mitigation Measures	<i>Archaeological watching brief as part of EMP. Conservation of heritage sites; graveyards stone stock enclosures and archaeological sites</i> <ul style="list-style-type: none"> Controlled excavation, recording and collection of stone age artefacts Archaeological sites not impacted by placement of infrastructure should be marked on a site plan, red flagged and a 500 m buffer 	<ul style="list-style-type: none"> Site Monitoring, recording and collection of material if required Ongoing conservation under the auspices of the environmental control officer 	<ul style="list-style-type: none"> Ongoing conservation under the auspices of the environmental control officer. Site Monitoring by archaeologist, recording and collection of material if required

	<p><i>zone implemented. Power lines and Sub Station should avoid areas of high archaeological significance where mitigation through recovery and recording is not an option.</i></p>		
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Table 9.5: Pre and Post Mitigation Impact Ratings for Archaeology - Beaufort West and Trakas Power Lines, Sub Stations.

9.5. Impacts on the Cultural Landscape

The heritage assessment is summarized and set out in tables 9.6 and 9.7 Structures and sites of heritage interest are identified and graded.

It is noted that buildings older than 60 years are contained within farms werfs on the farms Witpoortjie, (3c) and the graveyards at Trakaskuilen. Dwaalfontein (3c) and Amospoortjie (3b) (Farm 374) were outside the study area but are likely to be affected visually by the proposal. Sites within the study area are of social and historical significance. All impacts were likely to be visual in nature. Major issues in relation to visual impacts occur on these farm settlements and were ranked high to medium by virtue of proximity, and because of the contrast in scales and character of installation of the power lines and turbines, the impact is considered negative. These issues are evaluated in more depth under the assessment of impacts. This was regarded as more of a landscape character issue. Re-siting or removing the turbines with the most dominant impacts could be regarded as sufficient mitigation to reduce the impact to medium negative.

Heritage significance in all cases was considered local. It was noted that many of the sites viewed which were identified as older than 60 years were ruinous in nature and uninhabited. These structures include stone stock enclosures and ruins which were difficult to date. It was noted however that the affected farms were granted and farmed in the mid nineteenth century and some of the ruins are likely to date from that period. It is noted that power lines and turbines close to these farm settlements are likely to have a high impact on the landscape character of the site. It should be noted that two wind energy facilities relatively close by will have a cumulative visual impact along the N12.

The issue of the cultural landscape, when applied to generally accepted definitions and criteria did not apply. The landscape was flat and consisted of low scrub and bush, with long views across an extensive dry empty landscape, with subtle ridges punctuating the plains. This landscape did not fulfill the criteria of a significant cultural landscape. There were pockets of domesticated farmland, including dams and the farm werfs themselves including graveyards and ruins although the area is dominated by open undomesticated landscapes.

	Pre Construction & Construction	Operational	Decommissioning
Environmental Impact	<i>Visual impact on landscape character and cultural landscape. Visual impact on identified heritage resources of significance. Potential physical impact on heritage resources</i>	N/A	<i>Not Applicable</i>
<i>Extent</i>	<i>Farm scale, Local</i>	<i>Farm scale, Local</i>	<i>Farm scale, Local</i>
<i>Probability</i>	<i>Highly probable</i>	<i>Highly Probable in view of the suitability of the site</i>	<i>Not Applicable</i>
<i>Reversibility</i>	<i>Partly reversible but requires intense mitigation</i>	<i>Reversible with minor mitigation</i>	<i>Not Applicable</i>
<i>Duration</i>	<i>Temporary</i>	<i>Long-term 10 -50 years</i>	<i>Temporary</i>
<i>Cumulative Effect</i>	<i>On Visual Cultural landscape medium to low with mitigation during construction. Two existing wind energy facilities relatively close by will have a cumulative visual impact along the N12</i>	<i>High on cultural landscape or landscape character. Medium with mitigation including appropriate placement of power lines, sub stations and turbines.</i>	<i>Low Impact if mitigation undertaken during pre construction phase</i>
<i>Intensity/Magnitude</i>	<i>Medium to low on heritage farm sites</i>	<i>High to medium on heritage structures: farm Amospoortjie. Medium with mitigation Medium on heritage graveyards farm Trakaskuilen. Low to medium with mitigation Medium on farm Witpoortjie (stock enclosures, Dwaalfontein (3c) Low to medium with mitigation. High to medium on landscape character and farm landscape contexts (where applicable)</i>	<i>Low impact with mitigation</i>
<i>Significance</i>	<i>Low to medium heritage significance</i>	<i>Low heritage significance of most 60 year</i>	

		<i>old structures & ruins. Medium significance (3b) on Amospoortjie. Low to medium on Witpoortjie, Dwaalfontein (3c) and the graveyards sites at Trakaskuilen. Low significance of cultural landscape/landscape character</i>	
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Table 9.6: Impacts on the Cultural Landscape for the Beafort West and Trakas Power Lines and Sub Stations.

