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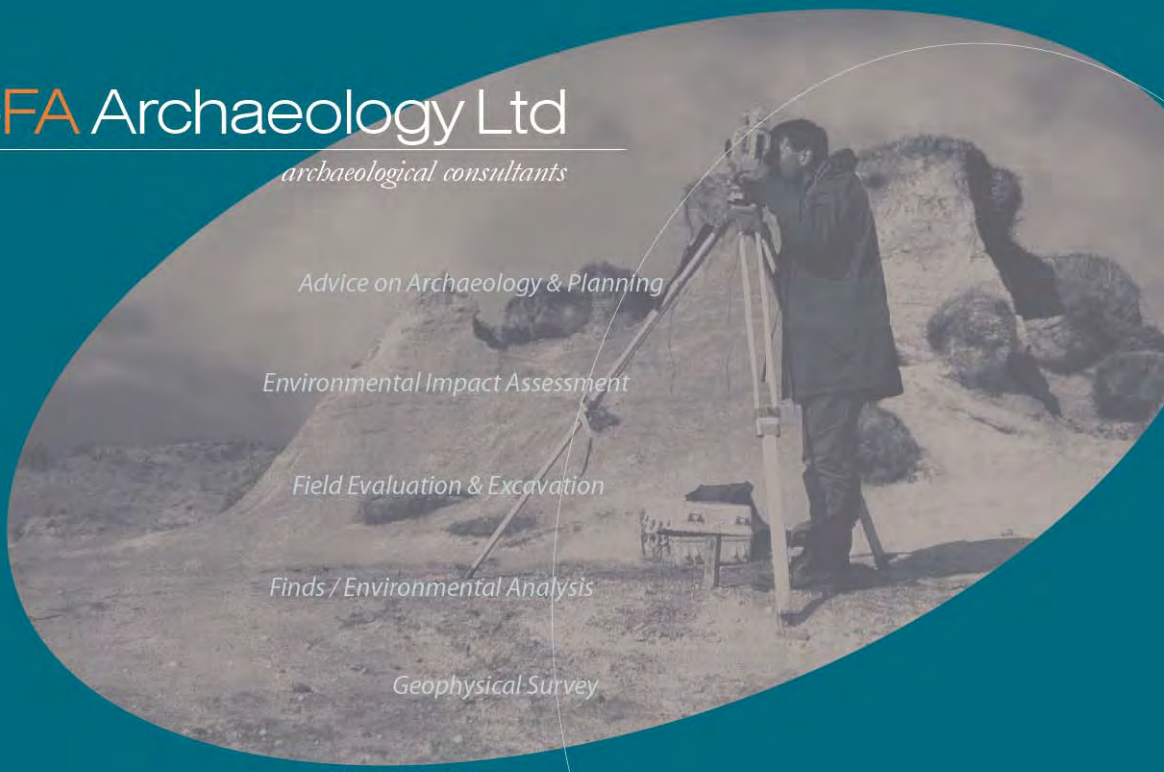
archaeological consultants



Advice on Archaeology & Planning

Environmental Impact Assessment

Field Evaluation & Excavation

Finds / Environmental Analysis

Geophysical Survey

Historic Building Recording

Site & Landscape Survey

Interpretation, Design & Display

Ovenden Moor Wind Farm
West Yorkshire

Archaeological Works

Report No. Y210/15

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Ovenden Moor Wind Farm, Ovenden, West Yorkshire

Archaeological Works

Report No. Y210/15

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Summary

CFA Archaeology undertook an archaeological watching brief and strip and record at Ovenden Moor Wind Farm, West Yorkshire in mitigation of the development. The purpose of the work was to monitor the impact of the decommissioning of existing wind turbines and the construction of new turbines on areas of potential survival of archaeological remains.

No archaeological remains were identified during the course of the works within the footprints of the turbine bases and crane pads and despite the potential for flint scatters in the area no flint was recovered.

As part of the archaeological mitigation of the development a 2.88m long peat core was taken in order to undertake an assessment for the potential for detailed palynological analysis (Appendix 2). This assessment involved counting 100 pollen grains from 12 sub-samples within the peat core to assess preservation levels, and the provision of two radiocarbon dates to assess the date range of the core. Despite fluctuations in pollen concentrations, the assessment demonstrates good pollen preservation throughout the core, whilst radiocarbon dating indicates that the peat dates from around the mid-sixth millennium BC, up to at least the 9th or 10th century AD.

1. INTRODUCTION

This report presents the results of archaeological works undertaken by CFA Archaeology Ltd (CFA) during 2015 at Ovenden Moor Wind Farm, Ovenden, West Yorkshire (Fig. 1, NGR SE 04179 31794). The work was commissioned by Wind Prospect in advance of the construction of nine new wind turbines with associated crane pads, access roads, and other infrastructure.

All work was undertaken in accordance with a WSI (Appendix 3) prepared by CFA and agreed with West Yorkshire Archaeology Advisory Service (WYAAS) in advance in order to comply with planning conditions on development.

1.1 Site Location and Description

The development area is located on land to the east of the A6033 and west of the A629 approximately 2.5km to the west of Ogden near Bradford, West Yorkshire (NGR SE 04179 31794). The site comprised an existing wind farm on an elevated plateau 430m above the Ordnance Datum (AOD) on the watershed between the Calder Valley to the south and the Worth Valley to the north; bordered to the north, east and west by areas of open moorland. Habitats present on the site included dry modified bog, wet modified bog, dry dwarf shrub heath, acid grassland and acid flushes. The existing wind farm was situated predominantly on dry modified bog and dry dwarf shrub heath.

The underlying solid geology comprises Rough Rock-Sandstone with superficial deposits of Peat (BGS 2015). The soils covering the development area comprise predominantly naturally wet blanket bog peat soils (LandIS 2015).

1.2 Archaeological and Historical Background

The following is a brief summary of the archaeological and historical background of the site: more detailed background information may be found in the Environmental Statement (AECOM 2012). Sites referred to are those from the Environmental Statement.

Mesolithic (10,000 to 3500BC)

The area around Nab Hill and Ovenden Moor contain a high frequency of recorded sites of Mesolithic date and have been termed a 'persistent place' indicating repeated use or visits. The material recovered from this period spans both the earlier and later Mesolithic and may suggest a significant locale for Mesolithic activity. The frequency of microlithic composite implements within the recovered assemblages could indicate either the preparation of this type of tool or hunting. Other tool types are present including blades, flakes, scrapers and debitage suggesting a multi-modal exploitation of the area.

Neolithic to Bronze Age (3500 - 700 BC)

The only site of Neolithic or Bronze Age date is a cup marked stone (36). Rock art is difficult to accurately date though normally assigned to the Bronze Age. Other Bronze Age sites are known in the wider area, such as a Bronze Age cairn to the west.

Iron Age (700 BC – AD 71) and Romano-British (AD 71 – 410)

There are no known Iron Age sites in the area of the development.

The projected line of a Roman Road passes through the area, from the fort at Manchester (Mancunium) over the Pennines to the Roman settlement at Ilkley (Olicana) passing through a number of smaller fortifications such as Littleborough and Sowerby (Margery 1967, 403).

Medieval Period (1066 – 1485)

There are four sites of medieval date in the area; at Withens a possible vaccary (12), a medieval enclosure with associated earthworks (31), ridge and furrow (34), and a number of trackways visible on aerial photographs (29).

Post-Medieval (1485 – 1830)

There are 17 sites of post-medieval date in the area, mostly related either to agricultural or industrial activity; farms (10, 13 and 35), trackways (32), a field bank (33) and areas of ridge and furrow (26, 27 and 28).

A series of sandstone quarries have been noted centred at Nab Hill, Woodcock, Old Fly Delph and Fly Delph (24). The remains of a tramway (43) associated with former quarries at Nab Hill, Woodcock, Old Fly Delph and Fly Delph survive along Cold Edge Road.

Historic maps (1849-51 Ordnance Survey) have revealed sandstone quarries (40 and 41) and peat pits (38, 39 and 42) in the area. A boundary stone is also recorded in the area (3). From the 1894 Ordnance Survey map. It was placed on the nearby parish boundary.

1.3 Previous Archaeological Work

Desk-based research was undertaken for a cultural heritage chapter of an environmental statement (AECOM 2012), and Prior to the commencement of the decommissioning works a watching brief on geotechnical works was undertaken by CFA Archaeology including the taking of environmental samples, in order to inform the a programme of archaeological mitigation (Appendix 2).

1.4 Project Aims and Research Objectives

In accordance with the WSI the aims of the project were to undertake works in mitigation of the impact on development and fulfil research objectives informed by the relevant research agendas and frameworks (EH 2010, Spikins 2010, Roskams and Whyman 2007 and Hodgson and Brennand 2007).

The specific project aims were to:

- establish the extent, depth, character and significance of any archaeological remains;
- ascertain their significance and place any archaeological remains (flint scatters, negative features; pits, ditches, occupation deposits/structures or fire spots, in relation to the early prehistoric history record of the region

2. METHODS

2.1 Strip and Record Areas

Strip and Record excavation was undertaken on all crane pad and turbine base areas across the site (Fig. 1). These areas were marked out using Leica surveying equipment by the client prior to stripping. Peat was then removed mechanically by a machine using a wide toothless ditching bucket under continuous archaeological supervision and in controlled successive level spits. Any further overburden was removed by machine down to the top of the natural subsoil. No machinery tracked over areas that had previously been stripped until archaeological investigation and recording was completed.

All archaeological remains were recorded by means of photographs, drawings and written records conforming to CIfA standards (2014a and 2014b) and CFA's quality manuals. All features were planned and drawn in section at an appropriate scale (normally 1:10, 1:20 or 1:50). All plans and sections were related in height to the ordnance datum.

Modern finds were recorded on site but not retained unless they were from stratigraphically significant deposits or intrinsically significant, all other finds were to be retained for post-excavation assessment. The requirements of the 1996 Treasure Act (with subsequent amendments) were accorded with.

2.2 Watching Brief

A watching brief was carried out on all new access tracks and spur roads long with the location of the new meteorological mast. All groundwork was monitored in these areas and in the event of archaeological remains being encountered; the methodology followed that described above for the strip and record areas.

2.3 Palaeoenvironmental Assessment

The methodology for the palaeoenvironmental assessment appears separately in Appendix 2.

2.4 Standards and Guidance

CFA Archaeology is a registered organisation (RO) with the Chartered Institute for Archaeologists (CIfA). All work was conducted in accordance with relevant CIfA Standards and Guidance documents (CIfA 2014a and 2014b), Historic England guidance (EH, 2008), and CFA's standard methodology.

2.4 Archiving

The project archive, comprising all CFA record sheets, finds, plans, reports, and photographs will be ordered according to the West Yorkshire Archaeology Advisory Service instructions and to nationally recognised standards (CIfA 2014c) and will be deposited at the Calderdale Museum.

The archive currently consists of:

<table>
<tr><td>Digital Photographs and Survey and other files</td><td>1 x CD</td></tr>
<tr><td>Notes and Research materials</td><td rowspan="3">1 x A4 folder</td></tr>
<tr><td>Topographic and Survey Plans</td></tr>
<tr><td>All non-confidential correspondence</td></tr>
<tr><td>Written Scheme of Investigation</td><td>1</td></tr>
<tr><td>Report x3</td><td>1</td></tr>
</table>

3. RESULTS

Appendix 1 comprises a full list of the contexts recorded during the strip and record phase of the works. The results below should be read in conjunction with the relevant figures.

3.1 Strip and Record and Watching Brief Areas

Strip and record was carried out at the crane pads and turbine bases of the proposed new wind turbines at the site and the location of the site compound area while a watching brief was undertaken on all new access tracks and spur roads, and the location of the new meteorological mast.

The site was covered by a layer of blanket peat bog (100) that varied in thickness. The peat levels at the southern end of the site were generally shallowest with depths of 0.10m recorded within the new access track and 0.20-0.30m at the locations of turbines 8 and 9. Towards the northern extent of the site the peat levels were much deeper with depths of up to 3.70m recorded within the footprint of Turbine 1.

No obvious subsoil was noted across the site with the peat layers directly sealing the underlying natural substrate (101). The natural substrate generally consisted of yellow-light brown silty sand with some patches of sandstone bedrock visible in places.

No archaeological remains were recorded within the strip and record and watching brief areas undertaken during this development. The full results by area are summarised in Table 3.1.

