PROPOSED RICHTERSVELD WIND FARM

(Rooibank (Farm 7/2), Witbank (6/2) and part of the remaining extent of Farm 1 (Re/1))

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

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EXECUTIVE SUMMARY

ACO Associates CC have been appointed by ERM on behalf of the client, G7 Renewable Energies, to undertake a Heritage Impact Assessment, as part of the EIA process, for the establishment of a wind energy facility in the Richtersveld on farms Rooibank (Farm 7/2), Witbank (6/2) and part of the remaining extent of Farm 1 (Re/1). The Study Area lies between Port Nolloth and Alexander Bay being some 26 km south of the South African border.

The fieldwork was conducted on 9 – 11 October 2010. It involved a foot survey of the turbine positions, substation and underground electrical connections and a drive down of the road network. No significant limitations were encountered during the survey.

Impacts of turbines and access roads

The cultural landscape of the area contains the living heritage of Nama herders who still use the area. The construction of wind turbines should not affect the herders who will continue to exercise a traditional way of life. Aesthetically however the turbines represent a very modern industrial and technological layer over a landscape characterised by an ancient lifestyle, however the area is remote, arid and does not form part of any area with special landscape qualities. Given this, and the need for renewable energy the proposed activity is deemed acceptable.

Impacts to palaeontological material are considered unlikely, however it is recommended that excavations be checked by a palaeontologist during the construction phase,

There are two archaeological sites of moderate significance and two archaeological sites of low significance within the Study Area which will require minor mitigation in terms of the proposed turbine positions and access roads. All of the sites are Late Stone Age in origin ranging between as old as 4000 years (Late Stone Age microlithic industry) as well as less than 2000 years in age (Late Stone Age ceramic period).

Site 3 (28°45'20.37"S 16°39'37.85"E) lies very close to locality WTG 5 which could mean that it may be impacted by construction activity (surface disturbance) relating to construction of turbine WTG 5 and the associated road.

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the entire site will have to be systematically archaeologically sampled prior to commencement of construction.

Site 4 (28°45'16.69"S 16°39'26.84"E) Lies close to a proposed access road and turbine WTG 4. If the construction area is not judiciously confined, disturbance of this archaeological site may result.

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the entire site will have to be systematically archaeologically sampled prior to commencement of construction.

Site 6 (28°44'13.26"S 16°42'33.53"E), the largest archaeological site identified in the Study

Area lies close to turbine WTG 26. Impacts (surface disturbance) from construction of the access road and the nearby turbine could affect this archaeological site.

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the site will have to be systematically archaeologically sampled prior to commencement of construction

Sites 1 (28°45'38.68"S 16°39'57.47"E) and 5 (28°44'16.55"S 16°42'37.96"E) are highly ephemeral scatters and are therefore considered to be of very low significance, hence should they be impacted, the loss to the heritage record is of very low significance. Mitigation/conservation of sites 3, 4 and 6 will serve as an adequate record of the archaeological heritage of the Study Area.

Mitigation of these sites is not critical, however in the interests of conservation site 5 should be flagged and the access road deviated by about 20 m to the north to avoid it.

Impacts of substation alternatives and 220kV transmission lines.

Both the preferred location and alternative will not result in any impacts and are therefore acceptable.

Conclusion

The proposed activity is considered acceptable. The mitigation requirements with respect to tangible heritage are moderate given large size of the Study Area.

1. INTRODUCTION

ACO Associates CC were appointed by ERM (Pty) Ltd on behalf of the proponent, G7 Renewable Energies, to undertake a Heritage Impact Assessment as part of an EIA process. G7 Renewable Energies (Pty) (G7) proposes to establish a wind energy facility near Alexander Bay. The proposed project will be located on Rooibank (Farm 7/2), Witbank (6/2) and part of the remaining extent of Farm 1 (Re/1) near Alexander Bay in the Northern Cape Province. The site is located on the R382 on the West Coast between Port Nolloth and Alexander Bay. The approximate site boundary is shown on Figure 1. The facility will generate up to 225MW of electricity which will be fed into the National Power Grid.