	Pre Mitigation Impact Rating	Post Mitigation Impact Rating	Decommissioning
Extent	The impact will only affect the site (2)	The impact will only affect the site (1)	The impact will only affect the site (1)
Probability	There is a 50% - 75% chance of occurrence (3)	There is a 25% - 50 % chance of occurrence (2)	There is a 25% chance of the impact occurrence (1)
Reversibility	The impact is partly reversible with intense mitigation measures (2)	The impact is reversible with minor mitigation measures(1)	The impact is reversible with minor mitigation measures(1)
Irreplaceable Loss	The impact will result in significant loss of resources (3)	The impact will result in marginal loss of resources (2)	The impact will not result in any loss of resources (1)
Duration	The impact will be mitigated by direct human action within 2 -10 years (2)	The impact and its effect will disappear with mitigation in span shorter than the construction phase 0-2 years (1)	The impact will disappear with mitigation in span shorter than the construction phase 0-2 years (1)
Cumulative Effect	The impact would result in minor cumulative effects (3)	The impact would result in minor cumulative effects (3)	The impact would result in negligible cumulative effects (1)
Intensity/Magnitude	Medium impact on the quality of the site but maintains general integrity (3)	Medium impact on the quality of the site but maintains general integrity (2)	Low impact on the quality of the site maintains general integrity (1)
Significance Rating	18 x 3	12 x 2	7 x 1
	51- 73 Negative Medium Impact	6-28 Minor Positive Impact	6- 28 Positive Low Impact
Mitigation Measures	<i>Construction environmental management plan (EMP) to be</i>	▪ <i>Road construction and the avoidance of cut and fill</i>	N/A

	<p><i>drawn up prior to construction.</i></p> <p><i>Position the proposed 20-40 m power lines within an area with 80 m high pylons should be sufficient to avoid over-scaling the N12 view corridor</i></p>	<ul style="list-style-type: none"> ▪ <i>Presence of archaeological watching brief during excavation</i> ▪ <i>Placement of turbines and infrastructure to reduce visual impact on heritage resources</i> 	
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Table 9. 7: Pre and Post Mitigation Impact Ratings for the Cultural Landscape - Beaufort West and Trakas Power Lines and Sub Stations.

9.6 Assessment of Impact on Affected Heritage Resources & Cultural Landscapes

Section 38 (3) of the NHRA requires the assessment of the impact of a proposal on the affected heritage resources. It has been established that there are structures of local heritage significance in the vicinity of the sites, but the strongest impact is likely to be on the character of the landscape of which these resources form a very small part. One layout has been submitted for assessment with two proposals differing only in extent and density for assessment. The third alternative is the “no go” alternative.

In terms of the no-go option the new impacts would not be present.

Assessment on heritage resources and cultural landscape is undertaken in terms of the following:

9.6.1 The Extent (Scale) and Nature of the Impact

This may be viewed in terms of:

- Regional/townscape scale
- Local scale
- Farm/site scale
- Individual element scale

The extent of impact on heritage resources and cultural landscapes is considered local and area-specific reducing to farm scale. Cumulative impact of the proposal on views to and from the site is likely to be visible from the N12, local roads and farm settlements and be visible over long distances. No scenic routes are affected

This report considers the extent of the impact as mostly local rather than regional in scale. Environmental benefits however in terms of a new process for the provision of clean energy are likely to be national.

The nature of the impact is likely to be visual and will affect the character of the environment on farmstead and werf of Amospoortjie in the 5 km buffer zone.

9.6.2 The Intensity of the Impact on Heritage Resources

This affects the degree to which the heritage resources and cultural landscapes will be altered. In terms of above ground heritage resources and cultural landscapes the degree to which heritage resources are likely to be altered.

Intensity of impact on heritage resource in the vicinity of Amospoortjie is likely to be high, but lower elsewhere. Impact on landscape character in vicinity of farmsteads and graveyards is likely to be medium to high. No mitigation is possible other than the grouping of power lines, sub stations and turbines in legible and iconic groups.

Nature of impact is likely to be visual in terms of the impact on landscape character, however. This is the subject of a separate VIA report by Oberholzer and Lawson (2015).

Mitigation, where necessary, may be achieved through repositioning the turbines.