Area	Description
Turbine 1	Turbine 1 area was generally flat. The peat levels (100) here were the deepest noted across the site with depths of 3.70m recorded towards the northern end of the turbine area. The peat depth at the southern end of the turbine area was measured at 3.20m. The natural substrate (101) was yellow-grey sand. No archaeological features or flint finds were identified within the area. The deep levels of peat here, along with the turbine area being seated in an area of low lying moorland, meant that large volumes of water were draining in to the area, and as such a full inspection of the area was impossible. To combat the water, and to prevent collapse of the existing road, the area was backfilled with stone immediately upon excavation. This meant that only small windows of the natural substrate could be seen at any time.
Turbine 2	Turbine 2 (Fig. 2) was on a slight downwards slope from north to south. The peat levels (100) here measured from 1.40m towards the southern end of the area to 2.30m at its northern extent. The existing access track was to be used as part of the new crane pad upon installation of the new turbine. The area suffered from influx of water once the lower peat levels were breached although this did not hinder the exposing of the interface between the peat and the natural substrate for archaeological investigation. The natural substrate (101) here was yellow-grey sand. No archaeological features or flint finds were identified within the area.
Turbine 3	The area for Turbine 3 was generally flat. Peat depths (100) varied across the area with depths of 1.10m recorded towards the western end of the area and depths of up to 2.20m recorded at the eastern end. The natural substrate (101) consisted of orange-dark brown silty clay. No archaeological features or flint finds were identified within the area.
Turbine 3 Spur Road	The access track towards Turbine 3 was floated up to approximately 7.00m before the start of the new turbine crane pad area, and as such no archaeological features were identified. The natural substrate (101) at the north-eastern end of the new track was a mixture of orange-dark brown friable silty clay.
Turbine 4	Turbine 4 area was generally flat. Peat depths (100) varied across the area with depths of 1.50m recorded at its southern end and depths of up to 2.60m recorded towards the northern end. The natural substrate (101) was grey clay with some patches of natural sandstone bedrock. No archaeological features or flint finds were identified within the area.

Area	Description
	Part of the existing access track was to be used as part of the new crane pad and so was not excavated during these groundworks.
Turbine 5	The area for Turbine 5 (Fig. 3) sloped downwards from south-west to north-east. The peat depths (100) were measured at 0.25m towards the south-west end of the crane pad and up to 0.45m in depth at the north-eastern end of the area. The natural substrate (101) was largely sandstone bedrock in the south-west end of the area and changed to orange sandy clay towards the north-eastern end. No archaeological features or flint finds were identified within the area. The north-eastern end of the area was waterlogged in places.
Turbine 5 Spur Road	The spur road for Turbine 5 was largely floated from the existing access track for the wind farm and sloped upwards from south-west to north-east. Only the last 50.00m at the north-eastern end of the track was exposed to the natural substrate. The peat levels (100) here were generally fairly shallow, with depths of 0.30-0.50m recorded in this area of the site. The natural substrate (101) was orange sandy clay with patches of natural sandstone bedrock visible in places. No archaeological features or flint finds were identified within the area.
Turbine 6	The area for Turbine 6 was generally flat (Fig. 4). The peat depths (100) were measured at 1.20m towards the southern end of the crane pad and up to 3.20m in depth at the northern end of the area. The natural substrate (101) was orange-brown sandy clay with areas of sandstone bedrock visible in places. No archaeological features or flint finds were identified within the area. Part of the existing access track was to be used as part of the new crane pad and so was not excavated during these groundworks.
Turbine 7	Turbine 7 area was largely flat with a slight rise to the east from the western end of the turbine base footprint (Fig. 5). The peat depths (100) varied across the area. Towards the western end of the area the peat was measured at 0.60-1.20m in thickness while at the eastern end of the area the peat was recorded at 0.20-0.40m in depth. The crane pad was stripped in segments due to water logging and issues with water management of the area. The natural substrate (101) was yellow-grey silty sand with patches of sandstone bedrock visible in places.
Turbine 7 Spur Road	The spur road for Turbine 7 was largely floated with peat depths too excessive to make stripping the road viable in approximately the 35.00m at the far eastern end of the track. The peat depths became shallower towards the west, and from here it was possible to strip for the road. The peat (100) was measured at 0.40-0.60m in thickness in the remainder of the road, with the natural substrate (101) being yellow-grey clay with some sandstone bedrock visible in places. No archaeological features were noted cutting the natural substrate here.
Turbine 8	Turbine 8 area was generally flat. The peat depths (100) across the area were shallow and measured 0.20-0.40m in depth. The natural was a mixture of orange sand and grey silty clay (101). No archaeological features or flint finds were noted within the area.

Area	Description
	The northern extent of the area appeared to have been previously stripped of the peat, and there was evidence for modern activity in the form of plastic coverings, most likely a remnant from the construction of the existing wind turbine. Two modern pipe/cable trenches, both on north-south orientations, were recorded cutting the area.
Turbine 9	Turbine 9 (Fig. 6) sloped downwards from north-south, with the slope at the south-eastern end of the area very pronounced. The peat depths (100) across the area varied with the peat measured at 0.25-0.30m in thickness towards the northern end of the area and at 0.45-0.50m in depth at the southern end. The natural substrate (101) was orange sandy clay, with the sandstone bedrock visible in places towards the southern end of the area. Some areas of deeper peat were noted although these appeared related to natural drainage channels within the moorland landscape. No archaeological features or flint finds were noted within the area.
Turbine 9 Spur Road	The spur road for Turbine 9 (Fig. 7) sloped upwards from south-west to north-east in the direction of the new turbine location. The peat depths (100) were measured at 0.40-0.50m in thickness. The natural substrate (101) was orange sandy clay. No archaeological features were noted within the area of the new road.
Compound Area	The area for the site compound steeply sloped downwards from west to east. The peat levels (100) here measured 0.20-0.45m in depth with the deeper peat located towards the eastern side of the compound area. The natural substrate (101) consisted of orange sand and patches of yellow-grey clay in places. No archaeological features were recorded.
Meteorological Mast	The spur road for the meteorological mast was floated. The area for the new meteorological mast was generally flat. The peat levels (100) measured 1.70m in depth. The natural substrate (101) was orange-brown silty sand with some areas of sandstone bedrock visible in places. No archaeological features or flint finds were identified within the area.
Access track	The access track (Fig. 8) from the site entrance towards the new spur road for Turbine 9 slightly sloped downwards from north-south. The peat levels (100) measured 0.20m at the southern end of the track and deepened to 0.60m towards the centre before returning to 0.20-0.30m in thickness at the northern end of the track. The natural substrate (101) varied, with orange sand at the northern extent of the access track and grey sterile clay at the southern end noted. No archaeological features or flint finds were identified within the area. The centre of the track, at the point where the peat was deepest, appeared very wet and waterlogged.

Table 3.1: Strip and Record/Watching Brief Area Summary

In addition to the above areas, the existing site access tracks were slightly widened in places to facilitate the movement of the trucks and wagons delivering the new larger parts of machinery for the new wind turbines on the site. This involved the stripping of the vegetation on the peat and in most cases did not disturb the natural substrate, or the interface between this layer and

the bottom of the peat, and in areas where this interface was revealed no archaeological remains were noted.

4. DISCUSSION

In general, the southern end of the site had the lowest levels of overlying peat while the northern end of the site showed the deepest. Although no artefacts or flint finds were recovered, numerous fragments of flint have been recovered in the past from the southern end of the site, and it is likely that the area saw some activity during the Mesolithic period, with the shallow layers of surviving peat exposing these artefacts in places.

5. CONCLUSION

The results of a programme of palaeoenvironmental assessment appear in Appendix 2 and separate conclusions are presented for that element of the work.

Although the artefact record and a number of find spots across the area dating to the Mesolithic suggest that Ovenden Moor was utilised during this period, the actual sites of camps and flint scatters would most likely have comprised small discrete areas, and were often on south or south-east facing slopes. Despite the strip and record on the new turbine bases and associated areas, no such sites were located at Ovenden Wind Farm.

Although no direct evidence was encountered during the evaluation process, the programme of strip and record presented the best opportunity to record Mesolithic flint scatters and camps, had they existed within the development footprint.

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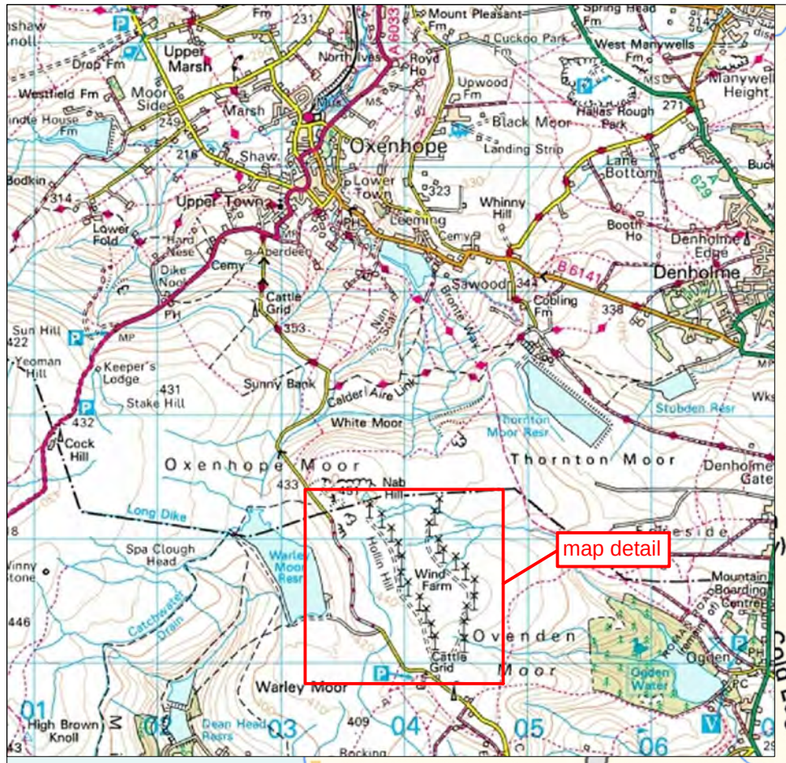
FIGURES 1-8



Key:

- Site Infastructure
- Archaeological Strip and Record
- Archaeological Watching Brief

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Fig. No:	Report No:
1	Y210/15

Title:
Site location and layout

Project:
Ovenden Moor Wind Farm, Ovenden: Archaeological Works

Client:
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Scale at A3:
1:5000

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Fig. 2 Turbine Base at T2 after strip, looking north-east

Fig. 3 Crane Pad at Turbine 5 after strip, looking north-east

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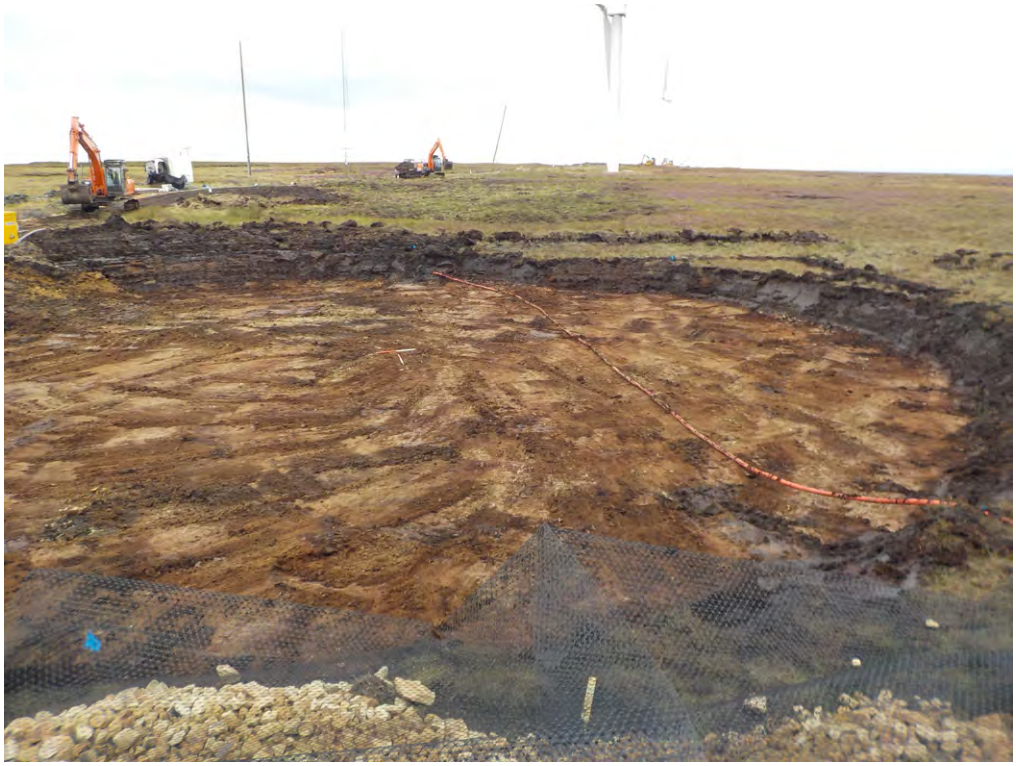

Fig. 4 Turbine Base at T6 after strip, looking north

Fig. 5 Crane Pad at T7 after strip, looking north

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Fig. 6 Crane pad at Turbine 9 after strip, looking south-east

