HERITAGE IMPACT ASSESSMENT: PROPOSED INCA JUWI WIND ENERGY FACILITY AT MOORREESBERG, WESTERN CAPE PROVINCE

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

Draft 1 Prepared for:

Savannah Environmental (Pty) Ltd
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EXECUTIVE SUMMARY

ACO Associates cc were appointed by Savannah Environmental (Pty) Ltd on behalf of the client INCA Energy, in partnership with Juwi Energy, to undertake a Heritage Impact Assessment report for the establishment of a wind energy facility as well as associated infrastructure, on a site located east of the N7 at Moorreesburg, in the Swartland Municipality, Western Cape.

The proposed property consists of portions of the farms Swartfontein, Bessiesfontein, Tontelberg and Hartebeesfontein.

This desktop assessment has identified the following potential heritage indicators:

Palaeontology: No paleontological issues expected

Archaeology: The proposed study area is within the highly transformed landscape of the Swartland. Archaeological impacts are expected to be low.

Built Environment: The built environment of the study area is generally much altered and of upgradeable heritage value apart from the Farm Swartland. It is not expected that the built environment will be directly impacted by the proposal unless it becomes necessary to demolish structures (farm houses, sheds, kraals, etc) that are greater than 60 years of age. It is anticipated in most instances it will be possible to avoid direct impacts. If any farm buildings, including sheds and old kraals, are threatened by development, a detailed assessment of their heritage significance will be required along with recording of details of structures.

Historic structures given a field grading of IIIB located at Klein Swartland are considered to be conservation-worthy. The duty of protection of these structures greater than 60 years of age will lie with the Provincial compliance authority, Heritage Western Cape. Any changes to the farm structures (by anyone) must be done in terms of the necessary permits issued by that organisation.

Accumulative Impacts: There are two authorised and almost complete wind energy facilities each within 40 km of the study area at Hopefield and Gouda, both of them within wheat-land contexts. At the time of doing the work neither of these facilities was visible from the study area (albeit that there was a haze at the time). There will be a cumulative impact in terms of the adding of an industrial layer onto an agricultural landscape. There will be character change, however this report is of the opinion that human made objects are aesthetically more tolerable in human made manicured agricultural landscapes. The presence of the Moorreesburg WEF is likely to be tolerable within the landscape context.

Cultural Landscape and setting: The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region. It is felt that of all landscapes in South Africa the presence of wind turbines in the study area are compatible with the manicured and swept quality of the surrounds, meaning that although the turbines will be highly visible from within and close to the site, including the N7, the sense of change or diminishment of the significance of the landscape will be acceptable, and not necessarily overly negative in status. Afzelia (2015) who provided the VIA, believe that the impact will generally be perceived as negative in terms of public opinion; however it is also noted that the Hopefield and Gouda wind energy facilities which are in similar contexts have not received an undue degree of negative comment.

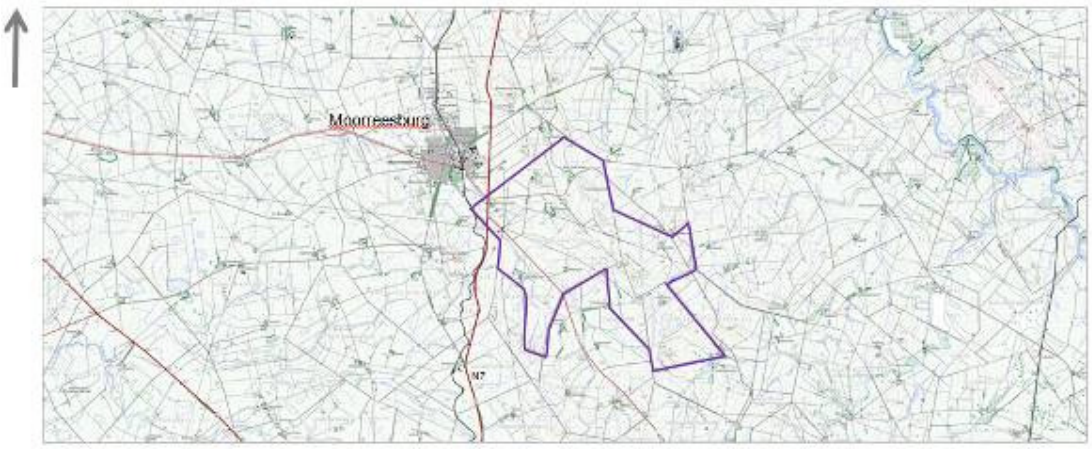
The Visual Impact Assessment by Afzelia (2015) notes that significant impacts will be experienced from the eastern edge of Moorreesburg, however this is the “industrial edge” of the town therefore

the impact on the residential properties will be more limited. While turbines will be visible from the N7 the central spine of hills through the study area will serve to increase both the back drop (visual absorption capacity) and have a screening effect with respect to turbines placed on north of the hill range. Afzelia have also commented that choice of the 25 turbines as opposed to the 40 turbine alternative will decrease the intensity of the visual impact.

CONCLUSION

Given the generally low heritage sensitivity of the study area, the proposed activity is acceptable in these terms. It may well be that visual and social impacts may be of greater significance, however the heritage qualities of the study area are of moderate significance. Impacts to physical heritage are considered to be unlikely. Landscape impacts which are a common concern with respect to developments of this kind are also expected to be moderate as the wheat land landscape (grade IIIB-C) of manicured and transformed hills is likely to be able to absorb the project is aesthetic terms.

The area is well suited to the proposed activity.



Declaration:

Mr Tim Hart is an independent specialist consultant who is in no way connected with the proponent, other than delivery of consulting services.

Tim Hart (MA) has been involved in heritage impact assessment and applied research for 28 years. Tim Hart is accredited with Principal Investigator status with the Professional Association of Archaeologists.