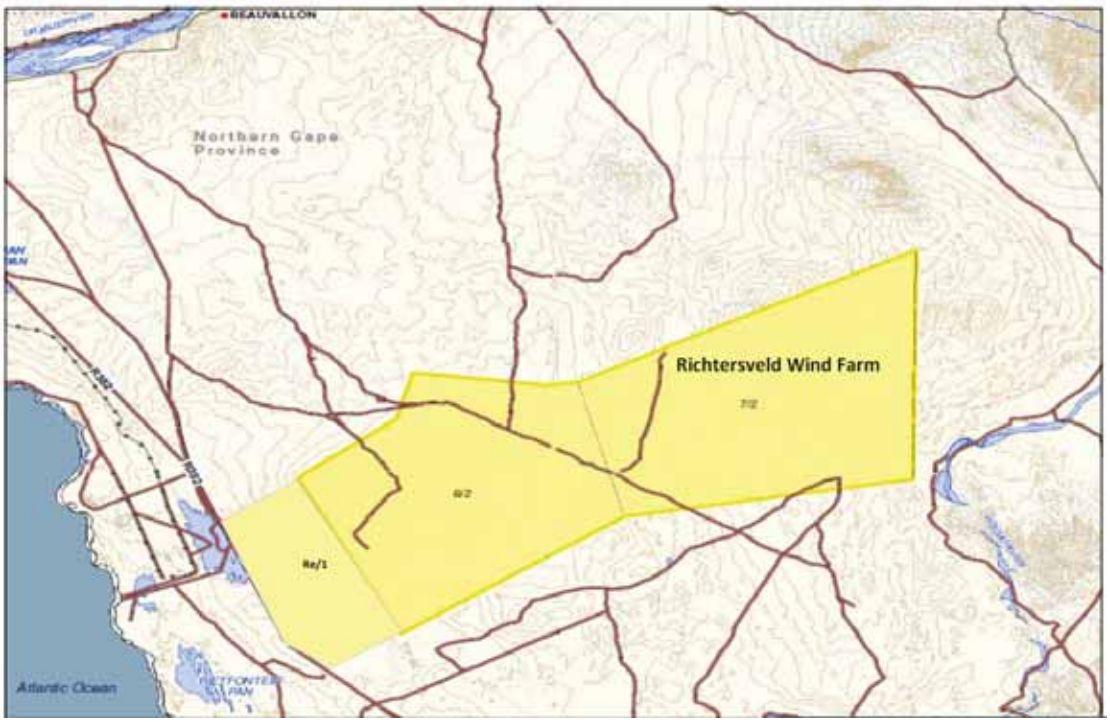

Figure 1 The Study Area (ERM 2010)

1.1 Development Proposals

• It is proposed that here will be up to 75 wind turbines on the site. Each turbine will have an individual capacity of up to 3 MW.

• The turbines will be up to100 m high (to the turbine hub), with a blade diameter of up to 117 m.

• Each turbine will have a concrete foundation at it's base. The foundation will be approximately 20 x 20 x 3 m below ground and 5 x 3 m above ground.
• There will be a gravel hard standing area adjacent to each turbine (approximately 2500 m2) that will be used during construction and maintenance activities.

• Each turbine will be accompanied by an electrical transformer.

• The site will be accessed via the R382 (between Port Nolloth and Alexander Bay)

• Existing tracks will be up-graded and new gravel roads may be constructed within the site to facilitate movement of construction and maintenance vehicles.

• Site access roads will be up to 12 m wide with drainage trenches adjacent to the road.

• Some existing public roads may need to be upgraded to facilitate the transport of the turbines and other construction materials to the site.

• An office and storage building with security and ablution facilities integrated into the main 220kV substation will be constructed on the central area of the site.

• A permanent wind measuring mast of up to 80 m will be erected to monitor wind conditions.

• Site fencing will be erected as required.

1.1 The heritage team.

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

Duncan Miller (Phd) is a heritage specialist with interests in geology and palaeontology. He has published widely on archaeology and palaeontology of the West Coast and has considerable knowledge of the geology, palaeontology and mineralogy of South Africa.

Kyla Bluff (BA hons) is an archaeologist and prospective postgraduate student.

Wesley Flear (BA hons) is an archaeologist and postgraduate student.

Figure 2. The proposed location of the 220 kV substation is in the central area of the site. This will be linked with existing Eskom 220 kV transmission lines by means of a small connecting substation.

2. METHODOLOGY

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

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

2.1 Assessing heritage in the context of wind energy developments

Wind energy facilities have grown exponentially throughout the world in response to the international energy crisis and climate change. Initially communities enthusiastically accepted the presence of wind energy facilities, however web-based research of international experience has indicated that they are not without controversy. The impacts of clusters of massive wind turbines on cultural landscape can be severe, both in physical terms and with respect to the intangible and aesthetic qualities of a given locality. A pilot study commissioned by the Provincial Government of the Western Cape "Towards a Regional Methodology for Wind Energy Site Selection in the West Coast region" (2006) considered landscape character rather than the cultural landscape but they concluded that wind energy facilities have a profound impact on the surrounding landscape in terms of the natural qualities of places. In terms of landscapes and heritage, there are no pro-active detailed local regional studies that can be consulted, however the pilot study recognises that severe impacts can occur, but also emphasises the desirability of clean energy and the need to build clean energy facilities in landscape that can tolerate them.

Wind energy facilities are often big developments. Turbines (some facilities with several hundred turbines are proposed in parts of RSA) can be up to 100m high with blades up to 50m in radius. The structure has to be counterweighted by a concrete block (up to 675 cubic meters) sunk deep into the ground. Each turbine site needs road access that can be negotiated by a heavy lift crane which means that in undulating topography deep cuttings and numerous roads

may be made into a landscape to create workable gradients. Due to their size the visual impacts are immitigable (they are easily visible from 10 km) in virtually all landscapes, however indications are (PGWC 2006) that they are perceived to be aesthetically more acceptable in agricultural or manicured landscapes.

The point at which a wind turbine may be perceived as being "intrusive" in terms of the aesthetics of an area is a subjective judgment, however it can be anticipated that the presence of such facilities close to wilderness and heritage areas will destroy many of the intangible and aesthetic qualities for which an area is valued, or could be potentially valued in the future. Yet the circumstances are variable as in certain landscape forms, the graceful shapes of the turbines and the sculptured twist of the rotors are perceived to be aesthetically pleasing.

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

The locations of the proposed turbines, access roads, electricity power lines, substations were loaded onto handheld GPS receivers (set to the WGS84 datum) to facilitate the identification of the search area during field work. Fieldwork was undertaken on 9-11 October 2010. Walk paths and site locations were recorded with GPS and finds were photographed and described.

- The proposed locations of the turbines, the substation alternatives and the underground power lines was surveyed on foot
- A drive down was undertaken of the access roads
- The impact of the proposed activity on the palaeontology of the area was assessed in terms of the known geology of the area.