Fig. 7 Spur road towards Turbine 9 after strip, looking north-east

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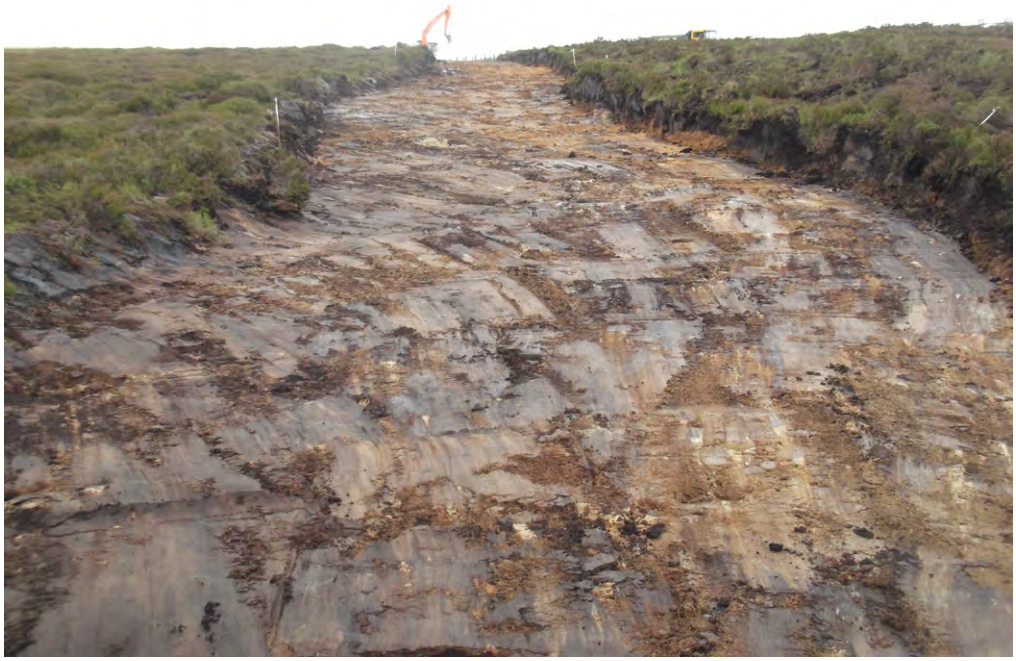

Fig. 8 New access track after strip, looking south

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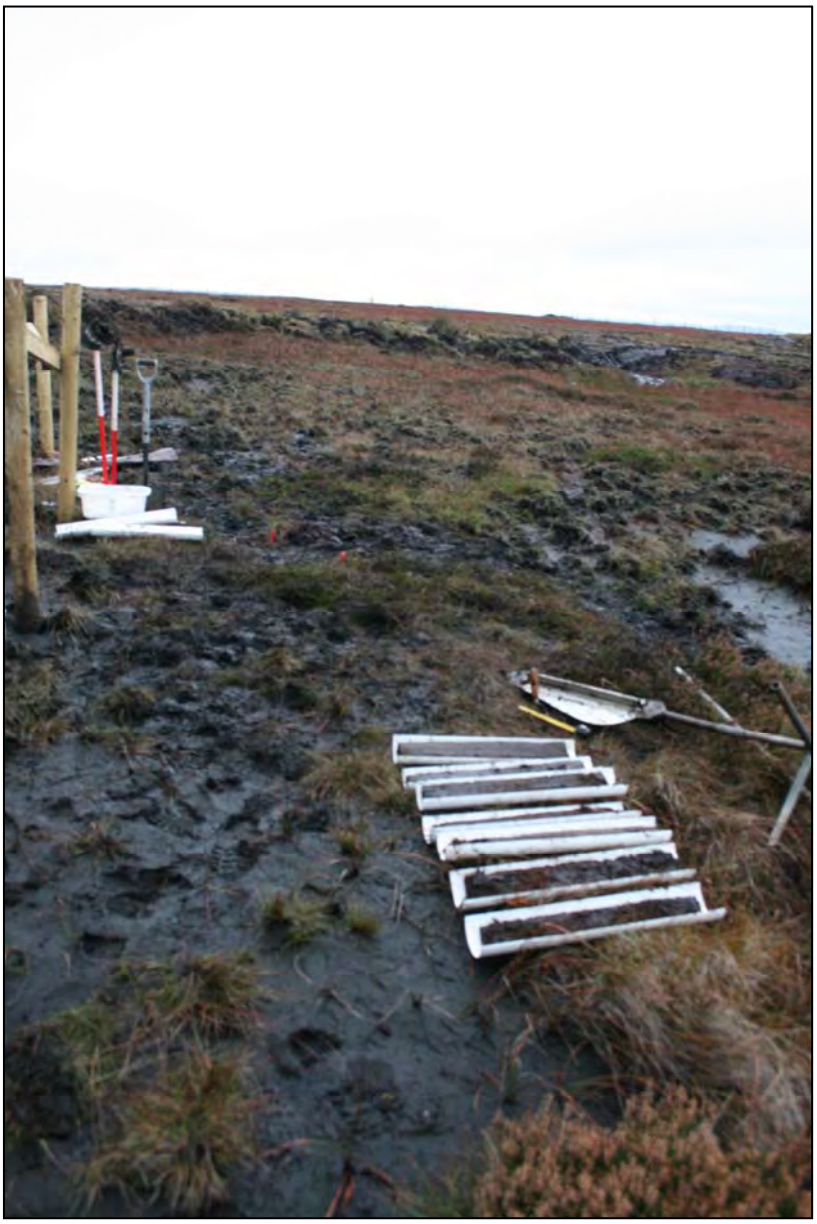
APPENDIX 1: CONTEXT REGISTER

Appendix 1: Context Register

Context no.	Area	Depth (m)	Type	Description
100	All	0.20-3.60	Layer	Peat layer covering the vast majority of the wind farm site area. Consisted of dark brown humic peat with a thin covering of moss/vegetation. Varied in depths across the site, with the peat generally becoming deeper toward the northern end of the site. Peat levels became waterlogged at the areas where deepest.
101	All		Layer	Natural substrate for the wind farm area. Generally consisted of yellow-light brown silty sand in most places, although some areas had patches of yellow sandstone bedrock visible.

APPENDIX 2: POLLEN PRESERVATION ASSESSMENT



OVENDEN MOOR, FIELDWORK AND POLLEN PRESERVATION ASSESSMENT REPORT

A Sheffield Archaeobotanical Consultancy (SAC) Report by Dr. Tudur Davies for CFA Archaeology

Summary

Fieldwork to collect a 2.88m long peat core was undertaken at Ovenden Moor, in order to undertake an assessment for the potential for detailed palynological analysis. This assessment involved counting 100 pollen grains from 12 sub-samples within the peat core to assess preservation levels, and the provision of two radiocarbon dates to assess the date range of the core. Despite fluctuations in pollen concentrations, the assessment demonstrates good pollen preservation throughout the core, whilst radiocarbon dating indicates that the peat dates from around the mid-sixth millennium BC, up to at least the 9th or 10th century AD.

Contents

Tables

Figures

1.1 INTRODUCTION

This report provides the results of fieldwork and assessment for the potential to undertake detailed pollen analysis on a peat core collected from Ovenden Moor Windfarm (SE 03736 32115) The report details the results of fieldwork, pollen counting and radiocarbon dating in order to assess the viability of additional research.

1.2 FIELDWORK

1.2.1 Methodology

Previous fieldwork undertaken by CFA archaeology (Casey 2015) undertook a series of archaeological test pits ahead of the Ovenden Moor Windfarm development. The peat within these trenches was at its deepest at Turbine 1 (NGR SE 03764 32054). Fieldwork for the current work aimed to collect a peat core from the deepest (and presumably the oldest) area of peat next to TP1. A depth probing survey was therefore undertaken to establish the optimum sampling location (see Figure 1-1). This was undertaken by pushing steel rods into the ground at a regular interval of 5m, northwestwards from a starting point c. 5m north of the ground disturbances of building work in progress.

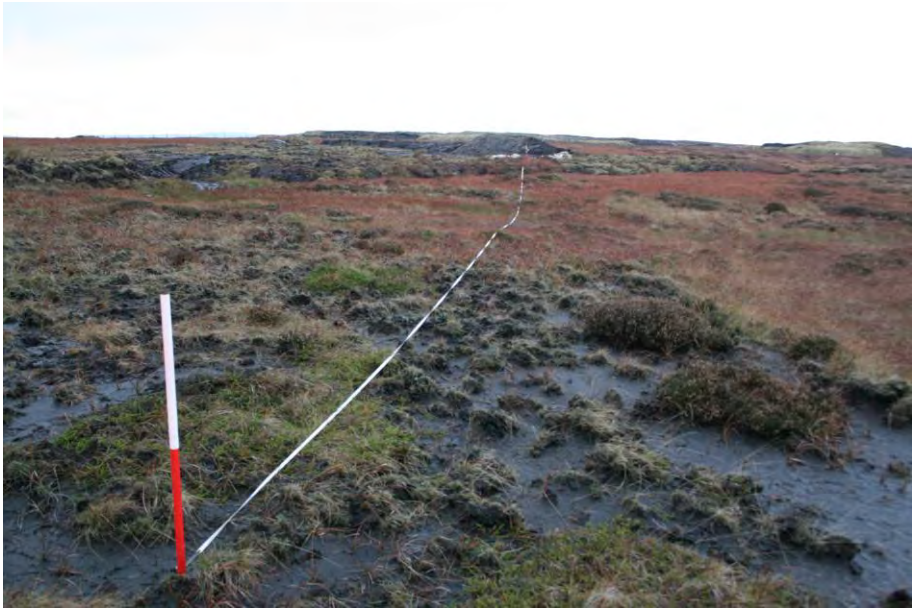


Figure 1-1 Northwest facing photograph showing the route of the depth probing transect

Once the deepest point along the depth probing transect was established, a core was extracted in 50cm segments using a Russian corer. Each core segment was subsequently sealed to avoid contamination, and placed in cold storage for preservation. The depth probing transect and sampling point locations were recorded in the field, using a hand held GPS.

1.2.2 Results

The deepest point along the depth probing survey was identified at the starting point of the transect, at a depth of 3.20m (see Table 1-1 and Figure 1-2). Due to safety reasons, it was not possible to investigate the depth of peat deposits to the south of this point. A 2.88m long core was collected from this site (NGR SE 03736 32115). Because of the stiff

nature of deposits, towards the bottom, coring could not collect samples to the 3.20m of sediment noted by the depth of probing.

Table 1-1 Results of the depth probing survey

Point	Distance along the transect (m)	Easting	Northing	Depth of deposits (m)
1	0	403736	432115	3.20
2	5	403732.3*	432118.4*	2.80
3	10	403728.6*	432121.7*	2.78
4	15	403724.9*	432125.1*	2.43
5	20	403721.2*	432128.5*	1.95
6	25	403717.5*	432131.8*	2.45
7	30	403714	432135	2.48
* Estimated from GPS readings taken from the start and end of the transect				

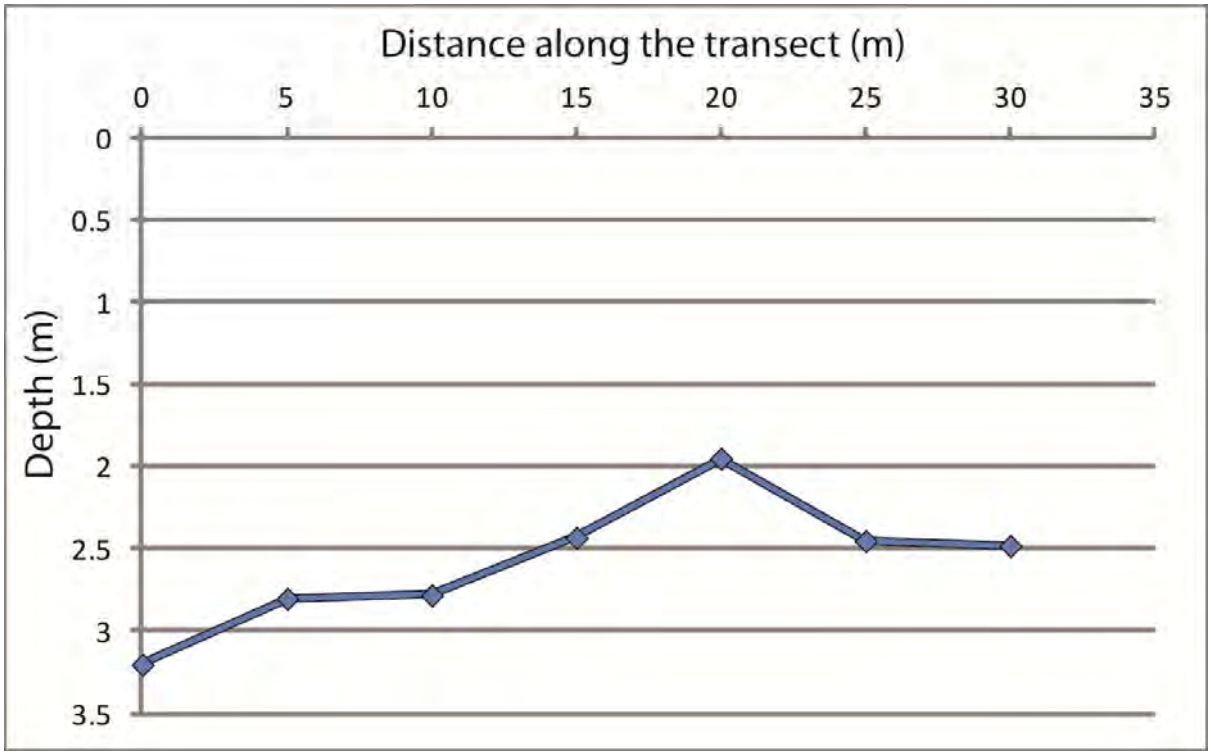


Figure 1-1 Graph showing the depth of sediments along the depth probing transect

1.3 POLLEN PRESERVATION ASSESSMENT

1.3.1 Methodology

A total of twelve sub-samples from the environmental core were assessed for pollen preservation to enable a comparison of intra-core variation (sample depths provided in Table 1-2). These twelve samples were processed in the laboratory by standard techniques as described by Moore and Webb (1978) and Moore et al. (1991). Micro-charcoal was quantified during pollen counting, tallying charcoal fragments by size using a graticule grid, as described by Swain (1978). *Lycopodium* spore tablets were added during sample

processing to enable the calculation of both relative pollen and charcoal concentrations. Pollen counts of up to at least 100 terrestrial pollen grains per sample were undertaken using a light microscope at x400 magnification and at x1000 magnification with oil immersion for critical identifications. Pollen identifications were carried out using the reference collection at the University of Sheffield's Archaeology department and keys provided by Moore and Webb (1978), Faegri and Iversen (1989) and Moore et al. (1991). Pollen nomenclature follows the classifications of Bennet (1994).

