Park End Farm, Brigsteer, Cumbria

Palaeoenvironmental Auger Survey Report

Oxford Archaeology North

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CONTENTS

SUMMARY **2**

ACKNOWLEDGEMENTS **3**

1. INTRODUCTION **4**

1.1 Circumstances of the Project....4
1.2 Location, Geology and Topography....4

2. METHODOLOGY **6**

2.1 Project Design....6
2.2 Auger Survey....6
2.3 Impact Survey....6
2.4 Archive....6

3. BACKGROUND **7**

3.1 Archaeological and Palaeoecological Evidence....7

4. RESULTS **8**

4.1 Auger Survey....8
4.2 Impact Survey....9

5. DISCUSSION AND POTENTIAL **10**

5.1 Auger Survey....10
5.2 Impact Survey....10
5.3 Palaeoenvironmental Potential....10

BIBLIOGRAPHY **11**

ILLUSTRATIONS **12**

List of Figures....12
List of Plates....12

APPENDIX 1: WRITTEN SCHEME OF INVESTIGATION **13**

APPENDIX 2: CORING LOGS **30**

SUMMARY

Following proposals for a raised water level management plan at a site adjacent to Park End Farm (Fig 1), the National Trust requested that Oxford Archaeology North (OA North) undertake a palaeoenvironmental auger survey of the proposed development area. Due to the site being within an area of wetland and of high archaeological potential, an assessment of the impact of the proposed development on any peat deposits and archaeological remains was requested prior to any construction works commencing on site. The potential of the site to provide an enhanced wetland habitat through the Government Stewardship (ES) Higher Level Scheme had been assessed previously by RMA (2010).

The main objective of the auger survey, as set out in the Written Scheme of Investigation (*Appendix 1*), was to highlight the presence/absence and significance of any peat deposits within the site that may be impacted upon by the development. Specifically, it aimed to determine the presence/absence of peat deposits within the proposed areas of deeper excavation in the development area specified as "deep dig" (Fig 2), where sediment disturbance is likely to be between 1-1.5m.

In total, 63 individual auger locations were surveyed within the areas of "deep dig" and across a potential palaeochannel. The cores were taken with a hand-held *Eiijkelkamp* screw auger and a 30mm bore hand-held *Eiijkelkamp* gouge auger to a maximum depth of 3m or to the point where underlying stiff clay was reached.

The auger survey has shown that most of the site comprises topsoil underlain by clay. Only three small pockets of thin remnant peat were observed, all within the southern end of the development site. The deposits are considered too thin to provide any substantial palaeoenvironmental history of the area.

As part of the fieldwork component of the survey, it was deemed necessary to undertake an impact survey of the areas of the site highlighted as spoil dumps and assess whether these dumps would impact upon any archaeological remains in those areas. A previous historic landscape survey undertaken by Oxford Archaeology North (OA North 2011) was used as the basis for locating potential sites. Eleven archaeological sites were highlighted as being potentially at risk but of these only three were considered to be at direct risk, sites A, B, and C.

Sites A and B, post-medieval trackway and boundary wall, lie on the incline of the field (Plate 5), which slopes significantly to the west before it levels off approximately 10m below Site A. Any spoil dumped in this area should be restricted therefore to the lower part of the field in order to avoid covering part of the trackway. Site C is situated furthest away from any proposed spoil heap but may be at risk from plant working and vehicular access within the area. 'Owlet Lane' (Site C) is currently the main access track through this field and a public right of way (Plate 6). While used at the moment by small vehicle and foot traffic, repeated use by heavier machinery while work in the area is undertaken may cause irreparable damage. For this reason, it may be necessary to arrange other points of access for plant equipment.

ACKNOWLEDGEMENTS

OA North would like to thank the National Trust for commissioning the report and their assistance during fieldwork, especially by Thomas Burditt, Lead Ranger for the National Trust in South and East Cumbria and Morecambe Bay. OA North acknowledges the Environment Agency and the National Trust for Lidar images of the site and would like to thank the RSBP for a map of the proposed excavations at the site, forwarded by the National Trust.

The auger survey was undertaken by Mairead Rutherford and Aidan Parker. Aidan Parker recorded the location of the cores with a GIS software package, and also carried out the impact survey. Mairead Rutherford described the sediments and she and Aidan wrote the report. Alan Lupton and Elizabeth Huckerby managed the project and edited the report.

1 INTRODUCTION

1.1 Circumstances of the Project

1.1.1 Following proposals for a raised water level management plan, on land adjacent to Park End Farm, Brigsteer, Cumbria (Fig 1), the National Trust (hereafter the 'client'), requested that Oxford Archaeology North (OA North) undertake a palaeoenvironmental auger survey of the proposed development area. The client also requested that OA North should undertake an impact survey of those areas of the site highlighted as spoil dumps (Fig 2) and whether these dumps would impact on any archaeological remains in those areas.