2.1 Limitations

There is good unpublished information on the archaeology of the area as De Beers mining operations have had archaeological surveys undertaken on an annual basis since 1995. limited work has been undertaken in the Alexkor diamond mining areas as they have not ever implemented any form of heritage management plan.

The below surface conditions of the site are assumed in terms of the published geology of the area. Apart from two small rocky outcrops, Aeolian sands cover the site.

There were no significant study limitations as all turbine and substation locations were accessible on foot or by off-road vehicle.

A GPS “tracklog” failure on one unit resulted in incomplete recording of walkpaths.

3. REGULATORY AND LEGISLATIVE OVERVIEW

The basis for all heritage impact assessment is the National Heritage Resources Act 25 (NHRA) of 1999, which in turn prescribes the manner in which heritage is assessed and managed. The National Heritage Resources Act 25 of 1999 has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

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

3.1 Cultural Landscapes (places of cultural siginificance)

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

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

(i) sites of significance relating to the history of slavery in South Africa.

3.2 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised by as a category of heritage resources. In the DEA&DP (Western Cape) guidelines for involving heritage specialists in the EIA process, Baumann & Winter (2005) comment that the visual intrusion of development on a scenic route should be considered a heritage issue.

3.3 Heritage Grading

Heritage resources are graded following the system established by Winter and Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

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

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

3.4 Wind Energy Guidelines

A pilot study commissioned by the Provincial Government of the Western Cape "Towards a Regional Methodology for Wind Energy Site Selection in the West Cape region" (May 2006) is the only locally available draft policy guideline in South Africa. The study looked at landscape character rather than at the "cultural landscape" or "heritage" but concluded that wind energy

facilities can have a profound impact on the landscape in terms of quality of place. In general terms it recommends a buffer of at least 500 m from heritage sites. There are no guidelines or draft guidelines for the Northern Cape Province.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Study Area is situated in the semi-desert area of the Richtersveld roughly 10 km inland of the coast. Previously the land portions involved formed parts of Alexkor's (State Diamond Mine) holdings. Members of the Richtersveld community recently successfully contested the State Diamond Mine occupation of ancestral land with result that the Richtersveld Community Property Association now has control of vast tracts of land on the Namaqualand coast including the Study Area. Historically, almost all of this land was the territory of the Nama herders, a Khoekhoen descendent community with roots in the area as long as 2000 years ago.

The Study Area is some 9 km inland of coast immediately east the two well known landmarks of the *Boegoeberg*. The coast of Namaqualand was occupied during the prehistoric past despite its arid qualities (Plates 1 and 2). There is evidence that people were living in the area a million years ago.

In terms of aesthetics the area is open and desolate (Plate 1). The coastal strip (west of the provincial road) has been subject to intense diamond mining for most of the 20th century. West of the R382 prospecting trenches, spoil heaps and bleak denuded areas litter the landscape. East of the R382 are the arid coastal lowlands consisting of large open tracts of sparsely vegetated dunes. While the Richterveld is held in high esteem as a wilderness destination, the Study Area holds little interest and is seldom visited (if ever) by tourists.

Plate 1. View from within the Study Area looking south east towards the escarpment.

Plate 2. Looking in a westerly direction towards the Boegoeberg

4.1 Palaeontological heritage

The proposed Richtersveld wind farm will be located on Rooibank (Farm 7/2), Witbank (6/2) and the remaining portion of Farm1 (Re/1) near Alexander Bay. The only rocky outcrops occur on Farm 6/2. There is an outcrop of granitic rocks, presumably of the Kuboos-Bremen Suite, near the north east corner. In the north central part of the farm (28° 44 13.40S 16° 40 00.56E) there is an outcrop of schistose rocks, probably of the Holgat Formation (28° 44′ 13.40″S 16° 42′ 32.72″E) of the Gariep Supergroup. In the centre (28° 45′ 28.56″S 16° 40′ 02.91″E) an outcrop of calcrete or surface limestone supports the existing wind monitoring mast. The granite, being igneous, contains no fossils. No fossils have been reported from the metamorphosed sandy and muddy sediments of the Neoproterozoic (latest pre-Cambrian) Holgat Formation (Frimmel *et al.* 1998; Gresse *et al.* 2006), and none are expected.

The Namaqualand coast records various high stands of the sea, with palaeostrandlines at elevations of 110 m, 65 m, 35 m, 20 m, and 5 m above present mean sea level (Roberts *et al.* 2006). These fossiliferous beach deposits of Miocene to Pleistocene age are covered with 15-50 m of wind-blown sand (Pether 1994; Roberts *et al.* 2006), and are unlikely to be intercepted in excavations for the proposed wind farm. Nevertheless, if excavations reveal shells and/or bones, intervention by a palaeontologist is required. The fossiliferous sediments consist typically of basal gravels, overlain by red or green sandy deposits. These contain mollusc fossils, as well as fossils of terrestrial vertebrates (Roberts *et al.* 2006).

The calcrete outcrop may represent a cemented aeolianite (dune), related to one of the former high sea levels. Similar aeolianites on the Namaqualand coast contain fossil eggshells of a Pliocene giant ostrich and fossils of primitive elephants (Pether 1994; Roberts *et al.* 2006; Macrae 1999). Any further excavation of this calcrete should be checked by a palaeontologist. The wind-blown sand cover may contain palaeosols with calcified roots and dune snails, as further south immediately north of the Olifants River, where these palaeosols also contain Early and Middle Stone Age artefacts (Roberts *et al.* 2006).

The overall palaeontological significance of the proposed Richtersveld wind farm area is predicted to be **moderate to low**.