1.3.2 Analytical Results

This section discusses the results of the preservation analysis and provides recommendations for further analysis. Table 1-2 provides a detailed breakdown of the results of pollen identification, which includes a species list and pollen and micro-charcoal concentration values. The total pollen counts and relative percentages of individual pollen species have not been provided as the number of counted pollen grains is not statistically viable to provide a detailed understanding of changes in environmental conditions.

Research on the differential preservation of pollen grains indicate that species show varying susceptibility to decay, which can in turn provide a biased representation of the original pollen assemblage. For example, *Alnus glutinosa* and *Calluna* vulgaris pollen can be over represented in relation to *Quercus* or *Salix* as they have a lower susceptibility to oxidation or corrosion (Havinga 1964, 1967). Other indicators of poor preservation include a high proportion of damaged pollen grains or a low concentration of pollen grains (Moore & Webb 1978).

All samples examined show excellent pollen preservation, as demonstrated by the relatively high pollen concentration vales and the large diversity of pollen types (including those more susceptible to decay, e.g. *Salix* and *Quercus*).

The pollen concentration within the samples vary significantly, ranging from a peak of 127.0k grains cm^{-3} at the bottom of the core, to 5.6k grains cm^{-3} in sample 4 at a depth of 80 cm. However, there is a diverse number of pollen types in all samples, including those more susceptible to decay (e.g. Quercus and Salix). It is also worth noting that the samples at the very top of the core, which would theoretically be more likely to have been damaged as a result of potential drying of the peat surface, are among the samples with highest pollen concentration, and that there does not appear to be a relationship between pollen concentration and the percentage of damaged pollen grains. The low pollen concentration in some samples may therefore to be the result of variation in peat growth rather than differences in pollen preservation.

Whilst no detailed comment can be made on the environments surrounding the sampling site, it is worth noting that several samples have high charcoal concentration values and contain pollen and spore types indicative of anthropogenic activity, including Cereal-type pollen, *Chenopodiaceae, Plantago lanceolata, Rumex* (various) *and Pteridium aquilinum* (see Clapham et al. 1987 and Stace 2010 for habitat descriptions relating to these species). It is therefore clear that this core contains a useful record of human-environment interactions surrounding the sampling site.

1.4 RADIOCARBON DATING ANALYSIS

In order to assess the date range of the core collected from Ovenden Moor, two AMS radiocarbon dates were sought from 1 cm thin slices of peat from near the top and at the base of the core at a depth of 7.5 cm and 286.5 cm respectively. The analysis was undertaken on both the humic and microfossil content of the peat by the Radiocarbon Dating Facility at Queens University, Belfast, the results of which are provided in Table 1-3. These results have also been plotted using CLAM (cf. Blaauw 2010), to provide a peat accumulation diagram for the core (see Figure 1-3).

The radiocarbon dating results suggests that the cores date from around the mid sixth millennium BC to at least the ninth or tenth century AD. It is likely, given the relatively early radiocarbon date from near the top of the core, that the upper surface of the peat has been truncated. No disturbance indicators were visible at the surface of the sampling area; however, it is plausible that it was subject to peat cutting activities, possibly dating from the later medieval period onwards.

As noted in section 1.2.2, the base of the peat depostis could not be collected due to the stiff nature of deposits towards the bottom. As a result, it has not been possible to establish the onset of peat growth at Ovenden Moor, though the dates obtained suggest that it happened at some time after the late Mesolithic period. It is of course acknowledged, that with only two radiocarbon dates it is not possible to establish the regularity of peat accumulation rates, or if there may be radiocarbon date reversals indicative of disturbance to the peat deposit. Howevder, with additional radiocarbon dates, it may be possible to establish how constant the peat accumulated, thereby enabling an estimated date for peat initiation.

Table 1-2 Pollen counting results summary (up to 100 pollen grains)

Sample number		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Depth (cm)		8	32	56	80	104	128	152	176	200	224	248	280
Pollen concentration (grains cm^{-3} x 1,000)		59.71	23.45	12.01	5.57	14.95	28.88	11.24	16.90	18.38	24.41	84.61	126.96
Charcoal concentration (cm^2 cm^3 x 1,000)		18.59	25.84	7.02	0.11	6.81	10.09	34.75	2.82	6.62	8.31	21.84	133.49
Damaged pollen grains (%)		2	7	3	4	1	2	1	5	5			
Pollen taxa													
Trees	Betula	y	Y	y	y	y	y	y	Y	y	y	Y	y
	Pinus sylvestris	y	Y					y			y	Y	
	Ulmus			y	y	y		y	Y	y	y	Y	
	Quercus	y	Y	y	y	y	y	y	Y	y	y	Y	y
	Tilia				y								
	Alnus glutinosa	y	y	y	y	y	y	y	Y	y	y	Y	y
	Fraxinus		y	y		y	y		Y	y	y		
	Carpinus				y								y
Shrubs	Corylus	y	y	y	y	y	y	y	Y	y	y	y	y
	Salix	y					y		Y	y			
Heaths	Calluna vulgaris	y	y	y	y	y	y	y	Y	y	y	y	y
Herbs	Poaceae (wild type)	y	y	y	y	y	y	y			y	y	y
	Poaceae (cereal-type)	y	y	y	y			y					
	Cyperaceae	y			y	y	y				y	y	y
	Caryophyaceae			y									
	Centaurea nigra-type						y						
	Chenopodiaceae								Y				
	Filipendula	y				y	y				y		
	Plantago lanceolata	y	y	y	y	y						y	

Sample number		1	2	3	4	5	6	7	8	9	10	11	12
	Potentilla				y			y				y	
	Radiola linoides-type	y					y						
	Ranunculus acris-type				y			y	Y	y		y	
	Rumex acetosella		y										y
	Rumex acetosa				y								
Spores	Isoetes	y		y									
	Polypodium	y		y	y	y	y				y		y
	Pteridium aquilinum		y	y	y								y
	Sphagnum	y	y	y	y	y	y	y	Y	y	y	y	y
	Pterospida (mono) indet.	y	y	y	y	y	y			y	y		y

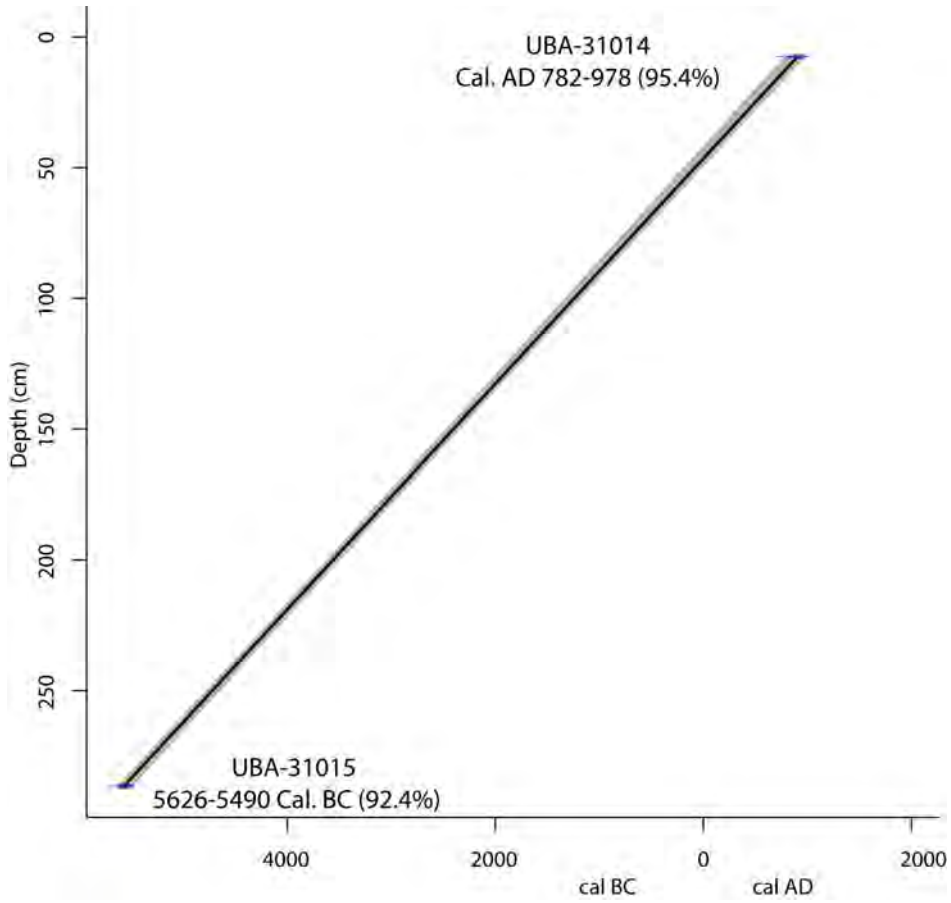


Figure 1-3 Peat accumulation diagram

Table 1-3 Radiocarbon dating results

Lab Code	Depth	Radiocarbon date	Calibrated date (95.4%) [1]
UBA-31014	7-8 cm	1142 ± 27 BP	Cal. AD 885-978 (82.9%) Cal. AD 810-848 (10%) Cal. AD 782-789 (2%)
UBA-31015	286-287 cm	6634 ± 38 BP	5499-5490 Cal. BC (2.5%) 5626-5509 Cal. BC (92.4%)
Notes: [1] Calibrated using CLAM (Blaauw 2010)			

1.5 CONCLUSIONS

The results of dating analysis and pollen preservation assessment suggest that the core collected from Ovenden Moor has excellent potential to provide environmental information dating from the late Mesolithic until the final centuries of the early medieval period. Previous pollen studies on blanket peat deposits have shown that they contain valuable information relating to regional pollen catchments. The presence of several pollen types indicative of anthropogenic activity makes this core especially valuable to examinine human interaction within the region surrounding the sampling site.

1.6 ACKNOWLEDGEMENTS

Emily Forster for her assistance with preparing equipment and Christopher Atkinson for his help with sample collection.

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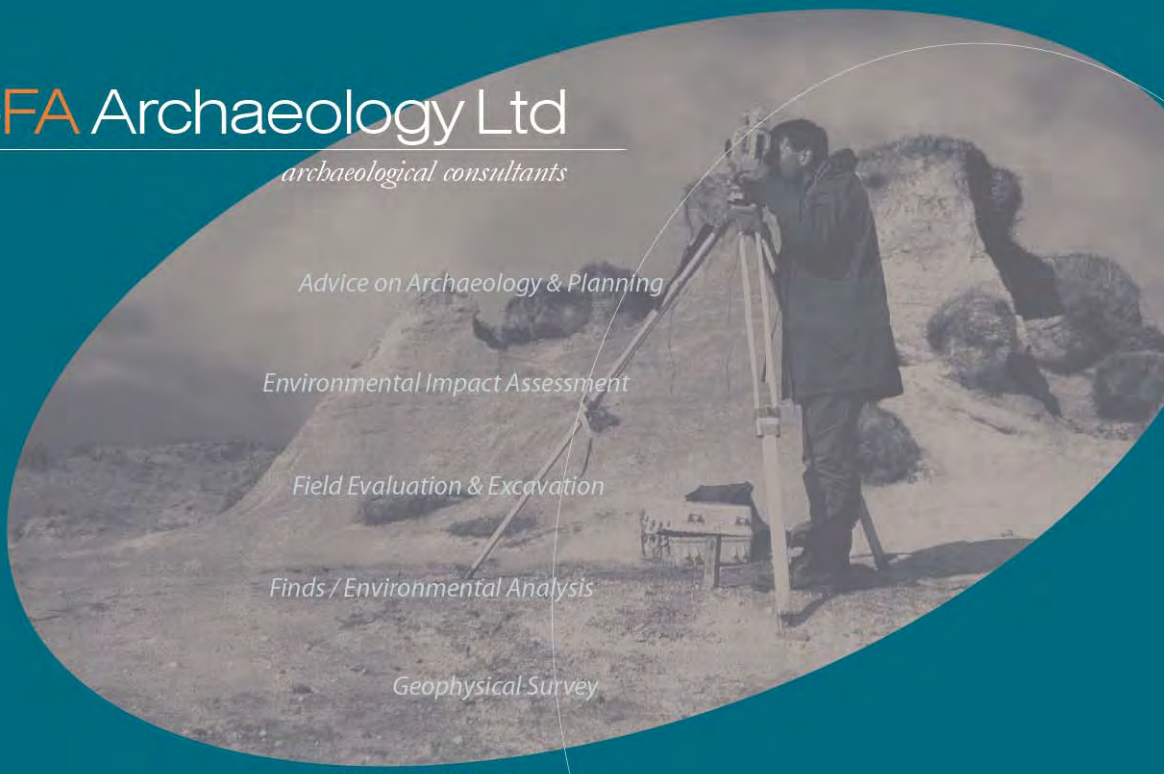
APPENDIX 3: WRITTEN SCHEME OF INVESTIGATION

CFA Archaeology Ltd

archaeological consultants



Advice on Archaeology & Planning

Environmental Impact Assessment

Field Evaluation & Excavation

Finds / Environmental Analysis

Geophysical Survey

Historic Building Recording

Site & Landscape Survey

Interpretation, Design & Display

Ovenden Moor Wind Farm (Repower)

Written Scheme of Investigation for a Programme of Archaeological Strip and Record and Watching Brief

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This document has been prepared in accordance with CFA Archaeology Ltd standard procedures.