1.1.2 The site lies adjacent to Brigsteer, Cumbria (centred NGR SD 485 888; Fig 1). Due to the site being within an area of high archaeological potential, following the requirement of the National Planning Policy Framework (NPPF, DCLG 2012; para 128), the client wished to understand the likely impact of the proposed development on any peat deposits in the areas of deeper excavation and on archaeological remains in those areas highlighted as spoil dumps, is understood, prior to any construction works commencing on site.

1.1.3 The main objective of the auger survey, as set out in the Written Scheme of Investigation (WSI; *Appendix 1*), was to highlight the presence/absence and significance of any peat deposits within the site that may be impacted upon by the development. The primary research objectives of the borehole survey can be summarised as follows:

- To determine the presence/absence of peat deposits within the proposed areas of deeper excavation in the development area;
- To identify significant variations in any peat deposits that may be indicative of localised features, such as topographic highs or palaeochannels and possible marine influences;
- To assess, as far as possible, the potential significance of any identified peat deposits in local, regional and (if relevant) national contexts;
- To assess the palaeoenvironmental potential of the peat;
- To identify deposits of potential significance for later collection of samples for palaeoenvironmental assessment and analysis and for purposes of radiocarbon dating.

1.1.4 The auger and impact surveys was undertaken between 2nd December and 6th December 2013. The following report presents the results derived from the survey (*Section 4; Appendix 2*) and a discussion of their significance (*Section 5*).

1.2 Location, Geology and Topography

1.2.1 The site is situated in the Lyth Valley, Cumbria and covers an area of approximately 1.5km by 0.5km (Fig 1). The location is Park Moss, which lies on the floodplain of the River Gilpin in an area of Carboniferous limestone overlain by Pleistocene tills (Hodgkinson *et al* 2000). The soil in the study area is a uniform loamy soil over grey clay and to the north and south this overlies fen, wood and/or bog peats, over soft grey clay (RMA 2010). The site is situated in an area of complex Holocene (post-glacial) stratigraphy, which was

influenced both by changing sea levels and climate change (Hodgkinson *et al* 2000). The topography of the site includes areas of wetland, grazed by Galloway cattle, and as a result, the ground surface is churned up in many places. Towards the northern part of the study area, trees have been thinned out from the hedgerows, leaving woody debris, some of which may have become incorporated in topsoil sediments. Compacted sediments alongside the drainage ditches probably results from these areas being used as present day trackways.

2 METHODOLOGY

2.1 PROJECT DESIGN

2.1.1 The methodology outlined in the WSI (*Appendix 1*) was followed. Cores were spaced 50m apart unless there was a change in lithology. Core locations were determined prior to fieldwork. Where areas of peat were found, cores were spaced 10m or 5m apart to establish the extent of the deposits (*Appendix 2*).

2.2 AUGER SURVEY

2.2.1 The auger survey was undertaken using a hand-held *Eiijkelkamp* screw auger and 300mm bore hand-held *Eiijkelkamp* gouge auger, and each location was probed until stiff clay was encountered. The resulting data were entered onto *proforma* data logging sheets (*Appendix 2*). The collection and recording of these data followed the English Heritage Geoarchaeology and Environmental Archaeology Guidelines (Ayala *et al* 2007; IfA 2008; Campbell *et al* 2011). Although each core location was surveyed with a DGPS, due to equipment malfunction it led to the coordinates of 14C and 43.1 not being recorded and height data being available for about one third of the cores only (*Appendix* 2).

2.2.2 In total, 63 cores were sampled along the areas designated "deep dig" on the map created by the RSPB and supplied to OA North by the client (Fig 2). Of these 47, were spaced at 50m intervals; eight at 10m intervals, along a transect adjacent to boreholes 10 and 14; four at 5m intervals associated with borehole 03; and the remainder were taken adjacent to original points or in stream beds in ditches (Fig 2) (*Appendix 2*).

2.3 IMPACT SURVEY

2.3.1 Using the gazetteer of sites from the Sizergh Estate, Historic Landscape Survey (OA North 2011) as a basis for the walkover, it was possible to identify a total of 11 sites potentially within the area of impact that needed to be assessed. Each of the previously identified sites was examined, working in a logical manner from the north to the south of the study area, and an assessment made on how likely each site was at risk of burial under a spoil dump. Any additional sites of potential, previously unrecorded, would be documented where applicable. However, due to the existing landscape survey, recording of each known site was restricted to a small number of digital photos for illustrative purposes within this document.

2.4 ARCHIVE

2.4.1 A full professional archive has been compiled in accordance with the WSI, and in accordance with current IfA and English Heritage (1991) guidelines. The project archive will be ordered and indexed and deposited with the Cumbrian record office, in Kendal. This report will be submitted to the Cumbrian HER.

2.4.2 An online OASIS form at http://www.oasis.ac.uk/ will, also be completed as part of the project. This information will be made available through the above website, unless otherwise agreed.