Contents

GLOSSARY

Archaeology: *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.*

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

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

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

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

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

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

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

Palaeontology: *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

Pleistocene: *A geological time period (of 3 million – 20 000 years ago).*

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

Structure (historic) *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

Wreck (protected): *A ship or an aeroplane or any part thereof that lies on land or in the sea within South Africa is protected if it is more than 60 years old.*

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency

1 INTRODUCTION

ACO Associates cc have been appointed by Savannah Environmental (Pty) Ltd on behalf of the client (INCA Energy & JUWI Energy), to establish a commercial wind energy facility, as well as associated infrastructure on a site located immediately to the East of the N7 at Moorreesberg in the Western Cape (Figure 1).

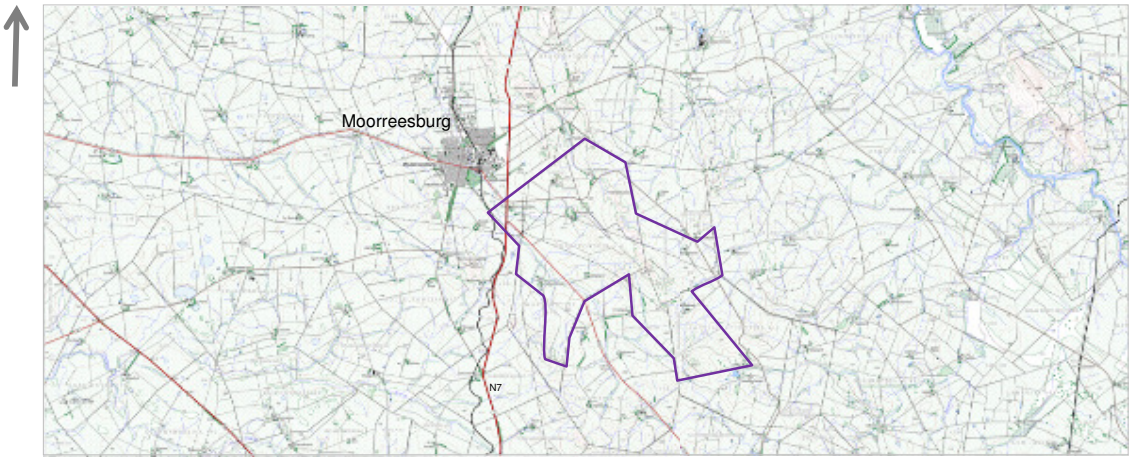


Figure 1: The locality of the proposed wind farm on a number of farms situated to the east of the Town of MoorreesbUrg.

The proposed wind farm will be located on the following properties indicated in Table 1 (referred to as 'the site') in the Malmesbury Division, Western Cape:

Table 1. Land portions making up the site.

Farm	Farm No.	Portion	Extent (Ha)	Landowner	Drafting notes
Klipheuwel (Hartebeestfontein) (servitude)	412	6	303,0881	Klipheuwel Trust IT 1821/2011	
Hartebeestfontein	412	2	303.9461	Engcar Plase (Pty)Ltd Reg No: 68/14405	
Tontelberg	424	1	264.4282	Pool Familie Trust IT 1793/2000	
Biesjesfontein	413	9	626.5630	Kleindrif Boerdery (Pty)Ltd Reg No: 73/13751	
Zwartfontein	416	1	325.5824	Pool Familie Trust IT 1793/2000	
Zwartfontein (servitude)	414	8	406.084	Wecar Trust IT 2920/2001	
Zwartfontein	414	Remainder of Portion 11 (Portion of Portion 1	352.2524	Hanekomshoop Trust	

Zwartfontein (Klein Zwartfontein)	414	Remainder of Portion 12 (Portion of Portion 1)	24.0997	Hanekomshoop Trust	
Zwartfontein (annex Klein Zwartfontein)	414	Remainder of Portion 13 (Portion of Portion 1) of the farm ZWARTFONTEIN no 414	66.7481	Hanekomshoop Trust	Comment: in the deed (page 4) it is Portion 13 and not remainder of Portion 13
Zwartfontein	414	Remainder of Portion 18 (Portion of Portion 1) of the farm ZWARTFONTEIN no 414	24.9874	Hanekomshoop Trust	Comment: in the deed (page 5) the extent is 24.9873 ha
Zwartfontein	414	Portion 23 (Portion of Portion 11) of the farm ZWARTFONTEIN no 414	51.3922	Hanekomshoop Trust	
Zwartfontein	414	Remainder of Portion 17 (Hanekomshoop) (Portion of Portion 1) of the farm ZWARTFONTEIN no 414	360.4609	Hanekomshoop Trust	
Zwartfontein	416	Portion 7 (Portion of Portion 3) of the farm ZWARTFONTEIN no 416	35.3002	Hanekomshoop Trust	
Zwartfontein	416	Remainder of Portion 3 (Zwartfontein noord) of the farm ZWARTFONTEIN no 416	68.2487	Hanekomshoop Trust	

All the land is currently zoned agricultural 1, and being situated in the Swartland, is mainly used for the cultivation of wheat.

1.1 Development Proposal

The proposal is the construction of a wind energy facility of 25 - 40 turbines producing up to 3.5 MW each. The power will be evacuated from the site by means of a 132kV line to the Eskom grid.

1.1.1 Alternatives

Two alternatives have been proposed for the facility. Namely a 25 turbine alternative and a 40 turbine alternative.

- The proposed activity will require the construction of laydown area for each turbine: cleared compacted areas for a heavy lift crane next to each turbine site for turbine assembly, maintenance and decommissioning.
- The excavation of a large foundation trench (typically 25x25x5m) for the concrete footing of each turbine.
- Temporary laydown areas for the placement and assembly of the turbine equipment during construction and decommissioning.
- An overhead transmission powerline (132kV) to the existing substation.
- Internal access roads to turbine sites.

1.2 Terms of reference

ACO Associates undertook to:

- Conduct a literature survey to gain a thorough knowledge of any background information pertinent to the affected area;
- Engage with consultants who have specialist regional knowledge of the area;
- Conduct a field survey of the proposed facility, tailored to the varying sensitivities and methods required;
- Map, record and photograph any heritage sites or objects offered protection by the NHRA or any other object or place considered significant by the ACO team;
- Produce an illustrated report describing the findings, defining areas of sensitivity, any further work required and suggesting mitigatory actions for reducing impacts to heritage resources.