4.1 Pre-colonial Heritage

Although little researched until relatively recently, the existence of shell middens on the coast of Namaqualand has been known since the 18th century travels of Robert Jacob Gordon. In August 1779 Gordon commented on the many shells and the remains of huts that littered the dunes (Cullinan 1992). In the early years of the 20th century Winifred Hoernlé (Carstens *et al.* 1987) also visited the area remarking on the archaeology present. In her diary she remarks that "all along the river there are evident signs of Bushman occupation for their shells are to be found in heaps on every side while here and there a piece of pot crops up too (Carstens *et al.* 1987:65). She comments that middens are plentiful along the shore but that nothing of interest is found on them. Recent heritage impact assessments along the Namaqualand coast have revealed just how remarkably rich the pre-colonial archaeology is there, although many middens do indeed contain nothing but shell and the occasional quartz flake (Halkett 2003; Orton 2005, 2007b; Orton & Halkett 2005, 2006; Webley, in prep.). Many thousands of shell middens occur, with some containing a rich array of finds including stone artefacts, pottery, bone tools, ostrich eggshell beads and animal bones.

Human burials occur widely and along the coast are completely unmarked. They are seldom found by archaeologists with the vast majority being dug up during diamond mining. Hoernlé (Carstens *et al.* 1987) also remarks on burials. She found a skeleton eroded out onto the surface

near Kortdoorn and saw many stone-covered mounds along the river which she suspected to be graves. Upon excavating one of them she found a skeleton lying on its left side with the knees brought up beneath the chin. The skeleton was 5 feet below the surface and covered with three large, flat stones.

Since the advent of rescue archaeology programs ahead of diamond mining in coastal Namaqualand, academic research has also commenced. Without this the large body of excavated material would not otherwise be fully and properly studied. One doctoral thesis has been completed (Dewar 2007) and published (Dewar 2008) and another is in preparation (Orton, in prep.). An earlier thesis examined mainly inland sites but also included the very important coastal site of Spoeg River Cave (Webley 1992b). Several academic journal articles have also been produced concerning coastal and near-coastal sites (Dewar *et al.* 2006; Dewar & Jerardino 2007; Jerardino *et al.* 1992; Orton 2007c, 2008; Orton *et al.* 2005; Webley 1992a, 2002, 2007). With archaeological research in Namaqualand being so youthful every contribution is valuable.

Further inland, both in the Richtersveld and in central Namaqualand, research has been underway for slightly longer, primarily through the efforts of Lita Webley (1984, 1986, 1990, 1992b, 1997, 2001, 2007; Brink & Webley 1996; Miller & Webley 1994; Webley *et al.* 1993) but including contributions by Smith *et al.* (2001) and Orton and Halkett (in press; Orton 2007a).

It has now been established that the coastal archaeology of Namaqualand is long and complex, covering the entire time span between up to a million years ago to the present day. The archaeology of the last 5000 years is particularly interesting with human occupation of these arid areas pulsing with variations in climate. Namaqualand boasts possibly the longest unbroken record of human settlement in that Nama speaking herders who practise traditional lifestyles in the area are descendents of Khoekhoen populations who fist came into southern Africa more than 2000 years ago.

4.2 Colonial Heritage

The following account of activities in the Richtersveld area during the historical period is compiled from Carstens *et al*. (1987), Davenport (2010), Fleminger (2008) and Williamson (2000). The first travellers to the Orange River included elephant hunters such as Jacobus Coetzee in 1660. The earliest European penetration of the Richtersveld via the coastal route was by William Paterson and Colonel Gordon in 1779. Dr E Richter, an inspector of the Rhenish Mission Society, visited the area in 1830. The area was subsequently named after him. A mission station was established at Kuboes in the mid 19th century.

Captain James Edward Alexander (geographer and explorer) visited the Sendelingsdrift area in 1837 and prospected for copper at Kodas. He explored the south bank of the Orange from the mountains of the Richtersveld to the sea, and proposed transporting copper down the Orange River by barge to the mouth, and then by ship to Europe. There is an inscription to this effect at the Baaken mine. A few years later, on 21 March 1846, the South African Mining Company was formed. They sent Thomas Fannin to the Orange River to survey the area and begin mining the copper deposits. He started an open cast mine that is now thought to be the oldest commercial mine in South Africa. Although the ore was rich and the progress good, the company faded away, probably due to logistical difficulties, the harsh environment and the lack of finance. In 1847 the British extended their control to the Orange River and the Richtersveld was included in the Namaqualand district. By the 1890s, the inhabitants of the Richtersveld demanded clarity regarding their ownership of the land. Eventually in 1934 a formal "ticket of occupation" was issued by the government giving the indigenous groups communal rights to the land which was technically still held in trust by the state. The Richtersveld then became a "coloured reserve" under a management board.