Ovenden Moor Wind Farm

Written Scheme of Investigation for a Programme of Archaeological Strip and Record and Watching Brief

Contents

1. INTRODUCTION

This Written Scheme of Investigation (WSI) was commissioned by Wind Prospect in order to detail the scope of works necessary to mitigate the impact of peat removal during ground breaking works at Ovenden Moor Wind Farm (Repower). The site is approximately 2.5km west of Ogden in West Yorkshire (centred on NGR: SE 04541 31797) at a height of 425-450m above the Ordnance Datum (AOD). This development will see the installation of nine new turbines and related infrastructure.

Based on the findings of the Environmental Statement (ES), West Yorkshire Archaeology Advisory Service (WYAAS) has recommended that palaeoenvironmental sampling be carried out within the site boundary. This is to be based on a structured approach providing detailed coverage across the site in a systematic fashion. The objective will be to collect data on past environmental conditions using microfaunal and microfloral remains (ES, Section 11.11.2).

The ES (Section 11.7.5) mentions that there are 18 recorded instances of Mesolithic activity within the study area. These are all find spots comprising varying amounts of flint tools and debitage assigned to the Mesolithic period due to the presence of flint with diagnostic Mesolithic characteristics. The areas around Nab Hill and Ovenden Moor contain a high frequency of recorded sites of Mesolithic date and the area has been termed a 'persistent place'; indicating repeated use. The material recovered from this period spans both the earlier and later Mesolithic and may suggest a significant locale for Mesolithic activity. The frequency of composite microlith implements within the recovered assemblages could indicate either the preparation of this type of tool or hunting. Other tool types found have included blades, flakes, scrapers and debitage suggesting a multi-modal exploitation of the area. Stratified sites of Mesolithic date are very rare as most activity is thought to have been transitory and ephemeral, leaving little detectable evidence apart from flint assemblages. The majority of flint has been found where peat has been eroding out, has not been accurately located and may not be from its original place of deposition.

2. PROJECT BACKGROUND

A programme of geotechnical test-pitting was undertaken under archaeological supervision in November 2014. The purpose of the monitoring was to take samples and establish the nature and depth of the peat and its interface with natural geology across the proposed site and assess the presence or absence of flint artefacts. Bulk soil samples were obtained from the base of the peat to recover flints and to assess the primary peat deposits. The results of this work are provided in Appendix 2. The peat assessment report is supported by a peat deposit model for the site (Fig 1), proposed mitigation is shown on Figure 2 and described below in Section 4.

3. OBJECTIVES

Research objectives of will be informed the relevant research agendas and frameworks (e.g. EH 2010, Spikins 2010, Roskams and Whyman 2007 and Hodgson and Brennand 2007).

The specific aims are to:

- establish the extent, depth, character and significance of any archaeological remains;
- ascertain their significance and place any archaeological remains (flint scatters, negative features; pits, ditches, occupation deposits/structures or fire spots, in relation to the early prehistoric history record of the region, and;
- Propose suitable mitigation strategies to report on any finds to include report(s) and possible publication if the results so merit it.

4. PROPOSED ARCHAEOLOGICAL WORK

The peat deposit model (Fig 1) shows that the blanket peat varies in depth across the survey area. The ombrotrophic nature of the peat which is typical of high moorland environments has formed where tree-cover was probably limited due to altitude. Although no woody layers were recorded in the peat profiles, similar peat formations obtained at higher altitudes elsewhere have provided a local and regional picture of woodland composition. Local pollen records are reliable in providing an insight into the impact on the local woodland such as clearance episodes and burning etc. Pollen analysis is further validated where there is a positive link between occupation site(s) and the established arboreal pollen record, which is normally acquired from peat coring close to the occupation site.

4.1 Mesolithic Flint scatters

Such is the general lack of accuracy in the location of findspots of Mesolithic flint and the bias in the record towards prospection where peat has eroded out (e.g. plateau edges), there is no meaningful distinction between ‘known findspots’ and ‘potential findspots’ in the context of the development footprint.

It is known that the depth of peat at the locations of the turbine bases and along much of the access track is in excess of 2m deep. Potential Mesolithic flint scatters could be affected by excavation beyond this depth for the crane pads and the access tracks, though it is likely that excavation will not be deep enough in most cases; the only areas where deep excavation is proposed that is likely to affect potential sites below the blanket peat are the turbine bases themselves.

5. METHOD STATEMENT

The following describes a programme of proposed works designed to identify archaeological remains which may be directly affected by the development. Should further work be required in specific areas of the site then this would be governed by an addendum to this WSI, with supporting figures where necessary.

Once the detailed construction methodology and the depths to which the machine stripping are known, areas will be excluded from further archaeological work, allowing the preservation in situ of potential Mesolithic sites (i.e. where the overlying peat is thick enough to preserve potential archaeological layers should they exist).

In areas where the peat is not thick enough to protect potential underlying Mesolithic sites then such areas will be monitored during stripping work under the terms of a 'strip and record' or 'watching brief' (see Fig. 2 and below). Any refinements to this, for instance full excavation of any sites specific to defined areas would be subject to agreement between the client and WYAAS and governed by an addendum to this WSI.

5.1 Strip and Record

The depth of peat in some areas may be so great that it will have to be stripped before a solid base is encountered. This will mainly be the case at the turbine bases themselves where peat is known to be deep. All groundworks undertaken in association with the development in areas agreed between the client and WYAAS will be subject to a programme of 'strip and record' in line with the methodology outlined below.

5.2 Peat Stripping

Peat will be removed mechanically by a machine using a wide toothless ditching bucket, under continuous archaeological supervision in controlled successive level spits. No machinery will track over areas that have previously been stripped. The full nature and extent of archaeological features and deposits will be exposed within the working area. Areas containing archaeological features and deposits will be recorded on a pre-excavation plan within the Strip and Record area.

5.3 Recording and Excavation

All features exposed will be fully mapped and a site plan will be made recording the position of all individual flints and other features exposed. All archaeological features and deposits will be excavated by hand. Areas of human activity such as hearths, fire pits, knapping anvils and stake holes will be 100% excavated. The interface between peat and bedrock will be hand cleaned if possible.

The stripped area is to be recorded according to the normal principles of stratigraphic excavation. The stratigraphy of the area is to be recorded, even when no archaeological deposits have been identified.

Section drawings (at a minimum scale of 1:20) must include heights A.O.D. Plans (at a minimum scale of 1:50) must include O.D. spot heights for all principal strata and any features. At least one section of each trench edge, showing a representative and complete

sequence of deposits from the modern ground surface to the natural geology, will be drawn and reproduced in the report even in instances when no archaeological features are encountered.

The actual areas of excavation and all archaeological (and possibly archaeological) features should be accurately located on a site plan and recorded by photographs, scale drawings and written descriptions sufficient to permit the preparation of a detailed archive and report on the material. The trench location, as excavated, will be accurately surveyed, tied into the O.S. National Grid and located on an up-to-date 1:1250 O.S. map base. Levels will be included on trench plans and 3-dimensional recording employed to record lithic scatters and other artefacts/ecofacts where encountered.

All excavation and on-site recording will be carried out according to standard CFA procedures, principally by drawing, by photography and by completing standard CFA record forms. Photographs will be taken of all archaeological contexts and a register of all photographs will be kept.

Black and white photography using orthodox monochrome chemical development should be used where appropriate. Film should be no faster than ISO400. Slower films should be used where possible as their smaller grain size yields higher definition images. Technical Pan (ISO 25), Pan-F (ISO50), FP4 (ISO125) and HP5 (ISO400) are recommended. The use of dye-based films such as Ilford XP2 and Kodak T40CN is unacceptable due to poor archiving qualities. Black and white photography should be supplemented by colour photography; this should be in transparency format (i.e. slides or digital photography as an acceptable alternative, see paragraph 7.4.5 below).

Digital photography: as an alternative for colour slide photography, good quality digital photography may be supplied, using cameras with a minimum resolution of 4 megapixels. Note that conventional black and white print photography is still required and constitutes the permanent record. Digital images will only be acceptable as an alternative to colour slide photography if each image is supplied in three file formats (as a RAW data file, a DNG file and as a JPEG file). The contractor must include metadata embedded in the DNG file. The metadata must include the following: the commonly used name for the site being photographed, the relevant centred OS grid coordinates for the site to at least six figures, the relevant township name, the date of photograph, the subject of the photograph, the direction of shot and the name of the organisation taking the photograph. Any digital images are to be supplied to WYAAS on gold CDs by the archaeological contractor accompanying the hard copy of the report.

In general, sampling will be targeted upon potentially significant archaeological deposits or features and should predominantly examine sealed contexts. Sample size will take into account the frequency with which material appropriate for sampling will occur but bulk samples of dry deposits will normally be 20-40 litres and waterlogged samples will be 10-12 litres.

Where deposits with a high palaeoenvironmental potential are identified, advice will be sought from the English Heritage Regional Science Advisor and from WYAAS on the need to extract, process and further examine environmental samples. Bulk sampling may also be used to collect charcoal for C14 dating where appropriate.

All artefacts and animal bone will be recorded, collected and labelled according to their individual stratigraphic context. Finds from each archaeological context will be allocated individual finds bags and waterproof labels will be used for each bag to identify unique individual contexts. The location of flint will be plotted and 3 dimensionally recorded.

All finds and samples will be exposed, lifted, cleaned, conserved, marked, bagged and boxed according to relevant guidance. In the event of the discovery of human remains, including cremation burials, these will be left *in situ* and not be further examined until WYAAS and the client have been contacted and an appropriate licence has been issued by the Ministry of Justice.

5.4 Standards and Guidance

CFA Archaeology is a registered organisation (RO) with the Chartered Institute for Archaeologists (CIfA). All work will be conducted in accordance with relevant CIfA Standards and Guidance documents (CIfA 2014a-c), English Heritage guidance (EH 2001, 2005, 2006, 2007, 2008a-c and 2011) and CFA's standard methodology.

5.5 Monitoring

The archaeological work will be monitored by WYAAS, who will be informed (at least 1 week) in advance of the works taking place and updated as to progress and any significant archaeological discoveries. Important or unexpected discoveries will be communicated to the client and WYAAS at the earliest opportunity. Contact numbers for the site will be forwarded in advance of the work starting.

5.6 Analysis and reporting

Should significant archaeological remains or deposits be recorded and if appropriate, once fieldwork is complete an 'Interim Assessment of Potential' may be produced, the scope of which may be agreed with WYAAS.

An Illustrated report will be prepared, summarising the methods and detailing the results of the work. The results will be considered in the wider historic and archaeological context of the area and relevant research frameworks or Strategies.

The post-excavation programme will include the results of analysis of artefacts, faunal remains and palaeoenvironmental work. CFA would discuss the results of the work within the archaeological context of the region.

5.7 Artefact Assessment

All artefacts must be assessed by a qualified and experienced specialist. Assessment should be generally based on MORPHE but should include:

- preparation of a descriptive catalogue;
- dating (where possible);
- an assessment of the significance of the assemblage;

- an assessment of the potential for further analysis to contribute to the interpretation of the archaeology of this site;
- an assessment of the potential for further analysis to contribute to artefact studies;
- recommendations for additional artefact illustration/photography;

an assessment of the condition of the assemblage and recommendations for conservation, retention/discard and archiving.

5.8 Sample Assessment

All environmental material must be assessed by a qualified and experienced specialist. Assessment should be generally based on MORPHE but should include:

- preparation of a descriptive table/catalogue;
- identification of material suitable for scientific dating;
- an assessment of the significance of the assemblage;
- an assessment of the potential for further analysis to contribute to the interpretation of the archaeology of this site;
- an assessment of the potential for further analysis to contribute to environmental studies;
- an assessment of the condition of the assemblage and recommendations for retention/discard and archiving.
- Scientific dating should be undertaken at this stage if it is required to fulfil the aims of the project.

5.9 Conservation Strategy

A conservation strategy must be developed in collaboration with a recognised laboratory. All finds must be assessed in order to recover information that will contribute to an understanding of their deterioration and hence preservation potential, as well as identifying potential for further investigation. Furthermore, all finds must be stabilised and packaged in accordance with the requirements of the receiving museum. As a guiding principle, only artefacts of a “displayable” quality would warrant full conservation

In the event that the results of the investigation are of sufficient significance to merit full publication, CFA would proceed to this stage subject to the approval of the client and in consultation with WYAAS.

All finds and samples will be processed and assessed for significance. A summary of the results of the archaeological works will be submitted for inclusion in OASIS. A copy of the report will be deposited with West Yorkshire HER including a digital copy on CD.