2 METHOD

Information about the study area was derived from a literature search, local informants and a site survey.

During the site survey turbine positions for both options were inspected by vehicle and on foot. Road locations were not provided, however extensive tracts of landscape were covered during the survey (see Figure 2).

Any significant heritage sites identified were mapped, assessed and graded.

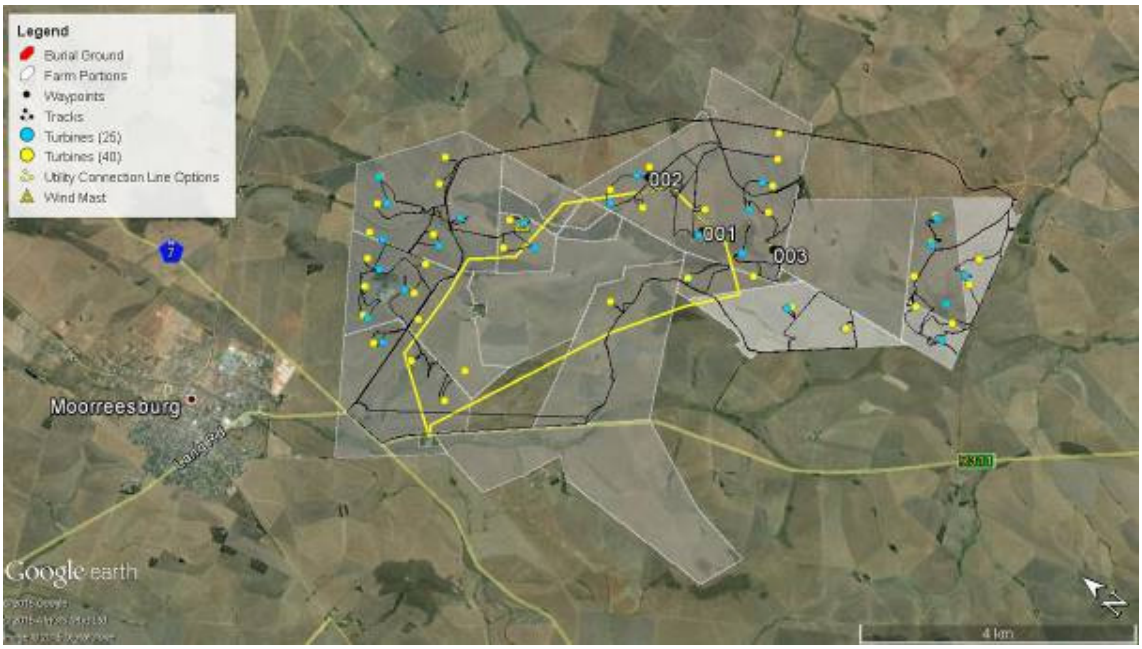


Figure 2. Recorded waypoints (001-003) and tracks during the survey.

2.1 Restrictions and assumptions

Few restrictions were encountered on site. Almost every proposed turbine position for both alternatives was inspected; furthermore large tracts of land were covered while team members were on route to turbine sites.

The fact that the work took place in the dry season before planting season meant that everywhere was accessible and visibility was excellent.

No trial excavations were conducted.

3 HERITAGE LEGISLATION

The basis for all Heritage Impact Assessments (HIA) is the National Heritage Resources Act, No 25 of 1999 (NHRA), which in turn prescribes the manner in which heritage is assessed and managed. The NHRA has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage, which must be considered in any heritage assessment, includes:

- Any place of cultural significance (described below)
- Buildings and structures (greater than 60 years of age)
- Archaeological sites (greater than 100 years of age)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards.

Section 38 of the NHRA stipulates that HIAs are required for certain kinds of development such as rezoning of land greater than 10 000 m^2 in extent or exceeding 3 or more sub-divisions, linear developments in excess of 300 m or for any activity that will alter the character or landscape of a site greater than 5000 m^2. Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m 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, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

1.1. Cultural Landscapes (places of cultural significance)

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

(a) its importance in the community or pattern of South Africa's history;
(b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
(i) sites of significance relating to the history of slavery in South Africa.

1.2. Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised as a category of heritage resources. Baumann & Winter (2005) recommend that the visual intrusion of development on a scenic route should be considered a heritage issue.

1.3. Heritage Grading

A key tool in the assessment of heritage resources is the heritage grading system which uses standard criteria. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1). The system is also used internally within Heritage Authorities around the country for making decisions about the future of heritage places, buildings and artefacts.[1] Presently Heritage Western Cape has a good guide to grading which is nationally applicable, on their website (http://www.westerncape.gov.za/public-entity/heritage-western-cape).

Table 2: Grading of heritage resources (Source: Winter & Baumann 2005).

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

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

[1] http://www.westerncape.gov.za/other/2012/9/grading_guide_&_policy_version_5_app_30_may_2012.pdf

4 RECEIVING ENVIRONMENT

The study area is in the heart of the Swartland, the main wheat farming area of the Cape Province. The Swartland is broad rural expanse of low rolling hills interspersed with farms, small communities and towns. Before the advent of wheat farming, the Swartland was characterised by "Renosterveld" plant communities which gave the area a dark-grey olive-green appearance when viewed from afar – hence the name Swartland (black country). The underlying geology consists of schists and shales of the Malmesbury Group, and is considered to be good agricultural land. The shale is rich in trace elements, which before the advent of agriculture supported large quantities of game. The Berg River alluvial terraces contain copious quantities of Early and Middle Stone Age artefacts attesting to the occupation of this landscape by humans for a million years or more. Today the Swartland is one of the most important wheat producing areas of the nation. Almost every farmer is involved in the cultivation of wheat. The wheat farming gives the entire area its particular character and texture (See Figures 3 & 4). A low wheat price in recent times has seen farmers look to other options – mixed farming, viticulture and renewable energy.