9.6.3 Significance of the Impact on Heritage Resources

The significance of the impact may affect the site in:

- Physical and material aspects
- Visual spatial qualities
- Associational impacts

This report finds that the nature or significance of the impact is largely visual/spatial (see above). Visual impacts on the landscape are likely to be substantial particularly in a cumulative sense.

Potential adverse visual impact may be considered overset by positive economic and environmental benefits as well as the creation of work opportunities.

Both development alternatives will not affect impact on above ground heritage resources in a material or physical aspects. Such heritage resources can be mitigated in the pre construction, and during the construction phase.

The nature of impact on cultural landscapes and landscape character is more complex and related to the change in the landscape character and the extent to which the proposal alters the landscape. Visual/spatial impacts are therefore; likely to be substantial both during and after construction.

9.6.4 Status of the Impact

The Impact on heritage resources is medium negative only at Amospoortjie outside the study area. This is offset by the fact that heritage resources are not of provincial or national significance. The farm settlement at Amospoortjie was scored as medium impact and because of the contrast in scales and character of installation, the impact was negative. It was decided that the sites could be considered a grade 3b heritage resource and the potential visual impact mitigated.

9.6.5 Visual / Cultural Landscape

During planning and construction the proposal may be viewed as moderately negative, particularly the visual impact of construction mechanisms. This however is not regarded as a heritage issue other than for archaeology, as no above ground heritage resources will be physically affected and the landscape limited is restricted to local. This applies to both the development alternatives.

In terms of visual impact the alternative one is considered the preferred option in terms of marginally lower visual impact.

9.6.6 Cost Benefit

The NHRA requires that impacts on heritage resources also be assessed in the light of the proposal to provide social and economic benefit to the community and the economy.

This report considers that the proposal will be a positive impact in terms of a cost benefit analysis. This is because the development of the site will improve job opportunities both during and after construction of the Wind farm facility. It is noted that the farms sites affected are largely empty and derelict

Both development alternatives will improve cost benefits. The no-go option will not.

9.6.7 Duration of the Impact

The construction period is dependent on the approval processes and the phased nature of the planning process during which road construction and transport of component parts as well as construction will occur. The duration of impact during construction is likely to be temporary.

The duration of proposal once implemented will be long term. It should be noted that wind farm facilities are regarded as reversible. They can be removed and reconstructed elsewhere. Both development alternatives will have an impact in terms of duration.

9.6.8. Probability

It is likely that there will be a wind farm facility developed on the site owing to the high suitability of the site for the proposal.

9.6.9. Confidence

Confidence the proposal will proceed is high in light of the general suitability of the site. However mitigation in relation to impact on areas of high visibility including areas of high receptors, areas of high visibility and areas of high cumulative impact should be considered.

9.7 Visual Impact – Heritage

This report does not consider the 2015 VIA; it did not form part of the scope of work for the CAS project. Rather, the heritage team recognise the VIA (2010) and acknowledges the statements and findings of the EIA VIA including the description and location of the Beaufort West site, the indications of the size and distribution of the proposed features, and the limitations and constraints given. All analysis carried out and documented in this report are derived from these criteria.

While turbine numbers have been reduced in the new proposal the introduction of two new power lines, each with a corridor of 4-7 km and a pylon height of an estimated 20-40m, will be subject to an independent VIA assessment. The final interpretation and status of the visual impact will rest with the VIA specialist.

The 2010 EIA VIA states:

The Beaufort West site has a number of visual constraints, including the proximity to the N12 national road, which passes through the site. The wind turbines would create a distinct feature in the open and sparsely vegetated Karoo landscape, and would be visible from a considerable distance. The Photovoltaic (PV) arrays used for generating solar power, would be highly visible from the N12 in their present location, as would the substation, with its transformers, together with the various Operations and Maintenance (O&M) BUILDINGS. (Oberholzer, & Lawson 2010).

The sampling of individual turbines provides a useful insight into the visual impact of the wind farm in relation to the observer at the critical viewpoint. However, in order to provide a balanced assessment, the scenario must be viewed at a more holistic level taking into account:

- The information provided by the sampling of turbines
- The interpretation of the view sheds and line of sight data, and

- The assessment of the VAC

The product of this holistic assessment is an overall visual impact score for the critical viewpoint as set out in table 9.6.