It is interesting that although copper was mined in the mid-19th century by the colonists and long before that by the prehistoric inhabitants of the area (Goodwin 1956), diamonds were only discovered by Europeans in the early 20th century. In 1908 Dr Bernhard Dernburg discovered diamonds in southern Namibia (Davis 2008) and the area became known as the 'Sperrgebiet'. Earlier, someone called Pohle had been the first to recognise the potential for finding diamonds in the Orange River. He had reasoned that since the river ran past the Kimberley diamond fields it must be carrying the gems downstream, but his limited prospecting yielded no result (Coetzer 1997). It was only in 1925 that the first Namaqualand diamond was discovered. It came from a site 10.5 km south of Port Nolloth and was found by Jack Carstens on 15th August using very rudimentary techniques (J. Carstens 1962; P. Carstens 2001). He continued his work to the south, since his father had found nothing around Alexander Bay from prospecting between 1899 and 1901. Subsequently, in November 1926, Dr Ernst Reuning, a geologist employed by Dr Hans Merensky, found the first diamonds at Alexander Bay (P. Carstens 2001). It was near the ruins of an old stone house used in the 1830s by Alexander as a copper store that Merensky noted an outcrop of shingle containing oysters. He had earlier noted the co-occurrence of oysters and diamonds to the south and set Reuning to work at that location. This spot was at the northern end of the so-called "Oyster line" which was a very rich source of diamonds. Earlier, a solicitor from Springbok named Israel Gordon, his two brothers and two others had first found diamonds near Alexander Bay. On 28th December 1926 Reuning and Merensky visited their claims and came to an agreement with the Gordon syndicate for 6 months of work on their claims but within a few days made a formal offer to purchase the property. This was accepted and Merensky obtained it for £17 500. Merensky then appealed to the state to prevent public digging at Alexander Bay and on 22 February 1927 the government banned prospecting on Crown land and, amidst much wheeling and dealing, began planning the establishment of the state diggings there (Rudd & Watson 1956 in P. Carstens 2001). It took over all mining

operations there in 1928 (Keyser 1972). This was later to become the Alexcor or State Diamond mines. After almost a century of mining, the Richtersveld community, compromising mainly people of Nama origin, once again obtained their rights to the land.

4.2 Living heritage: The Nama

Historical accounts up until 1913 suggest that Nama-speakers were living very much like their ancestors of several centuries before. The Nama-speaking inhabitants of the region follow a seasonal transhumant cycle. This means that they are not nomadic but tend to use a specific area on a seasonal basis. There is no clear indication of specific boundaries, and early traveller's record meeting with Nama groups as far south as Steinkopf. While pastoralism did allow for larger herder settlements, historic accounts suggest that the dry Northern Cape could not support the group sizes of several hundred observed further to the southwest. Since population density was low, there was little competition for land. Villages or kraals were centered on certain important water holes and the presence or absence of water was the first consideration when planning a move to a new area. Certain families, through time, come to be associated with a certain area.

Each herder settlement consisted of male members of the same patriclan, with their wives and children. All the settlements (or kraals) in a given area were often part of the same tribal structure, owing allegiance to the most senior member or captain. These chiefs decided, together with senior members of the village on when and where to move, and they gave permission to outsiders who wished to enter their area to use their resources. However, ultimately, economic survival depends on flexibility and reciprocity.

The definitive account of the social organisation of the Nama-speaking Khoekhoen is that of Winifred Hoernle who travelled through the region in 1912 and 1922/3. Khoekhoen society emphasized various rituals which took place at times of transition in an individual's life, such as birth, puberty, marriage and death. Water was associated with the concept of !nau (danger or vulnerability) which occurred during these periods of transition. Water was therefore used in many ceremonies, including that of rain making, initiation, birth, etc. Men and women had different tasks in ceremonies and in society. Interestingly, there are many indications that women exerted considerable authority within the household but they could also own and inherit stock and on rare occasions become regents or temporary chiefs.

The villagers of Kuboes, for example, moved to the Orange River in summer and to a variety of winter locations such as Springklip and Jakkalsputs. This type of information, which is readily available, can assist when interpreting archaeological deposits and determining prehistoric seasonal patterns.

While resources were often shared, there was also the understanding that certain groups or individuals had rights to particular resources (such as a honey nest) and that permission had to be obtained to use them. Ethno-botanical research by Archer (1994) has focused on the indigenous plant use of the descendants of the Nama-speaking Khoekhoen of the area. Knowledge on plant resources has declined during the 20th century and it is only the rural poor who use plants to supplement their diet, for medicinal purposes and in domestic architecture. She has identified at least 75 different, edible plant species many of which are used by children as snacks. At lease 45 different plants are used as medicines, some are common knowledge while others are only used by herbalists and healers. At least 22 different plants are used for utilitarian purposes including the construction of the traditional *matjiesbuis,* in leatherwork, in making soap and in making household items.

The original inhabitants of the area (the San and the Nama) spoke related but different languages. San is no longer spoken although some 6000 Nama speakers are still found in the Northern Cape. The South African San Institute (SASI) was founded in 1997 to research and protect the rights of indigenous minorities like the Khoe and San. During land claims investigations, SASI discovered 11 fluent southern San speakers in the Northern Cape, meaning that this language is effectively extinct. Crawhall, a sociolinguist who works for SASI has identified 6000 Nama speakers and has been concerned with the continued survival of this language.

Today there is dissent among the members of the Richtersveld community as the recent awarding of land to the indigenous inhabitants has created a plethora of management and leadership problems in a community who survival has depended very old traditional values for hundreds of years.

Within the Study Area today is evidence of some 10 active or recently active stock posts. Although the '*matjiehuisies*' are no longer built of traditional materials, they are rendered in modern materials and the style and size of the encampments follow traditional form. The stock posts are actively used indicating the people are practising traditional herding activities in the area today.

5. FINDINGS

4.3 Palaeontology

No palaeontological material, apart from one small fragment of mineralised bone was observed during the course of the field survey however it is possible that excavation may produce evidence of evidence of invertebrates (snails), old land surface and mineralised bones of Pleistocene animals. Indications are that the palaeontological sensitivity of the Study Area is low.