The study area itself is typical of the wheat-land landscape – a cohesive and highly characteristic landform to be found in the shale bedrock areas of the Cape. Generally the landscape is highly modified by human hand. The rolling hills have been subject to generations of contour ploughing, and the soil being fairly rich has resulted in a mosaic of relative small farms compared with other areas of South Africa. Farmsteads often enclosed by plantations of bluegum trees.


Figures 3 & 4. The Wheat Fields and some of the remaining Rhenosterveld

4.1 History

In 1661, Pieter Cruythoff, one of Jan van Riebeeck's corporals, led a reconnaissance team of eleven men to explore the hinterland. A myth had been circulating for some time about the city of gold, Monomotapa, which allegedly lay somewhere to the immediate north of the Cape settlement.[2] The VOC headquarters were impatient for their envisioned instant profits and commissioned several expeditions to find the fabled land. While the mission obviously never succeeded in locating a town saturated with gold, it did provide one of the earliest written records describing the interior of the Cape. The surgeon, Pieter van Meerhof, accompanied the first mission and kept the journal and wrote of plains teeming with wildlife. From one vantage point at Kasteelberg, on one day, they saw

[2] Worden, N, Van Heyningen, E & V. Bickford-Smith, 1998: *Cape Town: The Making of a City: an Illustrated Social History,* D. Philip, South Africa.

"thirteen horses (quagga), five rhinoceros, ostrich, thousands of hartebeest"[3]. It is also in this journal that 'Riebeek Kasteel' was first mentioned, named in honour of their mentor Jan van Riebeek.

When Willem van der Stel became governor of the Cape in 1699, he opened up new area for settlement, which included land grants in the Riebeek Valley and Tulbagh. Some of the first arrivals were Huguenots, and this resulted in the early establishment of vineyards, along with wheat and other fruit crops.

The VOC *freeburgher* system intensified pressures on the land. Food production yielded dreadfully low financial returns for the farmers, as the VOC paid unrealistically low prices. This forced farmers to turn to hunting as a means of survival. Within a number of years the larger fauna, such as the hippos of the Berg River, were exterminated. This level of natural resource exploitation put the settlers into inevitable conflict with the local indigenous Khoekhoen groups in the region, which included the Souqua (Sonqua), Cochoqua, and further along the coast, the 'Saldanhars'. The settlers' numbers, their uncompromising drive and firepower, all but guaranteed that the Khoekhoen would be pushed back and that the landscape, once teeming with wildlife, would irreversibly stripped of its natural fauna and flora.

According to historic records, the Khoekhoen favoured the Swartland as grazing land as it was far better suited to raising cattle than the depleted soils of the Table Mountain sandstones. The Berg River served as a corridor of permanent water and as such had a strong pull over the movement and settlement of people.

By the 19th century vast tracts of the Swartland were under wheat cultivation reaching an unsustainable climax in the 1930's when sheet erosion caused by years of poor plowing practice brought wheat farming to its knees and caused many of the poorer landowners to be displaced and their land consolidated. It was not until the universal implementation of contour plowing and modern fertilizers that farming became sustainable again. The indigenous Renosterveld plant communities have disappeared save a few small patches of land where remnant communities have survived. Hence, over the last 200 years the Swartland became transformed from a game rich wilderness to a vast historic landscape of wheat cultivation, farmsteads and small towns.

Like most of the Swartland Towns, Moorreesberg is a "kerksdorpie". The town of Moorreesburg is named after the Rev. HA Moorrees and was founded as a new Dutch Reformed parish on the farm Hooikraal in 1890. This was followed by a small school, post office and constabulary. The railway from Malmsbury was extended to the town in 1902.

Apparently farmers in the area had been endeavouring to establish the church to service the community since the mid 19th century. Messrs F Warnich and Dirk Kotze, then owners of the farm Hooikraal, each relinquished a piece of their land for church purposes. Over a period of many years the Moorreesburg Dutch Reformed Church purchased additional land for the growth of the town (the Church Council was effectively the Town Council). Moorreesberg is essentially a late 19th-early 20th century town that eventually became known as a regional center for wheat farming. A claim to fame that the town has is its association with the founding days of the company "Tiger Oats" [4].

[3] Molsbergen, 1916:45-62 & Mosop 1931: 6-11, in Rookmaker, L.C. *Zoological Exploration of Southern Africa*

[4] Athiros. G and L, and Turner, M. 2011 Riebeeks Castle. Tokai: Historical Media.

4.2 Heritage indicators and Findings

Palaeontology

No known palaeontological resources are present in this area as it is all underlain by Malmesbury Shale. The shales largely pre-date life forms. In addition no-limestone or calcrete formations of an age that would bear fossils were located.

Archaeology

The environment has been transformed by agriculture for more than 2 centuries. *In-situ* archaeological resources are extremely sparse with only three recorded occurrences being located. This consisted of a single quartzite flake that may have been of Early Stone Age origin, as well as two river cobbles, both found outside of their natural context, and on different farms (See Figure 2 for location, Figures 5 & 6 for artefacts).


Figures 5 & 6. Flaked river cobbles

Built environment

A survey of deeds of the land parcels involved indicate that all the land that makes up the study area derives from 3 parent farms Swartfontein, Biesjiesfontein and Tontelfontein. They were formalized as grants from quitrent farms in 1818-1835. Thus it is possible that the farms were inhabited and worked before this time.

Historical built environment within the study area is in poor condition, although there is plenty of evidence of farms *werfs* that contain vestigial historical fabric – stone or mud brick barns, kraals and abandoned structures. Indications are that most of the early farm residences have been demolished and rebuilt, or modernized beyond recognition.

Klein Swartfontein: (33° 9'34.01"S 18°42'55.18"E) The only really good example of an intact historical farmyard with buildings of a variety of ages is Klein Swartfontein where a variety of stone walled kraals, barns and residences have survived. Notable is the late 19th-early 20th century Karoo style farm house (resided in) and an adjacent smaller 19th century dwelling with a curvilinear iron roofed *stoep* (front and back) with Victorian ironwork still intact. It is in an abandoned condition. A field grading of IIIB is proposed for this farm complex.

Figure 7 & 8. The barn and 19th century dwelling on Klein Swartfontien. Figure 9 (below) panorama of structures at Klein Swartfontein.