9.7.1 Visibility and Visual Absorption Capacity (VAC)

Visibility and Visual Absorption have been categorised as follows:

CRITERIA	HIGH	MEDIUM	LOW
Visibility	<i>Very visible from many places beyond the 1 000 meter zone</i>	<i>Visible within the 1 000 meter zone but partially obscured by intervening landforms</i>	<i>Only partly visible within the 1 000 meter zone and beyond due to screening by intervening landforms</i>
VAC	<i>The ability of a landscape to easily accept visually a particular development because of its steep landforms, high vegetation and diverse texture.</i>	<i>The ability of a landscape to less easily accept a particular development because of its gradual landforms, moderate vegetation and less diverse texture.</i>	<i>The lack of ability of a landscape to easily accept visually a particular development because of its flat landforms, low vegetation and uniform texture.</i>

Table 9.6: Visual Assessment Criteria Ratings.

The viewshed for Beaufort West is widespread with visibility greatest to the north east of the site. The viewsheds indicate that turbines are visible from most of the landscape within the 5km zone. Visibility is greatest on the flat area of the site and up the sides of the mountain ridges. It should be emphasized that the viewshed is an indicator of areas in the landscape from where one or more turbines are visible NOT THE ENTIRE SITE.

The specialist report on the cultural landscape of Beaufort West states:

The issue of the cultural landscape, when applied to generally accepted definitions and criteria did not apply. The landscape was flat and consisted of low scrub and bush, with long views across an extensive dry empty landscape, with subtle ridges punctuating the plains. This landscape did not fulfil the criteria of a significant cultural landscape. There were pockets of domesticated farmland, including dams and the farm werfs themselves including graveyards and ruins although the area is dominated by open undomesticated landscapes Major issues in relation to visual impacts occur on farm settlements over 60 years old and were ranked high to medium by virtue of proximity, and because of the contrast in scales and character of installation of the turbines, the impact is considered negative (Atwell 2011).

Therefore, although visibility of the site is HIGH, the visual impact of the site from a cultural perspective is considered LOW.

The Visual Absorption Capacity of the landscape is LOW. Vegetation is mainly shrub land and low fynbos, and visual pattern is uniform. The landscape is fairly flat leaving the site visually exposed from all directions.

9.7.2 Critical Viewpoints for Beaufort West

The specialist report on the cultural landscape states:

*Buildings older than 60 years are contained within the farms werf of **Amospoortjie** (Farm 374). This site is outside the study area but is likely to be affected visually by the proposal.*

An analysis of the impact of the wind farm on the Amospoortjie farmstead was carried out using a GIS (see Figure 9.7). For the Amospoortjie site, two critical viewpoints were sampled, one looking south from the back of the farmstead, towards the wind farm (southern portion) and one from the approach to the farmstead along the N12, approximately 700 meters from the turning onto the main access road to Amospoortjie Farm.

For each critical viewpoint, 3 turbines were sampled and scored according to their distance from the farm, visibility, background screening and other factors such as their position in the dominant view and the existence of other features unnatural to the landscape (such as power lines, factories etc). The result of the sampling was used to provide an overall visual impact rating of the windfarm on the Amospoortjie farmstead.