5.1 Pre-colonial Archaeology

The pre-colonial archaeology of the Study Area is limited, and relatively sparsely distributed over the landscape (Figure 5). All the archaeological observations were either limited to Late Stone Age sites, or sites with material that is a-diagnostic. In total 6 observations were made.

Site 3. This small site was immediately noticeable as it contained various limpets and a large amount of Cape Coastal Pottery, as well as informal looking quartz artefacts. The presence of pottery indicates that the site is likely to be less than 2000 years old (Figure 3).

Figure 3. Locations of sites 3 and 4 relative to the access road and turbines wtg4 and wtg 5.

Site 6. The largest archaeological site (Figure 4), a Late Stone Age site predating the ceramic period which means that it is more than 2000 years old was found associated with the only significant granite outcrop in the Study Area. One of the larger granite boulders contained a natural water catchment hollow (*water bakkie*) which is why this locality was favoured as an encampment. The artefacts contained among them *microliths* (very small stone tools) and a strong retouched element suggesting that some of occupation took place during the formal phases of the Late Stone Age more than 3000 years ago. Although the site is some 14 km from the coast, the presence of small fragments of marine shell is an indicator that the shoreline was within the resource gathering range of the occupants of the site.

Figure 4. Sites 5 and 6 relative to the proposed turbine row.

Figure 5. Locations of archaeological sites. The white lines indicate walk paths of the team.

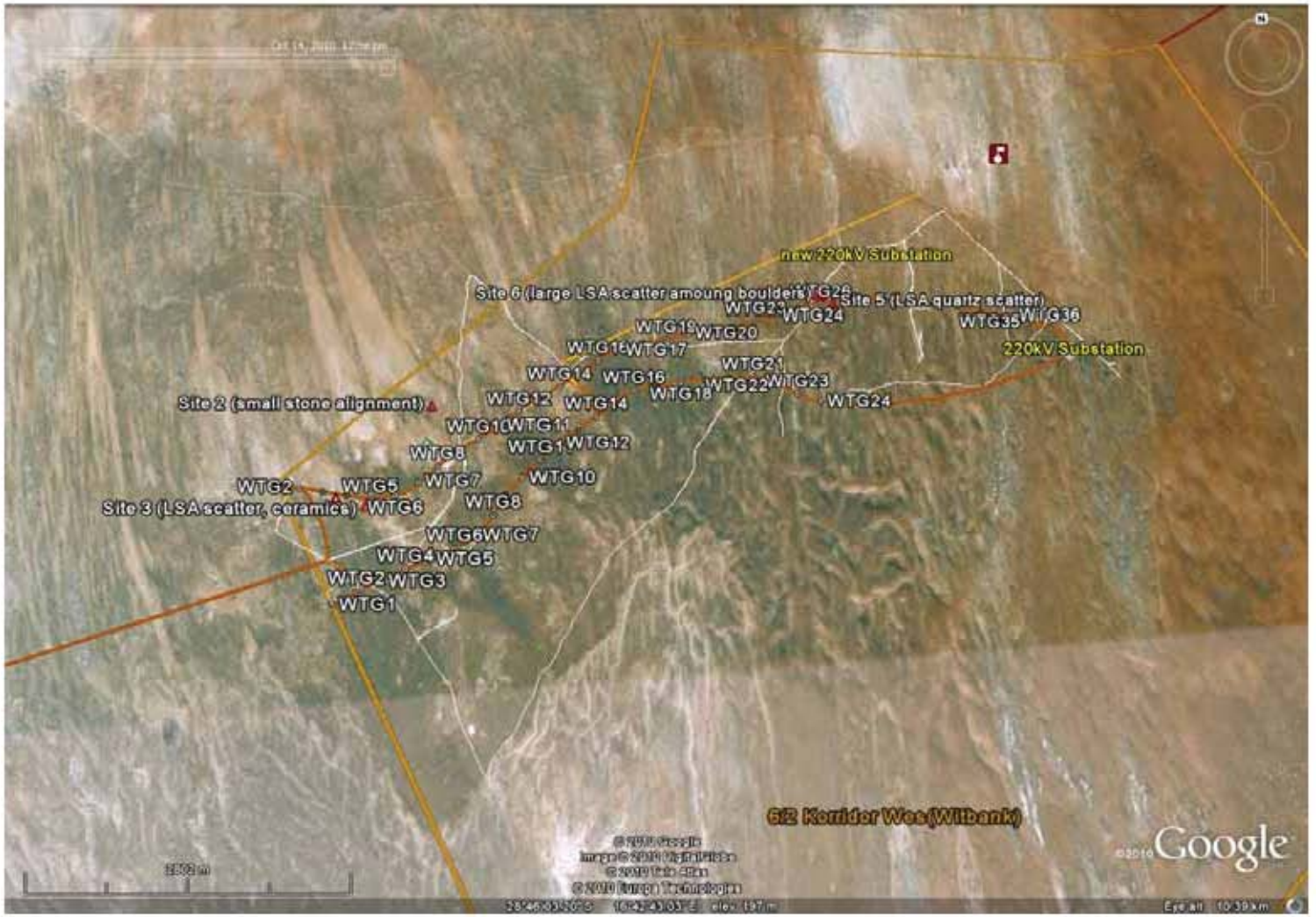

Figure 6. Location of archaeological sites relative to turbine positions.

5.2 Built Environment

The built environment on the site and environs is limited to radio transmitters and equipment situated on Visagiefonteinkop. All of this is less than 60 years of age and not protected under the National heritage Resources Act.