Bessiesfontein, (33°13'7.98"S 18°46'36.79") a farm with early 19th century origins contains a number of vernacular barns of interest, however the farmhouse was demolished some years ago to make way for a large agricultural shed. A field grading has not been assigned due to lack of information, nevertheless the structures should be regarded as generally protected .

None of the built environment is of a grade that would be publically celebrated as heritage places therefore the impact of the wind turbines on their heritage values is moderate. However, it is of concern to note that on some farms in the study area a number of ruins and historic structures have been illegally demolished since 2012. The damage can be assessed using the Google Earth history function.

Graves and graveyards

Farm graveyards are known to occur in the area. There is a farm cemetery at Bessiesfontein **(**33°13'15.60"S 18°46'20.56"E see Figures 10-13), and a local informant provided information about another at Swartfontein. Generally most land parcels farmed since before the 1960's are likely to have a farm cemetery on the property. Given the shale substrate, isolated unmarked pre-colonial graves are very unlikely to occur. Indications are that no farm cemetery will be directly affected.


Figures 10 - 13. The graves on Bessiesfontein. They are close to and amongst an old blue gum plantation. Many of the graves have been broken, one has had the marble headstone stolen. The majority of the graves are only marked by small stones (approx. a foot), that have been placed standing up. Some of these have been moved from their original position (33°13'15.60"S 18°46'20.56"E).

Landscape

The cultural landscape is one of cultivation (wheat and livestock) with farmsteads and occasional blue gum plantations. Farms tend to be quite small, therefore farmyards are more numerous than in other areas. There is a central spine of rolling hills that run through the study area. All but the steepest slopes are cultivated. The steeper slopes and rocky ridges that cannot be plowed still retain enclaves of Rhenosterveld vegetation. Generally in both winter and summer the landscape takes of a manicured appearance highly transformed by human hand. While this is not a remote wilderness landscape or a dramatic mountain vista, the Swartland has a distinctive character. The shadows and contrasts created by the rolling scenery in early mornings and evenings is highly scenic – a mosaic of blue gum tree clad slopes, rolling hills and valleys and farm complexes. Despite the intense agriculture there is still wildlife on the land. A rarely seen Cape fox, steenbok, raptors and blue cranes were observed in the area.

The impact of wind turbines on this landscape in heritage terms is difficult to quantify as this is an aesthetic judgement, however the visual impact has been assessed in detail by Afzelia Environmental Consultants and Environmental Planning and Design (2015). While it is agreed with the VIA that the visual impact will generally be high when experienced from farms within and close to the study area, outskirts of Moorreesburg, it is felt that of all landscape in South Africa the presence of wind turbines in the study area are compatible with the manicured and swept quality of the surrounds, meaning that although the turbines will be highly visible, the sense of change or diminishment of the significance of the landscape will not necessarily be negative in status.

Landscape grading: The landscape is considered worthy of grading at the IIIB-C level. A grading is justified on the grounds that the landscape is typical of a particular region and has a certain amount of aesthetic appeal.

5 POTENTIAL IMPACTS ASSOCIATED WITH WIND ENERGY FACILITIES.

Wind energy facilities are big developments that can produce a wide range of impacts that will affect the heritage qualities of an area. Each turbine site needs road access that can be negotiated by a heavy lift crane(s) which means that in undulating topography deep cuttings and contoured roads will have to be cut into the landscape to create workable gradients. During the construction phase each of the turbine sites will have to be leveled off to create a solid platform for cranes as well as a lay-down area for materials. This will involve earthmoving and road construction, followed by the bringing in of materials and plant. The actual construction of the turbines will involve excavation into the land surface to a depth of 3 m and over an area of 400 m^2 for the concrete base. The pre-

fabricated steel tower is bolted on to the base and erected in segments. The nacelle containing the generator is finally attached followed by the rotors. The turbines are connected to underground cables to a sub-station(s) (positioned to be determined) where after the generated current will be fed to the national grid via transmission lines.

5.1 Impacts expected during the construction phase of the wind energy facility

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

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places:
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometers of linear trenches for cables;
- Erection of a 132 kV power line;
- Construction of electrical infra-structure in the form of one or more sub-stations.

In terms of impacts to heritage, archaeological sites which are highly context sensitive are most vulnerable to the alteration of the land surface. The best way to manage impacts to archaeological material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas. If primary avoidance of the heritage resource is not possible, then some degree of mitigation can be achieved by systematically removing the archaeological material form the landscape. This is generally considered a second best approach as the process that has to be used is exacting and time-consuming, and therefore expensive. Furthermore the NHRA requires that archaeological material is stored indefinitely which has cost implications and places an undue burden on the limited museum storage space available in the province.

5.2 Impacts expected during operation of the wind energy facility

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. The point at which a wind turbine may be perceived as being “intrusive” from a given visual reference point is a subjective judgment, however it can be anticipated that the presence of such facilities close to (for example) wilderness and heritage areas will destroy many of the intangible and aesthetic qualities for which an area is valued. The fact that turbines are continuously revolving results in a visual impact that can be very disturbing and destructive to the sense of serenity of a place.

- Due to the size of the turbines the visual impacts are largely not easily mitigated (they are easily visible from 10 km and up to 30 km in ideal conditions) in virtually all landscapes (personal observations), however indications are (PGWC, 2006) that they are perceived to aesthetically/artistically more acceptable in agricultural or manicured landscapes;
- The fact that the turbines are in continuous motion creates a visual impact more severe than that caused by static objects and buildings;
- Shadow flicker – an impact particular to wind turbines, comprises very large moving shadows created by the giant blades when the sun is low on the horizon. Such shadows can extend

considerable distances from the turbine. Continuous shadow flicker will have a serious impact on the sense of place of a heritage site;

- Visual impact of road cuttings into the sides of slopes will affect the cultural, natural and wilderness qualities of the area;
- Residual impacts can occur after the cessation of operations. The large concrete turbine bases will remain buried in the ground indefinitely. Bankruptcy or neglect by a wind energy company can result in turbines standing derelict for years, creating a long term eyesore.