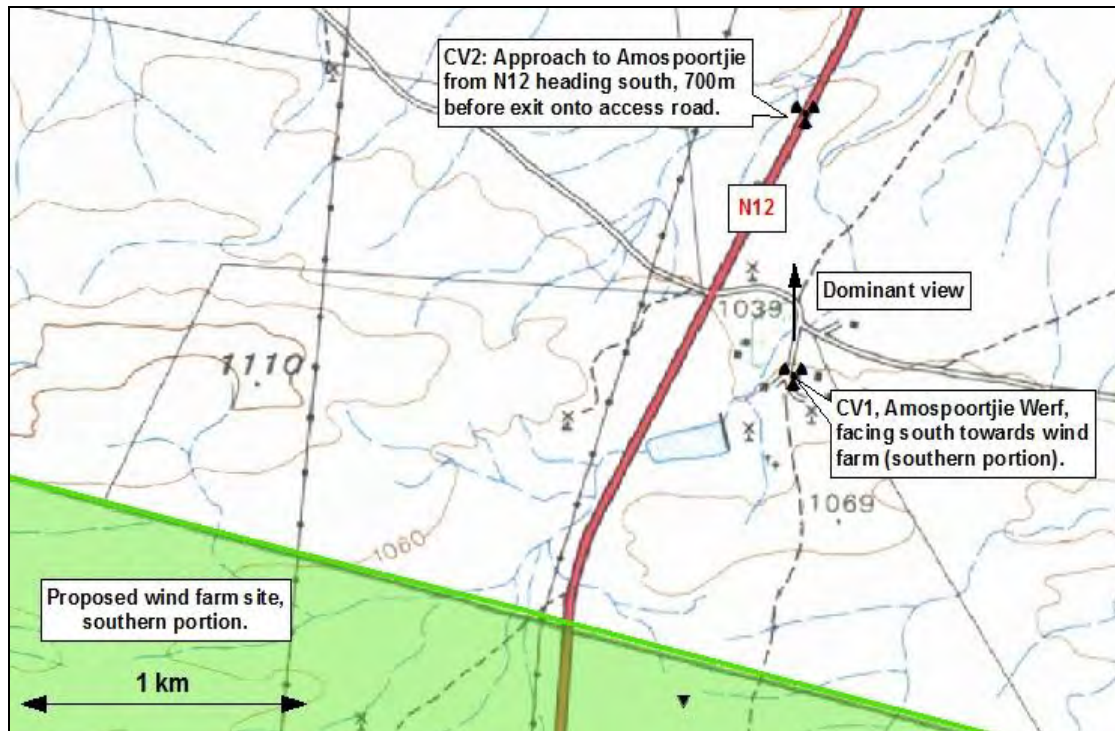


Figure 9.7: Critical viewpoints at Amospoortjie.

9.7.3 Amospoortjie Farmstead

Amospoortjie Farm lies more than a kilometer from the southern portion of the proposed wind farm. The view from the farm is to the north therefore the wind farm is outside the dominant view and will be more visible from the approach to the farm on the N12. Only 20% of the turbines in the south portion are visible from the farmstead and these are partially blocked from view by the undulating landscape. Silhouetting of some turbines will occur.

The distance of the wind farm from the Amospoortjie farmstead and approach, the poor visibility of pylons and the lack of impact of the wind farm on the dominant landscape of the farm combine to make the overall visual impact score LOW (farmstead) to VERY LOW (approach).

Figure 9.7 shows the spatial position of critical viewpoint 1 for the Amospoortjie werf and its relationship to the wind farm and Table 9.8 and 9.9 ranks the impact on the farm as MEDIUM LOW.

Turbine /PV Array	Distance from CV	Score	Visibility	Background Screening	Other Factors	Impact	Overall Impact
A	3060 m	Low	50 - 100% 0	No 0	Outside dominant view of -1	Very Low	LOW
B	1300 m	Medium High	50 - 100% 0	Yes 1	Outside dominant view of -1	Medium Low	

							view			
C	1500 m	Medium	0 50%	- 1	No	0	Outside of dominant view	-1	Low	

Table 9.8 Assessment of sample turbines, critical viewpoint 1: Amospoortjie Farm.

Sample Turbine /PV Array	Distance from CV	Score	Visibility			Background Screening		Other Factors		Impact	Overall Impact
A	3060 m	Low	0 50%	- 1	No	0	-	0	Very Low		VERY LOW
B	2900 m	Low	0%	-	-	-	-	-	NONE		
C	2100 m	Low	50 100%	- 0	No	0	-	0	Low		

Table 9.9 Assessment of sample turbines, critical viewpoint 2: Approach to Amospoortjie Farm.

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Section 11: Appendices

Appendix 1: Palaeontological Assessment – BEAUFORT WEST Land Parcel

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Palaeontological Impact Assessments & Heritage Management,
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Date: 1 August 2015

PALAEOLOGICAL HERITAGE STATEMENT:

Proposed Amendment to the Mainstream 280 MW Wind Farm, Beaufort West, Western Cape

Environmental Authorisation for a proposed 280 MW Mainstream Beaufort West Wind Farm, located c. 65 km to the south of Beaufort West, Western Cape, was approved in March 2012 and has since been extended. SiVEST have now been appointed to undertake various amendments and a new EIA process for the Mainstream Beaufort West Wind Farm. The new proposal involves splitting the existing, extended EA for a 280 MW wind energy facility into 2 x 140 MW Projects, one at Trakaskuilen (footprint 53.7 square kilometres) and the other at Witpoortjie (footprint 43.8 square kilometres) (Figure 1). Land parcels concerned include: Ptn 1 of Farm Trakaskuilen 15, Ptn 1 of Farm Witpoortjie 16 and Remainder of Farm Trakaskuilen 15. As part of the split, the total number of wind turbines will be reduced to 150 with concomitant changes in turbine layout, hub height and rotor blade length.

A desktop palaeontological heritage assessment for the original Mainstream Wind Energy Facility to the south of Beaufort West was originally submitted by Almond (2010) and incorporated into the consolidated Scoping Heritage Impact Assessment submitted to ERM by Patrick *et al.* (2010).