The report will include the following sections:

- Non-technical summary
- Introductory statement
- Aims and purpose of the project

- Methodology
- Detailed account of the work and its results.
- Significance of archaeological heritage assets and impact upon significance of the development
- Conclusion, including a confidence statement

Supporting illustrations at appropriate scales will be included (e.g. site plans, plans of deposits and features, sections including depositional relationships to the ground surface, feature plans and sections) all CAD sections and plans will include a drawn scale. In addition the report will contain the following as appropriate:

- Selected site photographs
- Drawn finds illustrations – of representative and/ or key finds to support the interpretation of date/ site function – at appropriate scales
- Supporting data – including a basic quantification of artefacts, ecofacts and structural data tabulated and full specialist reports
- Index to archive and details of archive location
- References
- Copy of the WSI
- Report Deposition
- A hard copy of the full report (plus a digital copy on gold disk) will be submitted directly to the WY Archaeology Advisory Service within a timescale agreed by both parties. The report will then assessed by WYAAS to establish whether or not it is suitable for accession into the WY Historic Environment Record. A copy of the final report (in .pdf format) shall also be supplied to English Heritage's Science Advisor (Andy.Hammon@HistoricEngland.org.uk). Any comments made by WYAAS in response to the submission of an unsatisfactory report will be taken into account and will result in the reissue of a suitably edited report to all parties, within a timescale which has been agreed with WYAAS. Completion of this project and a recommendation from WYAAS for the full discharge of the archaeological condition is dependent upon receipt by WYAAS of i) a satisfactory full report and, should publication be warranted, ii) a copy of a letter from an appropriate journal editor or publisher confirming acceptance of the article.
- The full report, once accepted by WYAAS, will be supplied on the understanding that it will be added to the West Yorkshire Historic Environment Record and will become a public document after an appropriate period of time (generally not exceeding six months).
- Copyright - Please note that by depositing this report, the contractor gives permission for the material presented within the document to be used by the WYAAS, in perpetuity, although The Contractor retains the right to be identified as the author of all project documentation and reports as specified in the Copyright, Designs and Patents Act 1988 (chapter IV, section 79). The permission will allow the WYAAS to reproduce material, including for commercial use by third parties, with the copyright owner suitably acknowledged.

- The West Yorkshire HER supports the Online Access to Index of Archaeological Investigations (OASIS) project. The overall aim of the OASIS project is to provide an online index to the mass of archaeological grey literature that has been produced as a result of the advent of large-scale developer funded fieldwork. The archaeological contractor must therefore complete the online OASIS form at http://ads.ahds.ac.uk/project/oasis/. Contractors are advised to contact the West Yorkshire HER officer prior to completing the form. Once a report has become a public document by submission to or incorporation into the HER, the West Yorkshire HER may place the information on a web-site. Please ensure that you and your client agree to this procedure in writing as part of the process of submitting the report to the case officer at the West Yorkshire HER.
- The attached summary sheet should be completed and submitted to the West Yorkshire Archaeology Advisory Service for inclusion on WYAAS's website. During fieldwork monitoring visits WYAAS officers will take digital photographs which may be published on the Advisory Service's social media feeds as part of an ongoing strategy to enable public access to information about current fieldwork in the county.

5.10 Archiving

The Calderdale Museum's curator, Jeff Wilkinson, will be notified of the date of commencement of fieldwork (Tel.: 01422 352334; email: jeff.wilkinson@calderdale.gov.uk). The project archive, comprising all CFA record sheets, finds, plans and reports, will ordered in accordance with current guidelines (Brown 2011) and deposited at Calderdale Museum.

5.11 Health and Safety

CFA is a Constructionline, Achilles and CHAS registered company. All CFA staff have been inducted into CFA's Health and Safety Policy and all site staff have current CSCS cards (Archaeological Technician). All work for the project will be subject to Risk Assessment procedures.

5.12 Outreach

Suitable avenues for outreach and the publicity of results will be explored, subject to the agreement of the client. Such outreach may take the form of a short summary in an appropriate archaeological journal, popular publication or talks to local groups and societies.

5.13 Resources

CFA Archaeology Ltd (CFA) is a professional cultural heritage consulting and contracting organisation operating throughout the UK. The company was formed in 2000 with the spinning-out from the University of Edinburgh of the *Centre for Field Archaeology*, which had been trading since 1990. Many of CFA's senior staff have been with the company since its earliest days.

CFA is a Chartered Institute for Archaeologists (CIfA) Registered Organisation (RO). This status is a form of quality assurance conferred by the CIfA and is a sign of our commitment to provide the highest standard of professional service.

CFA's main archaeological contracting services include watching briefs, field evaluations, set-piece excavations and standing building recording. We also carry out desk-based assessments, geophysical survey and topographic earthwork surveys. CFA carries out a large number of archaeological excavations a year, ranging from small single trenches to large-scale open area excavations; including urban redevelopment schemes, rural green field developments and major infrastructure projects such as roads and pipelines.

CFA also provides post-excavation services, in support of our own archaeological services and as specialist sub-contractors to others. CFA has its own in-house post-excavation facilities that include on-site storage facilities for artefacts and samples, wet-sieving facilities and a fully equipped laboratory. CFA provides in-house services including assessment and analysis of artefacts; palaeobotanical and biological material including human remains; and, palaeoenvironmental reconstruction. CFA also has access to a number of other acknowledged specialists for other aspects of post excavation analysis not currently carried out in-house, such as metalworking residues, soil micro-morphology and geochemical analyses.

CFA's publication record ranges from short notes in journals to papers in refereed national and specialist journals and includes monographs and specialist reference books. CFA also provides a range of illustrative and design services including: AutoCad and GIS mapping, 3D archaeological reconstruction, photographic rectification, and exhibition/display materials and book cover design.

Key Staff

The day to day management of the project would be the responsibility of Martin Lightfoot BA MA MCIfA (Regional Manager), who would ensure that the project was completed in accordance with recognised standards and guidance, the brief and this WSI.

Graphics and GIS: Leeanne Whitlelaw BA FSA Scot MCIfA (Graphics Manager)
Post-Excavation: Dr Mel Johnson MA PhD MCIFA FSA Scot (Head of Post-Excavation Services)

Palaeoenvironmental Specialist: Dr Mike Cressey HND BA MSc PhD CMIfA (Project Manager)

List of Specialists

Geophysics	Chris Gaffney (Bradford University)
Osteoarchaeology	Sue Anderson BA MPhil PGDip MCIfA FSA Scot
Conservation Laboratory	Ian Panter (York Archaeological Trust)
Palaeoenvironmental Scientist	Mike Cressey HND BA MSc PhD MCIfA (CFA)
Archaeobotany	Mhairi Hastie BSc MSc ACIfA (CFA)
Archaeozoology	Sean Bell BA MSc
Soil Micromorphology	Clare Ellis BA PhD MCIfA
Lithics	Paul Preston BSc M.Phil D.Phil Martin Lightfoot BA MA MCIfA (CFA)
Prehistoric pottery	Melanie Johnson MA PhD FSA Scot MCIfA (CFA) Elaine Morris BSc PhD FSA
Palynology	Robert McCulloch BA PhD (University of Stirling)
Industrial and domestic waste analysis, archaeological materials and residue analysis	David Starley BSc PhD

The above list is not exhaustive: should unusual or locally specific archaeological materials be discovered, then appropriate specialists will be sought on the advice of the Regional English Heritage Scientific Advisor. CVs and examples of work for all specialists may be supplied on request.

5.14 Quality Assurance

CFA works to the highest achievable standards across the range of its archaeological activities and employs best archaeological practices. CFA is a Registered Organisation (RO) of the Chartered Institute for Archaeologists (CIfA) and operates according to appropriate codes and standards.

A quality system has been produced to fulfil the requirements of best archaeological practice. This system comprises the Quality Policy, Quality Manual, project specific Quality Plans, and a series of Standard Operating Procedures, copies all of which may be supplied on request.

CFA staff are instructed in the requirements of the quality system. All staff working on projects are inducted in CFA working practices, including quality responsibilities. Every member of staff is made aware of their individual responsibilities within the project and within the Quality Plan. CFA ensures that all staff are qualified, experienced archaeologists, and that training is conducted in appropriate areas of CFA work procedures and in developing uses of new technologies. All staff are encouraged to apply for membership of the CIfA, the recognised professional body for field archaeology, at an appropriate level and are encouraged and assisted through an appraisal system to maintain continuing professional development documentation.

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APPENDIX 1

Palaeoenvironmental Assessment of Peat Deposits at Ovenden Moor Windfarm

Dr Mike Cressey

Introduction

This report presents the results of a geoarchaeological assessment of peat deposits sampled from a series of geotechnical test-pits located at the proposed Ovenden Moor wind-farm extension (Fig 1). The work was carried out in November 2014.

Site Location and Geology

The site is located within an elevated moorland plateau with the highest point at 451m AOD (Hollin Hill). The site is slightly undulating with higher ground located to the northern margin and generally sloping towards the south-east and south. The site lies on the watershed between Calder Valley to the south and the Worth Valley to the north.

The site is punctuated by two watercourses flowing east: Skirden Clough, located to the south of the site, flows through a steep-sided valley that flows south-east towards Ogden Water and; Ogden Clough is towards the north of the site and also flows eastwards towards Ogden Water.

Moorland peat lies across most of the site and is underlain by Upper Carboniferous deposits of the Millstone Grit Group with two formations present; Rough Rock Formation, described as ‘coarse grained, cross-bedded feldspathic sandstone’ (BGS 2013).

The composition of plant species colonising the moor is discussed in the Environmental Statement (2012). The list included purple moor grass (*Molinia caerulea*), wavy hair grass (*Deschampsia flexuosa*), hare's-tail cotton grass (*Eriophorum vaginatum*), mat grass (*Nardus stricta*), common cotton grass (*Eriophorum angustifolium*), bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum*) and bracken (*Pteridium aquilinum*). These plants are typical of drier areas of blanket bog environments and can be broken down into three broad groups including the *Eriophorum angustifolium* bog pool community, the *Carex echinata* Sphagnum mire complex and *Eriophorum vaginatum* blanket mire. All are typical of upland moorland where precipitation is high.

Field Recording Methods

An archaeological watching brief was maintained at each test-pit location and each test pit was dug by a mechanical excavator fitted with a toothed bucket. The test-pits were dug to a depth defined by the on-site geotechnical engineer. The field recording parameters included topographic setting and test-pit size and geo-referenced location to six figures. Maximum depth, colour and compaction along with visible inclusions such as plant remains were recorded onto CFA test-pit record sheets. Cross-referenced grab-sample number and digital photographic reference number were also entered onto the recording sheet. The nature of the bed-rock geology and importantly the depth of the interface between the underlying peat deposits and the bedrock was also recorded.

Laboratory recording methods

A qualitative assessment of the peat recovered in grab-samples was carried out to determine the type and character of the peat. The method followed Hodgson (1996) and English Heritage (2007 and 2011). Munsell colour codes along with physical properties including the presence or absence of macro-plant remains such as fossil wood (branch or trunk wood) or identifiable plant-macro remains such as sedges, rushes and leaves etc. As part of the assessment the peat/mineral interface recovered within the samples (Table 1) were processed by wet sieving in order to identify any worked flint or debitage.

Test Pit Profile Assessment

The results of the peat assessment are listed below.