While it is not expected that physical impacts will result- changes to the way in which the area is used by people can result in impacts. If the intangible qualities of a place are affected in such a way that it becomes an undesirable place to visit or reside, the sustainable use of the buildings will diminish. There is merit in making sure that no structures are affected by shadow flicker or noise which may result in them being uninhabitable.

Not implementing the proposal will result in no impacts to heritage, apart from those impacts caused by natural forces such as erosion, weathering and natural decay.

6 ASSESSMENT OF IMPACTS

The proposed development site is not sensitive in terms of archaeological material and marginally sensitive in terms of built environment. It lies adjacent to a scenic route and a town which will experience impacts although these may not necessarily be negative.

6.1 Archaeology

The study area is not archaeologically sensitive therefore rescue excavations of archaeological material will not be necessary for any development of the site, internal power line routes or substation sites. Generally the impact of the proposed activity on archaeological material will be very low.

6.1.1 Nature of impacts

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

6.1.2 Extent of impacts

It is expected that impacts will be limited (local). There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. Potential impacts caused by power line and proposed access roads are similarly likely to be limited and local. The physical survey of the study area has shown that archaeological material is insignificant and dispersed, which means that the extent of impacts is likely to be highly localised (if at all), with no regional implications for heritage of this kind.

6.1.3 Significance of impacts

In terms of the information that has been collected, indications are that impacts to pre-colonial archaeological material will be limited. In terms of buried archaeological material, one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be negligible.

6.1.4 Status of impacts

The destruction of archaeological material is usually considered to be negative; however opportunities for the advancement of science and knowledge about a place can result provided that professional assessments and mitigation is carried out in the event of an unexpected find. In this case there is so little material on site that there will be no opportunity to benefit therefore the impact will be neutral.

Table 2: Summary of Impacts for Archaeology

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (7)	Low (7)
Status	Neutral	Neutral
Reversibility	Low reversibility	Low reversibility
Irreplaceable loss of resources?	No	No
Mitigation: No mitigation required prior to construction.		
Cumulative impacts: n/a**.**		
Residual Impact: n/a		

6.2 Colonial period heritage

Colonial period heritage – that is buildings and historical sites of significance have not been identified within the boundaries of the study area.

6.2.1 Nature of impacts

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

6.2.2 Extent of Impacts

Direct or indirect impacts are not expected.

6.2.3 Significance of impacts

Given that there are no structures or historical sites within the study area that will be physically impacted, the significance of any impacts is very low. Furthermore, there are no heritage resources that are likely to ever be publically celebrated.

6.2.4 Status of impacts

Within the boundaries of the proposed wind energy facility, impacts are considered improbable. The overall status is considered to be neutral

Table 3: Summary of impacts on colonial period heritage.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Temporary (1)	Temporary (1)
Magnitude	Low (1)	Low (1)
Probability	improbable (1)	Improbable (1)
Significance	Very low (3)	Very low (3)
Status	Neutral	Neutral
Reversibility	n/a	n/a
Irreplaceable loss of resources?	No	No
Mitigation: n/a		
Cumulative impacts: No cumulative impacts		
Residual Impact: n/a		

6.3 Cultural landscape and sense of place

6.3.1 Nature of impacts

Cultural landscapes are highly sensitive to cumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region. It is felt that of all landscapes in South Africa the presence of wind turbines in the study area are compatible with the manicured and swept quality of the surrounds, meaning that although the turbines will be highly visible from within and close to the site, including the N7, the sense of change or diminishment of the significance of the landscape will be minimal, and not necessarily overly negative in status. Afzelia (2015) believe that the impact will generally be perceived as *negative* in terms of public opinion; however it is also noted that the Hopefield and Gouda wind energy facilities which are in similar contexts have not received an undue degree of negative comment.

The Visual Impact Assessment by Afzelia (2015) notes that significant impacts will be experienced from the eastern edge of Moorreesburg, however this is the “industrial edge” of the town therefor the impact on the residential properties will be more limited. While turbines will be visible from the N7 the central spine of hills through the study area will serve to increase both the back drop (visual absorption capacity) and have a screening effect with respect to turbines placed on north of the hill range. Afzelia have also commented that choice of the 25 turbines as opposed to the 40 turbine alternative will decrease the intensity of the visual impact.

6.3.2 Extent of impacts

Wind Turbines are without doubt conspicuous structures which will affect the atmosphere of the "place". While this impact may be considered local in terms of physical extent, there may be wider implications in terms of the change in "identity" of the area and the cumulative effect this could have on future tourism potential. The impact of the proposed activity will be local but with a moderate contribution to cumulative impacts.

6.3.3 Significance of impacts

The impact of the proposed activity is low

6.3.4 Status of impacts

The status of the impact is neutral-negative (without mitigation).

Table 4: Summary of Impacts on Cultural Landscape

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (2)	Medium (2)
Probability	Likely (3)	Likely (3)
Significance	Medium (24)	Medium (24)
Status	Neutral - Negative	Neutral - Negative
Reversibility	Reversible after closure of facility	Reversible after closure of Facility.
Irreplaceable loss of resources?	No	No
Mitigation: None possible		
Cumulative impacts: The closest existing wind energy facility is at Hopefield. This facility		
Residual Impact: n/a		

6.4 Transmission lines

The study area is sparse with respect to both archaeological and historical material/sites.

Table 5: Summary of Impacts on Heritage

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (1)	Low (1)
Probability	Possible(2)	Possible (2)
Significance	Low (12)	Low (12)
Status	Neutral	Neutral
Reversibility	Reversible after closure of facility	Reversible after closure of facility.
Irreplaceable loss of resources?	No	No
Mitigation: No mitigation is suggested.		
Cumulative impacts: Accumulative impacts are not expected.		
Residual Impact: n/a		

6.5 Access routes

Table 6: Summary of Impacts on heritage		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (1)	Low (1)
Probability	Possible (2)	Possible (2)
Significance	Low (12)	Low (12)
Status	Neutral	Neutral
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Mitigation: No mitigation required.		
Cumulative impacts: Within the context of the wheat lands where the earth is turned on a yearly basis, accumulative impacts are not expected.		
Residual Impact: n/a		

6.6 Comparison of alternatives

Alternatives:

In terms of the existing heritage on the site and immediate environs this report finds that alternative 1 (25 turbines) and alternative (40 turbines) are both acceptable, although this report is accepting of the finding in the VIA that the 25 turbine option would limit the intensity of the impact.