The outlined changes to the original development proposal, including splitting the project into two facilities of 140 MW capacity each as well as the accompanying changes in the layout, hub height and rotor blade length, will probably result in a *reduction* in the magnitude of anticipated impacts on local palaeontological heritage resources. This is primarily a consequence of the reduction in volume of fresh bedrock disturbed or excavated during the construction phase (*e.g.* for wind turbine foundations, laydown areas, access roads, borrow pits). Since the entire development area within the Great Karoo is highly sensitive in terms of fossil heritage, as outlined by Almond (2010), the preliminary conclusions and recommendations made in that report apply in full to the amended Beaufort West Wind Farm project proposal, *viz*:

Bedrock excavations during construction of the proposed wind energy facility to the south of Beaufort West will primarily impact continental sediments of the Abrahamskraal and Teekloof Formations of the Lower Beaufort Group (Karoo Supergroup). These Mid to Late Permian

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sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (e.g. trackways) and plants (e.g. petrified wood). The Abrahamskraal – Teekloof stratigraphic interval is of special palaeontological significance in that it contains a record of a catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago. The palaeontological sensitivity of the Beaufort Group sediments in the study area is consequently very high. Caenozoic surface sediments in the study area (e.g. alluvium, fluvial gravels, colluvium) are generally of low palaeontological sensitivity, although sparse fossil remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here.

Construction work undertaken into Beaufort Group bedrock in order to install the wind turbines and associated infrastructure are likely to expose, disturb, destroy or seal-in valuable fossil heritage. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events. It is therefore recommended that :

1. Before any major construction commences, a thorough field scoping survey of natural and artificial rock exposures within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of palaeontological sensitivity on the ground.

2. On the basis of the field scoping survey, a realistic, collaborative mitigation programme and protocol should be drawn up by the palaeontologist in conjunction with the developer and Heritage Western Cape. This mitigation would normally involve the recording and judicious collection of fossil material within the development area as well as the recording of relevant geological data, before or during the construction phase of the development.

In addition to reiterating these recommendations regarding fossil heritage, it should also be emphasized here that:

- Surface clearance activities (e.g. for access roads, laydown areas, field camps, borrow pits) may also compromise fossils preserved at or close to the ground surface, so the proposed specialist palaeontological field assessment should take place well *before* construction of any sort commences, and not just before major bedrock excavations;
- Scientifically important geological features (e.g. informative sections or exposures through key rock units) are also of conservation significance and are protected by law. They should be assessed during the proposed pre-construction study;
- The proposed palaeontological field assessment and mitigation applies to all land parcels that will host infrastructural components of the two wind energy facilities, including transmission line connections to the grid.

Significant impacts to fossil heritage are largely confined to the construction phase of the wind farm developments, with little further impact during the operational and decommissioning phases. The duration of the impact is considered by some EAPs as confined to the construction phase, but the impacts are of permanent effect and are non-reversible, with potential loss of unique, irreplaceable fossil heritage.

Please note that:

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- All South African fossil heritage as well as geological sites of scientific importance are protected by law (South African Heritage Resources Act, 1999) and fossils cannot be collected, damaged or disturbed without a permit from the relevant Provincial Heritage Resources Agency - in this case Heritage Western Cape (Contact details: Heritage Western Cape. Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za);
- The palaeontologist concerned with mitigation work will need a valid fossil collection permit from Heritage Western Cape and any material collected would have to be curated in an approved depository (e.g. museum or university collection);
- All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

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REPORT ON DEEDS OFFICE SEARCH & SURVEYOR GENERALS OFFICE

FOR

CAPE ARCHAEOLOGICAL SURVEY

FOR WINDFARM PROJECT FOR ERM

&

FOR CLIENT

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The Beaufort West Parcel, this lies on the N12 between Beaufort West and Klaarstroom. Without a better sense of the actual terrain and its history it is at present difficult to expand on the area, though it appears to be quite high lying and the source of watercourses. The farm Palmietfontein 370 is the most northerly of those indicated for inclusion in the Windfarm project here. Farm 370 and the relevant Portions 1, 3 and 4 and the Farm 374, Brits Eigendom and its Portion 4, Amospoortjie, and Portions 11, 21, Dwaalfontein are in the Beaufort West district while Farm 15, Trakaskuilen and Farm 16, Witpoortjie fall into the Prince Albert District.