Table 1 Test Pit sample Assessment Results

Test Pit No	Sample No	Summary Description	Max depth of the peat interface
1A	<1>	Homogenous plastic peat (10YR 2/2 Black) Occasional fine roots. Interface, (10YR 6/4 Yellowish Brown). Light orange brown silty clay with gravel and cobbles.	-3.2m
1B	<2>	Very compact fibrous peat (10YR 3/3 Very Dark Brown). No visible large plant macro remains. Interface, light-orange-brown sand with course angular gravel.	-2.65
2A	<11>	Homogenous plastic peat (10YR 3/3 Very Dark Brown). Abundant fine roots (40%). Plant macros absent. Interface light grey brown sandy gravel, cobbles of sandstone.	-2.3m
3A	<18>	Very firm to compact peat (10YR 3/2 Dark Brown). Occasional fine roots (30%). Interface, very light brown sub-angular gravel.	-1.2m
3B	<17>	Firm to compact fibrous peat (10YR 3/3 Very Dark Brown). Abundant fine roots (<40%). Larger plant-macros absent. Grey-brown coarse sub-angular gravel, cobbles and boulders (highly weathered).	-1.5m
4A	<4>	Very dark homogenous fibrous peat (10YR3/3 Very Dark Brown). Fine roots <20%. Interface, grey-brown coarse sand with sub-angular sandstone.	-2.35m
4B	<3>	Mineral rich peat with sandy texture, poorly preserved (10YR 6/6 Yellowish Brown). Interface, grey-brown course sand merging with course sub-angular gravel and cobbles (weathered bedrock)	-1.8m
4C	<5>	Dark homogenous peat, (10YR 3/3 Very Dark Brown) fine roots-no larger diameter plant macros present. Interface, grey-brown fine to course sand with occasional pockets of sub-angular sandstone.	-2.4m
5A	<21>	Well humified firm to compact peat (10YR 3/3 Very Dark Brown). Occasional fine roots (20%). Brown silt and sand, occasional large boulders (0.9 x 0.7 x 0.15m)	-0.5m
5B	<20>	Very plastic peat (10YR 3/3 Very Dark Brown). Abundant fine roots (60%). Occasional larger fragments of plant stems (1-2mm diameter) of Carex/Poacea types. Interface, brown-silty gravel, sand and course sub-angular sandstone.	-0.65m
6A	<7>	Very well humified peat (10YR 3/3 Very Dark Brown). Very fibrous, abundant fine roots. Larger plant macros absent. Interface, brown slightly silty sand, fine gravel.	-1.8m
6B	<8>	Very plastic homogenous peat (10YR 3/3 Very Dark Brown). Roots absent. Occasional mineral inclusions (10YR 5/6 Yellowish Brown). Interface, grey brown silt and fine sub-angular gravel.	-2.5m

Test Pit No	Sample No	Summary Description	Max depth of the peat interface
7A	<15>	Homogenous compact peat (10YR 3/3 Very Dark Brown). Roots and larger plant macros absent. Brown silt and fine to course sand with sub-angular sandstone.	-1.2m
7B	<14>	Very degraded peat within a sandy matrix (10YR Dark Yellowish Brown). Occasional fine roots (<10%). Brown silty gravel merging with fine to course sub-angular gravel.	-0.4m
8A	<22>	Made ground over very fibrous peat (10YR 3/3 Very Dark Brown). Abundant fine roots (40%) and occasional stems of *Calluna vulgaris* (heather). Interface, grey-brown sand, gravel and sandstone boulders.	-0.2m
8B	<23>	Mineral rich with peat poorly preserved (10YR 6/6 Yellowish Brown). Roots absent. Few small stones (<10%). Interface, Orange-brown sand, fine to course sub-angular sandstone.	-0.4m
9B	<28>	Poorly preserved gritty peat intermixed with sandstone peds (10YR 5/3 Yellowish Brown). Roots absent. Interface, brown silt and gravelly sand with occasional cobbles.	-0.6m
10	<26>	Mineral rich with degraded peat, small peds of sandstone. (10YR 4/4 Dark Yellowish Brown). Occasional fine roots (15%). Interface, Orange-brown sand with sub-angular course gravel.	-0.35m
11	<25>	Plastic gritty peat (10YR 3/3 Very Dark Brown). Occasional fine roots. Interface, orange-brown sand, fine to course gravel.	-0.45m
12	<27>	Gritty homogenous peat, firm to plastic (10YR 6/6 Yellowish Brown). Rare fine roots. Larger plant-macros absent. Interface, orange-brown sand with sub-angular gravel of sandstone.	-0.6m
13	<19>	Very firm to compact peat. Abundant fine roots (40%). Larger plant-macros absent. Interface, orange-brown silt merging with fine to course sand, sub-angular gravel.	-1.4m
14	<16>	Very plastic peat (10YR 3/3 Very Dark Brown). Rare fine fibrous roots (<5%). Interface, Brown slightly silty sand and gravel and cobbles.	-2.1m
15	<13>	Very compact peat with gritty texture (10YR 4/2 Dark Grey Brown). Abundant fine roots. Interface, firm to stiff fine to course sand merging with course sub-angular gravel.	-0.6m
16	<9>	Very humified plastic peat (10YR 3/3 Very Dark Brown). Fine roots and plant-macros absent. Blue-grey silt and gravel, fine to course sandstone.	-2.3m
17	<12>	Very compact homogenous peat (10YR 3/3 Very Dark Brown). Gritty sandy inclusions from interface, mainly orange to brown silt with sub-angular sandstone.	-2.5m
18	<24>	Homogenous fibrous peat (10YR 3/3 Very Dark Brown). Abundant fine roots (60%). Larger plant-macros absent. Interface, brown sand and sub-angular gravel.	-2.2m
19	<10>	Compact sandy peat (10YR 4/4 Dark Yellowish Brown). Roots rare (10%). Interface, orange-brown gravel and sub-angular sandstone.	-0.7m
20	<6>	Very plastic peat, (10YR 3/3 Very Dark Brown). Abundant fine roots 50%, with visible 1-2mm diameter degraded plant stems.	-1.3m

Sample processing results

Wet sieving followed by sorting confirmed that all the samples were sterile of flint or any micro artefact.

Peat Assessment Results

The peat is a typical homogenous ombrotrophic peat which has derived its nutrients from rainwater (Brooks and Stoneman 1997). The topographic nature of its surface humps and hollows with standing pools of water is typical of this type of high moorland peat where rainfall is high and natural drainage is poor. The propensity for increased waterlogging towards the near surface of the peat is a result of restricted drainage brought about by peat compaction. Within this site there is a strong tendency towards the weathering of the underlying parent rock which is mainly feldspathic sandstone. Its breakdown into a reduced grey clay layer is the result of the acidic nature of the peat (pH <5.5) which results chemical weathering at the peat/bedrock interface, resulting in degraded mineral bands of variable width across the site.

The undulating nature of the topography is also very variable as a result of glacial moulding during the Late Glacial Period. The position of the interface below the peat is very variable across the site. In most cases this unit is dominated by sand and gravel, mainly derived from weathering. The presence of boulders below some of the profiles indicates the presence of Devensian fluvio-glacial outwash activity which is largely responsible for this material.

Palynological Potential

The watching brief and the resultant peat deposit model (Fig. 1) shows that the blanket peat varies in depth between 0.2-3.2m across the survey area. Many pollen analytical studies have been conducted using the peats of the North York Moors and other upland areas in northern Britain showing variations in the tree line and in forest composition as well as possible forest clearance episodes (Edwards, 1990, Simmons and Innes, 1996b, Innes and Simmons, 1999 and 2000).

The peat at Ovenden Moor has a high value in terms of its palynological record for establishing local woodland cover and potential fire histories during the Mesolithic. The peat would also provide a regional picture of later prehistoric woodland composition. Pollen analysis remains the most powerful technique for reconstructing continuous records of human-landscape interactions such as early prehistoric incursions into the woodland cover. Pollen records may also further advance ‘home-field’ activities where there is a positive link between occupation site(s) and the vegetation record, which is commonly (but not exclusively) acquired from peat coring close to the occupation site.

The interface depths range from between -3.2m (TP1A) forming the deepest and -0.2m (TP8A) the shallowest. Figure 1 shows the depth distribution of the peat and the potential peat coring sites within the survey area.

Recommendations for further Palynological Study

A programme of radiocarbon dating could be initiated to establish the age of the inception of the peat. A staged approach could be adopted driven by an initial pilot study:

Stage 1

Replicate cores will be obtained using a hand-held Eijkelkamp (Dutch) closed chamber corer suitable to a depth of 5-6m. Two or more overlapping cores will be obtained and suitably labelled, sealed and packaged for transportation to CFA's cold storage facility.

A pilot study would determine the radiocarbon age of the base of the peat, intermediate and sub-surface of the peat in order to determine how much of the Holocene sequence is present within the peat column. The peat inception date could be assessed to determine its formation dynamics in relation to the wider Mesolithic activity within the region.

Stage 2

According to the basal and intermediate dates attained and depending on the results of the pollen spectrum a skeletal pollen diagram and report will be produced on the results with a series of further radiocarbon dates (minimum of three) obtained at critical points within the profile.

Stage 3

Advance the pollen study with further closer interval pollen counts at critical points (minimum 400 grains TLP) within the skeletal profile if the Stage 2 results confirm an unbroken pollen sequence and the potential is good for a complete vegetation record of Ovenden Moor.

Stage 4

Produce a detailed pollen report for Ovenden Moor and publish the results if they so merit it.

It is considered that a staged approach is the best option to mitigate the loss of the peat which may provide a record of Mesolithic woodland interaction if the peat is in excess of 7000BP.

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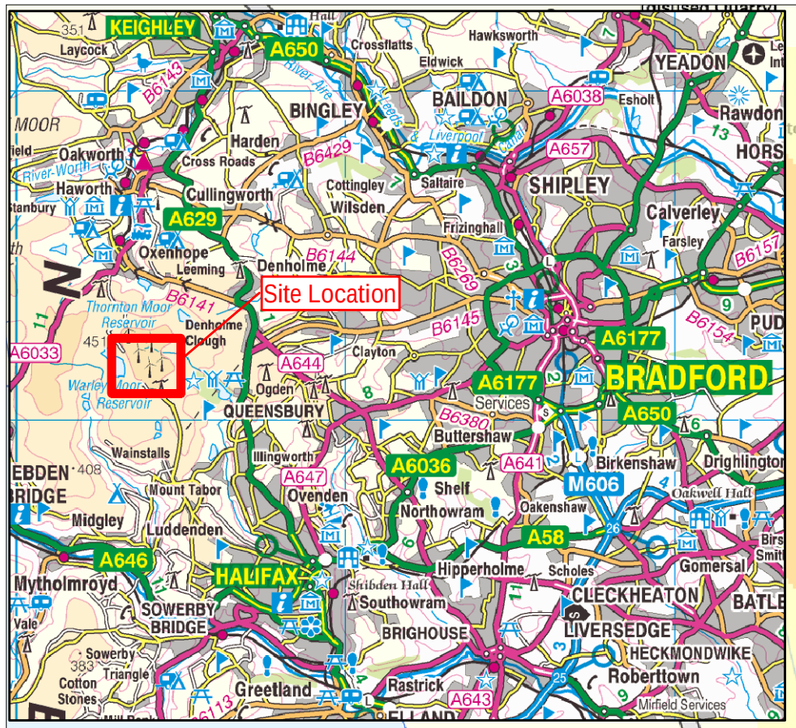

Key:

- Access Track and Hardstanding
- Met Mast
- Temporary Construction Compound
- Control Building with Substation
- Bore Hole

Peat Depth Interpolation 2014

- 0.1 - 1
- 1.001 - 2
- 2.001 - 3
- 3.001 - 4
- 4.001 - 4.4

OVEN_TP_Locations

- 0.1 - 1
- 1.001 - 2
- 2.001 - 3
- 3.001 - 4

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Fig. No:	Report No:
1	-

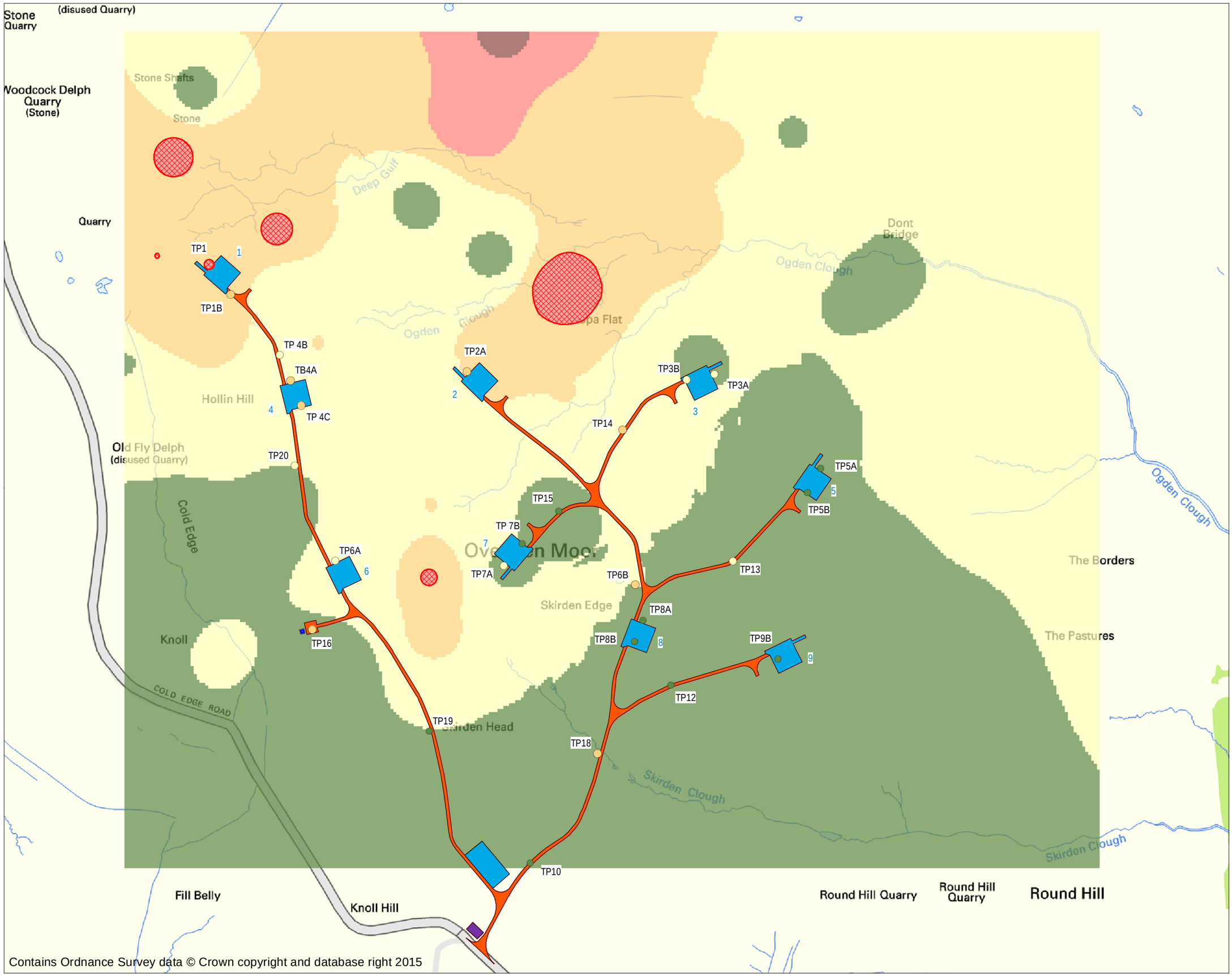
Title: Distriution Map of Peat Depths derived from Test Pit monitoring