6.6.1 Substations

The proposed substation site is acceptable. No preference for other area is offered.

6.6.2 Transmission lines

Both proposed transmission lines routes are acceptable. No preference is offered

7 MITIGATION AND CONSERVATION

In terms of archaeology and palaeontology no mitigation is required.

7.1 Un-identified archaeological material and graves

There is always a chance that archaeological material and graves may be exposed during excavations for the facility and access roads.

All archaeological material is protected by Section 38.5 of the National Heritage Resources Act and it is an offence to destroy material. Archaeological material may only be altered or removed from its place of origin under a permit issued by the South African Heritage Resources Agency. If archaeological material (including graves) is uncovered, all work must cease in that area, while the

relevant heritage authorities are notified. Rescue mitigation may be required, for the cost of the developer.

Human graves can occur anywhere on the landscape. It is best that these are not disturbed. In the event of an accidental disturbance, the find site must be left as undisturbed as possible (i.e. treated as a forensic site) and an archaeologist contacted immediately. The archaeologist will invoke the necessary procedure for exhumation if needed.

7.2 Built Environment

It is not expected that the built environment will be directly impacted by the proposal unless it becomes necessary to demolish structures (farm houses, sheds, kraals, etc) that are greater than 60 years of age. It is anticipated in most instances it will be possible to avoid direct impacts. If any farm buildings, including sheds and old kraals, are threatened by development, a detailed assessment of their heritage significance will be required along with recording of details of structures.

Historic structures given a field grading of IIIB located at Klein Swartland are considered to be conservation-worthy. The duty of protection of these structures greater than 60 years of age will lie with the Provincial compliance authority, Heritage Western Cape. Any changes to the farm structures (by anyone) must be done in terms of the necessary permits issued by that organisation.

Accumulative Impacts

There are two authorised and near developed wind energy facilities – each within 40 km of the study area at Hopefield and Gouda, both of them within wheatland contexts. At the time of doing the work neither of these facilities was visible from the study area (albeit that there was a haze at the time). There will be a cumulative impact in terms of the adding of an industrial layer onto an agricultural landscape. There will be character change, however this report is of the opinion that human made objects are aesthetically more tolerable in human made manicured agricultural landscapes.

8 CONCLUSION

Given the generally low heritage sensitivity of the study area, the proposed activity is acceptable in these terms. It may well be that visual and social impacts may be of greater significance, however the heritage qualities of the study area are of moderate significance. Impacts to physical heritage are considered to be unlikely. Landscape impacts which are a common concern with respect to developments of this kind are also expected to be moderate as the wheat land landscape of manicured and transformed hills is likely to be able to absorb the project is aesthetic terms.

The area is well suited to the proposed activity.

9 MANAGEMENT

Project component/s	• Turbine construction involves a large excavation for the counterweight foundations. • Overhead and below surface power lines.

	• Substation(s) construction • An overhead power line to connect the facility to the electricity grid • Internal access roads • Workshop area/office for maintenance • Construction of access road.
Potential Impact	No impacts expected.
Activity/risk source	Construction of access roads.
Mitigation: Target/Objective	Avoid impacts to ruins, farm buildings and cemeteries.

Mitigation action/control	Responsibility	Timeframe
Check final road routes with heritage consultant, design mitigation if necessary.	Proponent and project archaeologist.	In planning stages before construction commences.
Record any historical structures that may need to be demolished.	Project archaeologist	In planning stages before construction commences.

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11 APPENDIX A

Summary of findings of the Visual Impact Assessment

11.1 Landscape character

The landscape character of the study area can be divided into three distinct Landscape Character Areas (LCAs);

Rural Agricultural Landscape Character Areas. This is a productive wheat farming area that is characterised by open fields punctuated by farmsteads and undulating topography. This is a relatively open landscape where visibility is generally only modified by landform. The proposed development is located within this LCA.

Wilderness Landscape Character Areas. This LCA is comprised of the mountain ranges to the east and north of the study area. These areas are in the main formally protected and are covered with natural vegetation. Because of the sheer nature of the landform, visibility of the proposed development is only likely to be possible from the edges that face the proposed site.

Rural Elevated Dune Landscape Character Area, this is comprised of the elevated land form approximately 30km to the west of the proposed site. This LCA is generally covered by natural fynbos that in areas has been invaded by alien vegetation. Within this area there are numerous small settlements and homesteads. This area is elevated above the Rural Agricultural Landscape, it generally has shallow gradients and has a vegetation that limits the visual horizon. Because of this views over the agricultural landscape towards the proposed development are largely only possible from the eastern edge of this LCA.

Urban Landscape Character Areas, these are comprised of the town of Moorreesburg and other small settlements within the study area. Once inside these areas views of the external landscape can be difficult to see. In Moorreesburg however because roads typically run directly down the small ridge on which the settlement is located towards the proposed development, narrow vistas of the site will be possible from within the urban area.

11.2 Visual Impact

Visual impacts might include;
General landscape change or degradation which might entail the introduction of elements that would modify the character of the landscape. Of all the LCAs identified, the mountainous wilderness areas to the north, east and south of the study area are the most important as these generally have a protected status. The simple and open character of the agricultural LCA in which the proposed site is located also has some importance due to its cohesive consistent nature and the fact that it provides a strong contrast with the adjacent mountainous zone.

Change in specific views of identified visual receptors that might spoil the enjoyment of a view or restrict a current or potential use of the area. Identified receptors include;
Area Receptors such as urban areas and the wilderness landscape to the northeast and south.

Linear Receptors which include main routes through the area. It is likely that these routes will be mainly used by local people however, the N7 Cape to Namibia Route is used extensively by tourists. The R311 and R44 are also likely to carry a proportion of tourist traffic.