Farm 370 Palmietfontein was first granted in 1841 (Diagram filed 360/1834 Beaufort Quitrents) to Jacobus Andries Balie (ψ) and to Johannes Balie (ψ) and consisted of 5391 Morgan. J.A. Balie's ψ was transferred from his estate to his widow, Susanna Sophia Balie in 1871 and the other ψ through the estate of one Petrus Balie to Johanna Catharina Steenkamp his 'surviving spouse'. Thereafter it remained in the Balie family (who appear to have included a Johannes Hendrick Wilhelmas Michael Brits who appears in 1886 as the Transferee from the estate of Susanna Sophia Balie) until it was partitioned in 1898 into the two major portions, one to Petrus Johannes Balie and the other, to Johannes H.W.M. Brits. The portion (ψ) registered to Petrus Johannes Balie in 1898 is Portion 1 of 370 registered in 1898 (Dgm. No. D/N401/1898 D/T 3738 dated 11/5/1898). Portion 3 (now Knapdraai, Dgm. No. K/W 145/56) and Portion 4 (now Odendaalsrust, Dgm. No. K/W 146/56) were registered in 1956 to members of the Balie family. It appears as if

Portions 2, 3 and 4 were part of the 1898 Brits portion. Portion 2 (Nuwe Plant) passed to a Paul Lodewyk in 1924, and this included members of the Brits family.

What is of interest in a South African context and of social history is that by 1956 the Balie family were designated as being of the 'Gekleurde Groep' (Coloured, under Apartheid laws) and the Lodewyk connections were of the 'Blanke Groep' (White). Thus, back in 1834, when the land was first surveyed and then granted in 1841, it was granted to Jacobus Balie, who must have then have been of 'coloured' extraction, either from Khoi, Slave or Dutch, Dutch-Eastern extraction or mix. This may be a valuable source of some of local history's complicated threads and contact on outlying frontier farms and districts during the 18th, 19th and 20th Centuries. It is also of note that this farm though in the same area, was first granted in 1834 whereas the surrounding property of Farm 374 for instance, and Farms 15 and 16 (Prince Albert) were granted some fifty years later.

Farm 374 Brits Eigendom (Brits Property), originally as a whole consisting of 36892 Morgan, and its relevant remainders and portions, falls into the 5km buffer zone between and around the land parcels designated on Farm Palmietfontein 370 and Farms Trakaskuilen 15 and Witpoortjie 16 (see Fig. 2). It appears that on the first grant on the 18/08/1906, (Dgm 2928/1906 BW Qts. 17 No 18) to Matthys Michael Barend Brits the farm was consolidated and consisted of portions 374/1/1 Rietfontein, 374/2/1 Amandel Hoogte, 374/3/1 Kafferskraal and 374/4/1 Amospoortjie. Portion 4 Amospoortjie (Dgm. 2311/1906), consisting of 7255M, was part of the estate of an MC Brits, to a Pieter Johannes Brits and in 1939 a portion (Portion 21 of Amospoortjie, 2305M520sq.r. (Dgm. K/N 2680/1939)) of this went from MM Brits to an Ella Dorothea Mariena van Zyl. Portion 11 (of 1822M 9968sq r

(Dgm. 1204/1941), also of Amospoortjie went in 1942 to Matthys Michael Brits, and a portion (Remainder of 821M) of this went immediately to Jan A Oosthuizen and from him in 1946 to Jacob J Claasen. A small portion of 4.874M was expropriated by the Provincial Administration of the Cape in 1963 while the remainder (703M) was transferred by G.G. Claasen to another Jacobus Claasen in 1985. There appear to be several dwellings (60 years old) on these various portions (and the above Farm 370, and see below Farms 15 and 16)) and it is yet to be seen as to what value these have under the heritage and environmental legislations.

Farms 15 and 16, Prince Albert District

Farm 15, Trakaskuilen, was first registered in the Division of Prince Albert, Diagram No. 764/1873. It was first granted on the 16th November 1899 to a Johannes Mattheus Christian Horn as a whole, with an area of 8693 Morgan 190 Sq R. Over the next fifty years the property exchanged hands five times and in 1953 the whole was transferred from Jozef Klue to two people, one a William Harold Little John Wright, and the other, Harold Johnston Glennie under Deed No. 12161 and then partitioned under Transfers Nos. 15572 (Portion 1, 4409.1618Mgn.) and 15573 (the REM. 4284.1549Mgn.), dated 21/9/1955. A portion of Portion 1 consisting of 24.336 M. was expropriated by the Provincial Administration of the Cape in 1963 (336/1963). Diagram No. 1283/55 D/T15572 dated 21/9/1955 relates to Portion 1.

When digital capturing of data took place in 1984 Portion 1 of Farm 15 was still registered to William H L J Wright and bond charges were registered on the property in 1969.