Project: Ovenden Moor Wind Farm

Client: Wind Prospect

Scale at A3: 1:6,000

Drawn by:	Checked:	Date:
SW	MC	27/02/2015



Contains Ordnance Survey data © Crown copyright and database right 2015

Key:

- Met Mast
- Control Building with Substation
- Strip and Record
- Watching Brief
- Potential Peat Core Sample Locations

Peat Depth Interpolation 2014

- 0.1 - 1
- 1.001 - 2
- 2.001 - 3
- 3.001 - 4
- 4.001 - 4.4

OVEN_TP_Locations

- 0.1 - 1
- 1.001 - 2
- 2.001 - 3
- 3.001 - 4

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Fig. No:	Report No:
2	-

Title: Proposed Mitigation

Project: Ovenden Moor Wind Farm

Client: Wind Prospect

Scale at A3: 1:6,000

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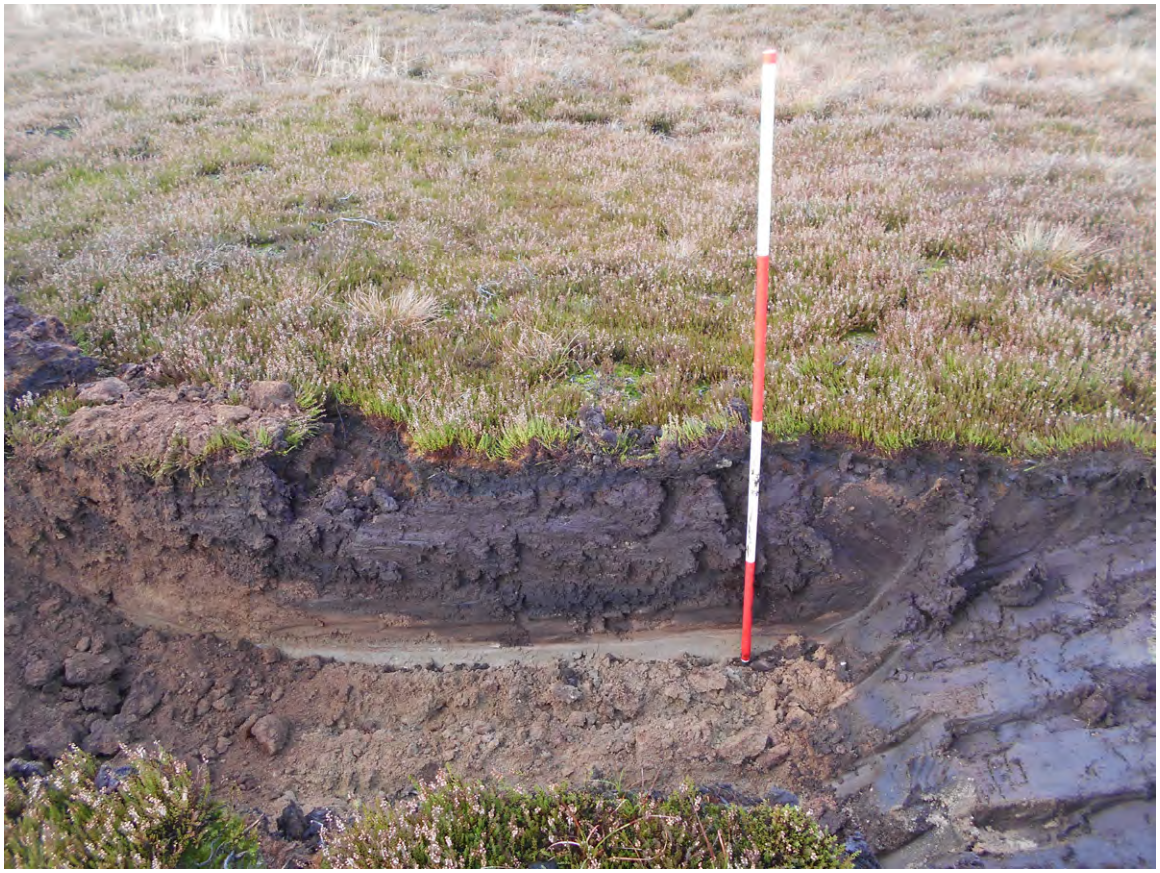

Plate 1 - Test Pit 5a shallow peat, natural bedrock and dry surface.

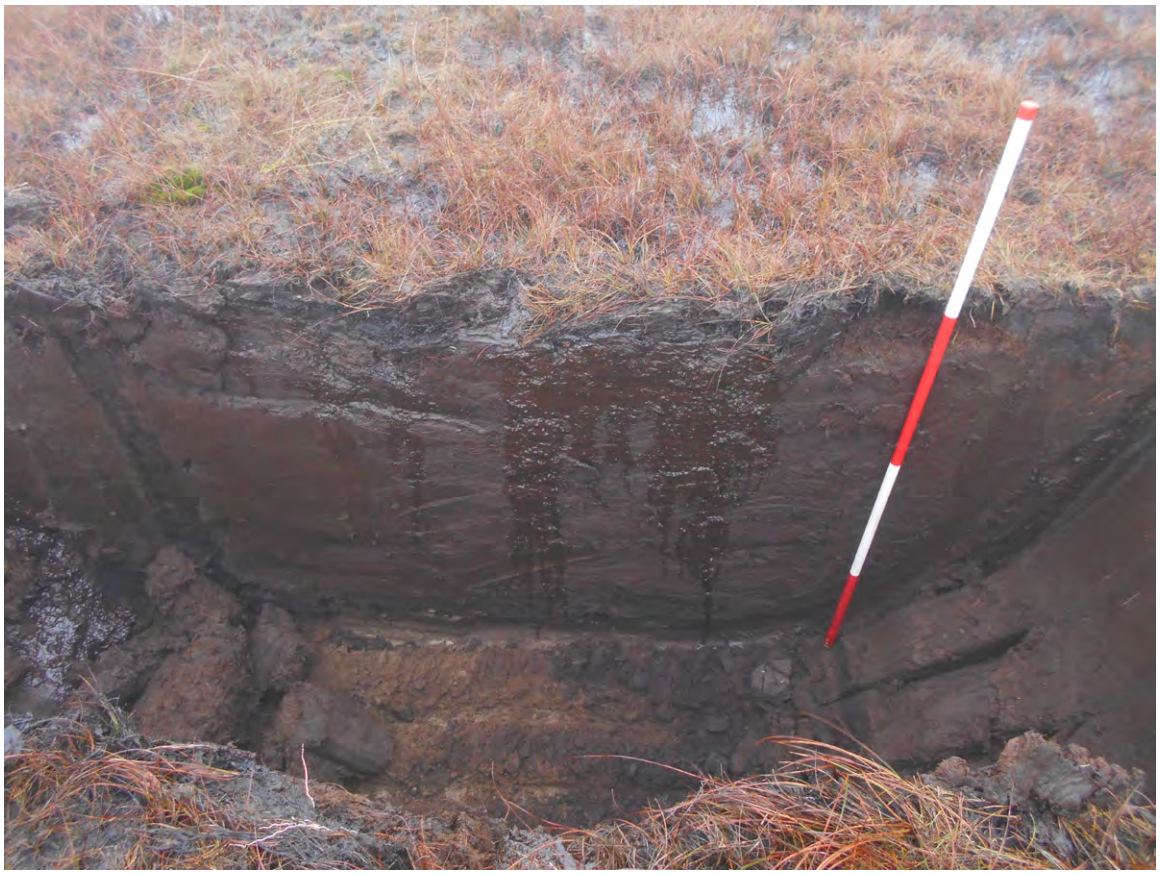

Plate 2 - Test Pit 6a north-east-facing section with saturated surface.

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Title:	Plate: 1 - 2	Report: WSI	Drawn: SW	CKD: ML	Date: 02/03/15
	Client: Wind Prospect				
Project: Ovenden Moor Wind Farm					

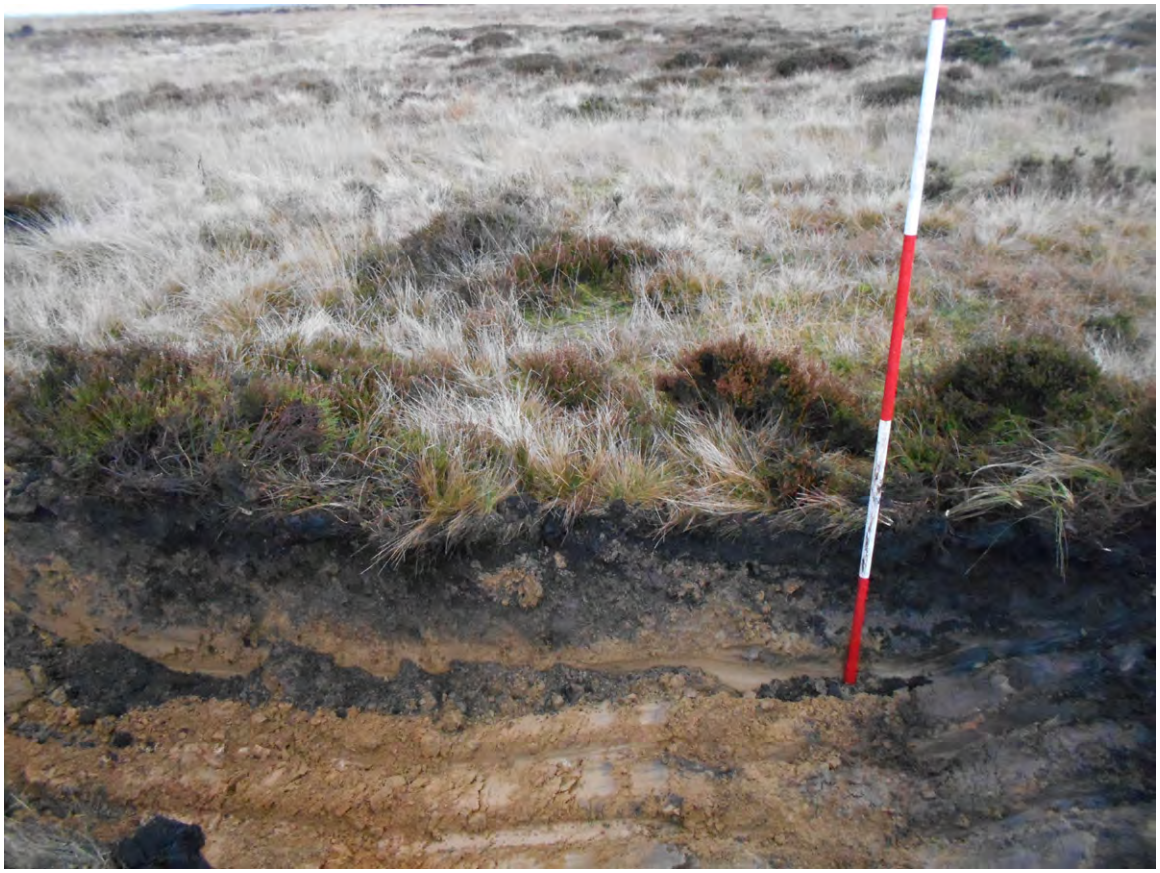

Plate 3 - Test Pit 8a west-facing section showing shallow peat.

Plate 4 - Test Pit 14 north-west-facing section with deep peat.

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Title:	Plate: 1 - 2	Report: WSI	Drawn: SW	CKD: ML	Date: 02/03/15
	Client: Wind Prospect				
Project: Ovenden Moor Wind Farm					

WEST YORKSHIRE ARCHAEOLOGY ADVISORY SERVICE SUMMARY SHEET
ARCHAEOLOGICAL FIELDWORK IN WEST YORKSHIRE

Site name / Address: Ovenden Wind Farm	
Township: Ovenden	**District** Calderdale
National Grid Reference (to six or eight figures *depending on the archaeological sensitivity of the site*): SE 04179 31794	
Contractor: CFA Archaeology	
Date of Work: April 2015 – November 2016	
Title of Report (in full): Ovenden Moor Wind Farm, Ovenden, West Yorkshire, Archaeological Works	
Date of Report: March 2016	

SUMMARY OF FIELDWORK RESULTS (100 WORDS OR LESS)

CFA Archaeology undertook an archaeological watching brief and strip and record at Ovenden Moor Wind Farm. No archaeological remains were identified during the course of the works and no flint was recovered.

In addition a 2.88m long peat core was taken in order to undertake an assessment for the potential for detailed palynological analysis. This assessment involved counting 100 pollen grains from 12 sub-samples within the peat core. Despite fluctuations in pollen concentrations, the assessment demonstrated good pollen preservation and radiocarbon dating indicated that the peat dates from the mid-sixth millennium BC, to the 9th or 10th century AD.

Author of summary: Phil Mann	**Date of summary:** 14 March 2016