Point Receptors that include isolated and small groups of homesteads that are generally associated with and located within the Agricultural Landscape that surrounds the proposed development site.

11.3 General Landscape Change

Given the relative elevation of the protected areas, it will be possible to see the proposed wind farm from these areas, particularly from the closest edge. These edges overlook the broad valley in which the proposed site is located.

These wilderness areas are however remote and it is unlikely that a large number of people will experience views from the top of these steep mountainous areas. For those that do however they will overlook a highly modified rural landscape. Whilst the area is not natural, it does present a strong agricultural character with a land use pattern that reflects the land's natural capacity. To this extent the view presents a natural pattern.

Within this natural pattern, the proposed wind farm could present an area of development that appears contrary to the broader agricultural pattern. There are however mitigating circumstances including;

- When viewed from a distance whilst the individual turbines may be obvious, the agricultural pattern will flow through and around the structures.
- When viewed from above, the turbines will be viewed against the backdrop of agricultural use and will not be seen against the skyline.
- The location of the sun will for approximately half of each day the side of each structure facing these protected areas will be cast in shadow making it likely that the structures will recede into the background. Weather and atmospheric conditions are likely to extend this period.
- There is an existing wind farm close to Gouda that is in the process of being extended that is closer to the listed natural protected areas and is likely to be more obvious from these areas.

Therefore, whist the proposed wind farm may be visible from the edges of these protected areas, it Is not likely to be obvious at all times and when it is it will not disturb the natural landscape pattern seen from these areas. The assessment also found that the topography surrounding the proposed site served to restrict impacts to intermittent views of small parts of the development until the viewer is close to the site and within a ring of intervening ridgelines. This means that the most obvious landscape change within the Rural Agricultural LCA only becomes fully apparent over a relatively small area of the landscape. This area is also close to the urban area of Moorreesburg and so development within the landscape is already apparent from this area.

The influence of the proposed development in extending the influence of wind farm development across the landscape was also considered. Whilst to a degree the development will inevitably contribute to this, mitigatory circumstances include;

Currently and after development of the proposed wind farm, no two wind farms are likely to be obvious at any one time within the landscape.

Currently and after development of the proposed wind farm, windfarm development will be located on different and parallel strategic routes through the area.

The proposed development will have little or no impact on the character of the Urban and the Rural Elevated Dune LCAs.

11.4 Change in specific views of identified visual receptors

The assessment found that whilst views of the development will be possible over a wide area, it is only likely to be receptors within a ring of intervening ridgelines close to the site that are likely to be adversely impacted to a significant degree. These include;

Views from roads will be affected negatively however it is only really views from within the high impact zone that is defined by surrounding ridgelines that the impact will be significant. The N11 Cape to Namibia Route will be impacted over approximately 9km.

Views from Moorreesburg will be affected but largely this will only be the west to east running roads that run downhill towards the site providing narrow vistas into the urban area. From the site visit it was concluded that Moorreesburg has a relatively diverse economy for a small town and that tourism is likely to be a relatively small sector. It therefore was concluded that the change in view is not likely to impact negatively on the majority of activities within the town in any significant way. It was however identified that sectors of the population are likely to view the proposed development in a negative light.

Views from Farmsteads in close proximity to the wind farm are likely to be adversely impacted. The largest impact will be associated with farmsteads within the turbine field. Many of these farmsteads currently have tall vegetation surrounding them which could provide a degree of screening. It would also be possible to augment this vegetation however this is only likely to have any positive impact at a distance from the development.

Shadow flicker was found likely to affect a number of homesteads in the vicinity of the wind farm. The risk of this impact extends to the eastern edge of Moorreesburg. From the site visit it was identified that the majority of the potentially affected urban area is industrial in nature.

The nature, extent and location of ancillary infrastructure was found to be critical in minimising impacts particularly within the identified high impact zone close to the development. The visual objective should be to maintain the existing agricultural landscape running through and around the turbine towers in order to maintain a visual link and make it appear that the turbines are isolated elements within a broader landscape type. If the ground level is cluttered with infrastructure this is likely to erode this perception. Key considerations include;

- Adopting the overhead power line alternative 2 which largely follows an existing power line alignment and minimises use of higher areas of the site for the alignment.
- Siting key elements of the development such as the control building and in lower areas of the site and preferably close to other development such as the existing Moorreesburg Substation.
- Minimising disturbance and as far as possible maintaining an agricultural outlook.

The different nature of the landscape to the east and west sides of the ridge on which the wind farm is proposed was also considered. It was found that the landscape on the west side of the ridge is already impacted by development as it overlooks Moorreesburg and has a number of infrastructural elements running through and in close proximity to it. There is also an active quarry sited on the hillside. The eastern side of the ridgeline by contrast is relatively undeveloped. Maintaining as much

of the ancillary infrastructure on the western side of the ridge was therefore considered critical if impacts on the broader landscape character are to be minimised.

Lighting was also considered. This is likely to include security lighting around the control building and wind turbine obstruction lighting for aviation safety. It was found that this lighting is likely to only have a local impact. The location of the control building on the western side of the ridge and close to existing lit areas was considered of likely benefit in minimising impacts.

11.5 Conclusion

Whilst the proposed Moorreesburg wind farm will be visible over a wide area, topography will significantly modify its impact to the extent that high levels of impact may only be experienced in a relatively small area that is defined by surrounding ridgelines. The landscape of a large part of the high impact zone has already been modified by development. It is recommended that further modification, particularly associated with ancillary infrastructure is concentrated in this area.

In terms of the best visual alternative (25 turbine or 40 turbine alterative), the 40 turbine alternative is likely to predominantly increase impacts over the 25 turbine alternative within the high impact zone. The difference between the alternatives is likely to be reduced with distance as smaller sections of the development are obvious due to the undulating topography.There may be benefits in reducing the numbers of turbines in close proximity to Moorreesburg and the N7 particularly with respect to the potential risk of shadow flicker whilst maintain the denser layout in other areas.