By 1961 the REM. of Farm 15 was transferred to Johannes Stephanus Ferreira from H J Glennie, after which a portion of 12.956 M was expropriated by the Provincial Administration of the Cape also in 1963 (No 329/1963). In 1964 transfer from J S Ferreira to W H L J Wright took place, thus making W H L J Wright the registered bondholder of both Portion 1 and the Remainder of Farm 15 Trakaskuilen.

Farm 16, Prince Albert 16/1, called Witpoortjie was registered under **Diagram 765/1873**, with an area of 5168M 300 Sq. R. The farm was granted on 1/7/1879 to 1) Johannes Mattheus Christian Horn ($\frac{1}{2}$ share) and 2) to Jacobus Cornelis Johannes Swanepoel ($\frac{1}{2}$ share) under Prince Albert Quitrents Vol. 2 no. 26 dated 1/7/1879. The $\frac{1}{2}$ share belonging to the estate of J M C Horn went on 26/2/1888 to Ochert Johannes M P Brits and virtually straight away to Jacobus C J Swanepoel (on 17/8/1888) (who therefore now had both $\frac{1}{2}$ shares), and from him by 17/11/1888 to Willem Adriaan Venter. From W A Venter in 1915 it went to Johanna E. Verwey, a minor ($\frac{1}{4}$ share) and to Cornelis Tobias Verwey ($\frac{1}{4}$ share).

The other original $\frac{1}{2}$ share of J C J Swanepoel went in his estate in 1918 to an Abel Hermanus Swanepoel (Transfer no. 6971), and under transfer no 6287 on 30/6/1926 from a Stephanus Jacobus Swanepoel to Jan Adriaan Swanepoel. The property held under these transfers, nos. 6971 and 6287 was portioned vide transfers no 11789 and 11790 dated 14/11/1938, into Portion A (also called Ptn.1) (Transfer no.11789) of 2584M 150 Sq. r. from Abel Hermanus Swanepoel and 'another' to Jan Adriaan Swanepoel (b. 1883). The REM. (transfer no. 11790) was transferred from Abel Hermanus Swanepoel and 'another' to Abel H Swanepoel (born 1879). Thus by 1938 the farm was owned by what must have been two brothers, Jan Adriaan and Abel Hermanus Swanepoel, born in 1883 and 1879 respectively.

Abel H. Swanepoel's share, the REM. (transfer no. 11790), went to Jacobus Cornelis Swanepoel (b. 1905) in 1952 and in 1972 to Maria Magdalene Swanepoel (widow) and from her to a younger Abel Hermanus Swanepoel in 1975. From the younger Abel Swanepoel the property (now in hectares,) of 2213,4928 ha. was transferred to Johannes Hendrik Bekker. The last pre-digital transfer in the original deed history of the REM. was in 1984 from J H Bekker to Pieter Andries Botha Snyman.

Regarding Portion 1 (see **Dgm. 976/1896**, transfer No 11789 dated 14/11/1938/ Folio 230), this was transferred from Abel Hermanus Swanepoel and 'Another' to Jan Adriaan Swanepoel, and from him to Henry George Scheun in 1942. From H G Scheun it was transferred to Adam Marthinus de Swardt in 1943 and from A M de Swardt to the same William Harold Little John Wright from Farm 15, Trakaskuilen (see above) on the 26/5/1976, thus portions of two properties, Portion 1 and the Rem. of Farm 15 and Portion 1 of Farm 16 were both owned by W H L J Wright.

Appendix 3: List of GPS Coordinates for Archaeological Sites

Site Name	Category	Co-ordinates	Co-ordinates
MSA 1	Pre-colonial	-32.92667	22.64349
Amos 1	Pre-colonial	-32.8942	22.55961
Amos 2	Pre-colonial	-32.89433	22.5591
Amos 3	Pre-colonial	-32.89395	22.56089
Amos 4	Pre-colonial	-32.894	22.56127
MSA 2	Pre-colonial	-32.86737	22.53787
MSA 3	Pre-colonial	-32.95744	22.5574
MSA 4	Pre-colonial	-32.78753	22.51986
TK	Colonial Era	-32.95158	22.54743
Dump 1	Colonial Era	-32.94928	22.61569
Dump 2	Colonial Era	-32.94974	22.61905
WEL	Colonial Era	-32.9597	22.66127
AM	Colonial Era	-32.89208	22.55629
DW	Colonial Era	-32.90807	22.6545
Graves 1	Colonial Era	-32.87405	22.49474
Graves 2	Colonial Era	-32.87211	22.53722
House	Colonial Era	-32.77142	22.48554
Graves 3	Colonial Era	-32.77113	22.48971
Graves 4	Colonial Era	-32.7629	22.48679