5.3 Cultural Landscape

The cultural landscape of the site is interesting, relating to aspects of the living heritage of the area. Before the advent of formal diamond mining operations in the 1920's, this area was inhabited by the Nama herding people. Although in recent years Nama settlement patterns have changed and have been subject to increasing urbanisation, until fairly recently (last 30 years) many traditional practises were followed. The lifestyle centred on a herding economy finely tuned to the arid environment of the area. Nama herders were traditionally highly mobile with families moving around the landscape from stock-post to stock-post so that the herds of fat tailed sheep and goats grazed the *veld* in a sustainable manner. The traditional *matjieshuisies* (domed houses made from finely woven reed mats over a framework of bent poles) could be easily disassembled and transported, traditionally on the backs of cattle, and re-erected with relative ease wherever required. Hence a kraal would be established (traditionally built from thorn bushes). Once the area was grazed (normally after a month or two) the families would move on to the next stock post and re-establish their home.

During the study some 5 stock posts were noted, each of them analogous the traditional settlements (Plate 3). There was also evidence in the form of a number is disused kraals, tracks and stock posts that the landscape had been used for traditional pastoralism for some time. Although reed mats are not used for making huts the "modern" stock posts contain analogous elements – domed huts are covered with cloth or plastic and the kraals are built from wire. In terms of spatial arrangement they are similar to the prehistoric settlements documented by archaeologists in the area. Today many herdsmen own vehicles and commute to their stock posts from the various small towns and villages of the Richtersveld.

The cultural landscape of the area contains the living heritage of Nama herders who still use the area. The construction of wind turbines should not affect the herders way of life or decrease the natural resources available to them. Aesthetically however the turbines represent a very modern industrial and technological layer over a landscape characterised by an ancient lifestyle. The social impacts of turbines on the community and the benefits and implications of the increased revenue for the communities involved imply a deeper indirect impact for the people of the Richterveld – assessment of this however lies within the realm of the economic and social expertise.

Plate 3. A typical stock post (Veepos) with hut, cooking area and kraal.

6. IMPACT IDENTIFICATION AND ASSESSMENT

6.1 Turbines

Palaeontology: any deep excavation has the potential to impact palaeontological material, however it is expected that the trenches and foundations required will not go deep enough to intersect with any major fossil bearing sediments. Impacts are not expected, however there is always a possibility un-expected finds may occur in deep excavations.

Mitigation involves a palaeontologist undertaking a site inspection while foundations trenches for turbines and and cable routes are being excavated.

There are two archaeological sites of moderate significance within the Study Area which may require mitigation in terms of the proposed turbine positions.

Site 3 (28°45'20.37"S 16°39'37.85"E) lies very close to locality WTG 5 which could mean that it may be impacted by construction activity (surface disturbance) relating to construction of turbine WTG 5 and the associated road.

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the entire site will have to be systematically archaeologically sampled prior to commencement of construction.

Site 4 (28°45'16.69"S 16°39'26.84"E) Lies close to a proposed access road and turbine WTG 4. If the construction area is not judiciously confined, disturbance of this archaeological site may result.

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the entire site will have to be systematically archaeologically sampled prior to commencement of construction.

Site 6 (28°44'13.26"S 16°42'33.53"E), the largest archaeological site identified in the Study Area lies close to turbine WTG 26. Impacts (surface disturbance) from construction of the access road and the nearby turbine could affect this archaeological site (see Figure 5).

Mitigation involves cordoning off the site to exclude it from construction activities. If this is not feasible the site will have to be systematically archaeologically sampled prior to commencement of construction

Sites 1 (28°45'38.68"S 16°39'57.47"E) and 5 (28°44'16.55"S 16°42'37.96"E) are highly ephemeral scatters and are therefore considered to be of very low significance, hence should they be impacted, the loss to the heritage record is of very low significance. Mitigation/conservation of sites 3,4 and 6 will serve as an adequate record of the archaeological heritage of the Study Area.

Mitigation of these sites is not critical, however in the interests of conservation site 5 should be flagged and the access road deviated by about 20 m to the north to avoid it.

Site 2 lies outside the Study Area.

6.2 Substations

A 220kV substation will be required which will be built in the central area of the site. It will also contains amenities for staff. A smaller connecting substation will be required at the eastern end of the site to connect with the existing Eskom transmission lines. An alternative site has been

proposed (28°44'34.66"S 16°40'47.58"E) in a more central position with a 220 kV line to the existing transmission lines.

Neither the proposed site or alternative will impact any known heritage sites.

6.3 Transmission lines

There are no identifiable heritage issues with respect the impact of the proposed construction of underground electrical lines connecting the turbines. There is however the possibility that human remains and lost graves may be encountered. A guideline of what to do in the event of such a find is provided in the recommendations section of this report.

6.4 Access Roads

The proposed access roads follow existing tracks where this is feasible, but also follow the two main rows of turbines (north and south) which will require the construction of new roads.

Site 5 lies directly in the path of the proposed access road. Minor mitigation in the form of slight deviation of the road alignment should limit the impact of the proposed road.

Table 2 The potential impact of construction of turbines, substation, access roads and power line on the palaeontological heritage of the Study Area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Positive
Extent	Local	On-site
Duration	Permanent	Long-term
Probability/likelihood	Unlikely	Unlikely
Significance	Minor	Minor - moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation of palaeontological heritage can be achieved by ensuring that trenches and excavations are checked by a palaeontologist. The collection of new scientific information is a positive impact.		
Operational Phase: n/a		
Decommissioning Phase: n/a		
Cumulative impacts: n/a		

Table 3: The potential impact of the construction of the turbines, substation, access roads and power line on the pre-colonial archaeology and built environment of the Study Area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Neutral - positive
Extent	Local	On-site
Duration	Permanent	Long-term
Probability/likelihood	Highly likely	Unlikely
Significance	Moderate	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation will involve marking off sites 1,2, 6 with a barrier, sampling sites 3 and 4 prior to the construction phase. No mitigation required for the built environment.		
Operational Phase: Maintain exclusion of sites 1,2, and 6.		
Decommissioning Phase: Re-establish exclusion of sites 1,2, and 6.		
Cumulative impacts: Minor		

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

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Neutral
Extent	Local	On-site
Duration	Permanent	Permanent
Probability/likelihood	Unlikely	Unlikely
Significance	Major	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	yes	
Mitigation: The Northern Cape heritage authority and SAHRA should be notified immediately if a burial/human remains are uncovered during the construction of the WEF. Work in the area must stop while an archaeologist investigates – mitigation may involve exhumation.		
Operational Phase: None		
Decommissioning Phase: None		
Cumulative impacts: The cumulative impact is not likely to differ from the above.		

Table 4: The potential impact of the construction of the turbines, substation, access roads and power line on the Cultural Landscape (archaeological landscape) of the Study Area

	Without Mitigation	**With Mitigation**
Nature/Type	Negative & Direct	Negative
Extent	Local	local
Duration	Permanent	Permanent
Probability/likelihood	Definite	Definite
Significance	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: No mitigation posible.		
Operational Phase: See above		
Decommissioning Phase: None		
Cumulative impacts: Although this proposal is located far enough from other similar proposals, there is a danger that on a national level there is erosion of the aesthetic and wilderness qualities that are very much the character and identity of RSA.		

Figure 5. Google Earth 3-dimensional modelling showing archaeological site 6 relative to turbine rows.

7. CONCLUSION AND RECOMMENDATIONS

This study finds no fatal floors with respect to the development proposal.

Indications are that both palaeontological and archaeological heritage can be mitigated successfully. The archaeological heritage is best mitigated through avoidance of the sites. Where this is practicably not feasible, the sites are small enough to be mitigated through archaeological sampling without incurring large amounts onerous curation and storage requirements.

The impacts to paleontological heritage are expected to be minimal, however during the site development phase, a palaeontologist must be appointed to conduct a site visit to inspect foundation excavations and trenches.

Prior to the development phase, an archaeologist must re-identify the archaeological sites and cordon them off with fence droppers and barrier tape so they can be protected during the construction process. They should be considered no-go areas.

Human remains can occur at any place on the landscape, but are particularly likely to be found on or close to archaeological sites. They are regularly exposed during construction activities along the west and south coasts. Such remains are protected by a plethora of legislation including the Human Tissues Act (Act No 65 of 1983), the Exhumation Ordinance of 1980 and the National Heritage Resources Act (Act No 25 of 1999). In the event of human bones being found on site, SAHRA must be informed immediately and the remains removed by an archaeologist under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.

The arid and relatively featureless landscape of the area is not an important tourism area. Although the large vertical intrusions of the of the wind turbines will be visible for many kilometres, the tourist on the R382 is likely to focus their attention on the coastal area and the views towards the *Boegoeberge* which are the most significant and scenic features on the landscape between Alexander Bay and Port Nolloth.

The need to conserve the South African landscape cannot under-estimated. The vast horizons of the country and the variety and qualities of the landscape contribute significantly to our communal identity, and make the country a tourism destination like no other. Having said this, it is also critical that renewable energy is encouraged. This means that it is necessary to identify and conserve iconic landscapes but also allow some latitude so that more marginal areas can be utilised. The Study Area therefore is considered suitable for the proposed activity.

8. LIST OF DEFINITIONS AND ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

Acronyms

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

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The proposed wind farm, spearheaded by Dutch electric grid operator, TenneT, could produce 30 gigawatts of powerâ€”or enough electricity to power a city of 20 million people. That's more than twice the amount of offshore wind power installed across Europe today. To compare, the London Array, currently the largest offshore wind farm in the world, has a 630-megawatt capacity, or enough to power about half a million homes.Â The facility will be located in Dogger Bank, a windy and shallow site about 80 miles off the East Yorkshire coast, which is also within ideal reach to the five countries. So why build a wind farm offshore? Well, space is major problem for many onshore wind projects. Without that connector the wind farm will not be built. Shetland Islands Wind Speeds a Big Bonus Connection to the mainland aside, the main advantage of wind power in the Shetlands is that due to advantageous wind speeds wind farms built there are likely to be twice as productive as those on the mainland. More: Viking Energy. via: Renewable Energy World Wind Power Rule Britannia: UK is Now World's #1 Offshore Wind Power Provider Vattenfall to Build 300 MW, Â£780M Offshore Wind Farm in Kent 6.4 Gigawatts of Offshore Wind Farms Slated for Scotland. Renewable Energy. Scotland. United Kingdom. Wind farms across the globe play a vital role in addressing the energy demand while also reducing the carbon footprints. This list covers some of the largest onshore and offshore wind farms operating across the globe.Â Wind is one of the unlimited sources of energy we have on earth. Now, we have built massive wind farms to harness wind energy that would otherwise go unused. Here are some of the biggest wind farms that are making a significant difference in reducing carbon footprints: Gansu Wind Farm, China. Source: Popolon/Wikimedia Commons. Pollution levels in China have soared in the last few years. According to WHO, more than 1 million Chinese citizens died prematurely as a result of the deadly airborne toxins.