3 BACKGROUND

3.1 Archaeological and Palaeoecological Evidence

3.1.1 The southern part of Cumbria has yielded archaeological evidence for settlement from the Mesolithic period onwards although the presence of people in the area may date from the late Devensian (Wimble *et al* 2000). OA North previously surveyed the archaeology of the Lyth Valley wetlands as part of the North West Wetlands Survey (Hodgkinson *et al* 2000). The most significant wetland archaeological site recorded from nearby is the corduroy trackway that ran from Foulshaw Moss (Munn Rankin 1910; Hodgkinson *et al* 2000), whilst the track described at nearby Rawson's Moss by Barnes (1904) may also be part of the same feature. The mosses of the Lyth Valley were intensively exploited, especially during the seventeenth and eighteenth centuries (Hodgkinson *et al* 2000). Heslington Moss, in the centre of the Lyth Valley, formerly an extensive mire, is now represented by remnant peats (*ibid*).

3.1.2 Wimble *et al* (2000) carried out a detailed programme of pollen analysis and dating from two nearby peat deposits at Foulshaw Moss (NGR SD 460 825) and Heslington Moss (NGR SD 466 889). The results of this work concluded that small scale disturbance affected the area throughout the prehistoric period but it was in the late Iron Age that sustained, large clearance of woodland occurred (*ibid*). The area appears to have been relatively intensively exploited during the Romano-British period, with a decline in activity in the post-Roman period. A marked regeneration of woodland occurred prior to intensive exploitation during the medieval period. Large areas of open landscape became established during historically recent times (*ibid*).

3.1.3 Hodgkinson *et al* (2000) described three pollen samples from a 2.30m thick section of peat from Birkrigg Bog (SD 537 866) to the east of Levens, (approximately six miles south of Park End Moss), which were interpreted to suggest that organic sedimentation at this site began possibly during the late Mesolithic. The pollen record suggested development of mixed woodland at the site, with some evidence for woodland disturbance. Another pollen study site is that at the Roundsea Wood National Nature reserve (Birks 1982). Diatom records and sedimentary responses to sea level change during the last 8000 years at Roundsea Wood have been published by Zong (1997, 1998).

4 RESULTS

4.1 Auger Survey

4.1.1 In total, 63 cores was taken (Fig 2), varying in depth to a maximum of 3m. The coring logs are presented in tabular form in *Appendix 2*. In general, the deposits record blue/grey silts and clays overlain by stiff light brown clay. In the north and central part of the site these clays are overlain by topsoil. At three locations to the south (cores 03, 10 and 14), small pockets of remnant peat were found, stratigraphically sandwiched between silts/clays and topsoil.

4.1.2 The lithostratigraphic record in cores 35 and 41 may be taken as typical of sediment accumulation in the northern part of the study area (cores 30-47). Both cores penetrated sediments to a depth of 1m. The deepest sediments comprise blue/grey silts and clays and are overlain by stiff light brown clays over which topsoil is recorded. A third core reached a depth of 1.5m and revealed a similar lithostratigraphic record. The stiff clays appear to act as a semi-impermeable layer under the topsoil allowing water to accumulate, resulting in the build-up of surface water, leading to development of a wetland environment.

4.1.3 The central area (cores 15-26) shows a generally uniform and monotonous sequence of stiff to very stiff light brown clays, with iron staining, overlain by muddy, generally unconsolidated topsoil. Cores 19-22 provided a transect across the upper part of a possible palaeochannel shown on the Lidar data but no organic sediments were recorded.

4.1.4 In the southern part of the study area (cores 1-14), a transect across a possible palaeochannel (cores 11-13) showed that no organic sediments were present at these locations. However, small accumulations of peaty deposits were encountered at coring locations 3, 10 and 14. A maximum depth of 0.65m of peat was recorded at site 10. The results for each of these sites are presented below.

4.1.5 *Borehole 3*: The location of this core is in a shallow depression within a former (but now vegetated) possible drainage channel (Plate 1). The lidar images suggest that this may be a southern extension of a possible palaeochannel (Fig 3). A core of 1m depth recorded 0.08m of blue/grey clay and water overlain by stiffer clays, up to 0.36m thick. Humified, crumbly peat deposits up to 0.28m thick are then recorded prior to deposition of organic-rich topsoil. A series of four cores, all 5m apart, was taken to the north, south, east and west of Core 3, to establish the extent of the peat deposit. Only one core, 3 (South), contained a clayey peat deposit, 0.15m thick. The other cores recorded stiff brown/grey clays overlain by topsoil.

4.1.6 *Borehole 10:* At this site, 0.46m of humified woody peat was recovered at a depth of 0.14-0.60m from a 1m core. The peat deposit is underlain by blue/grey silts and clays and overlain by unconsolidated, peaty topsoil. A section of peat, from 0.20-0.30m, was collected from the gouge auger, allowing identification of the wood as alder wood (D Druce, *pers comm*).

4.1.7 *Borehole 14:* At this site, the core penetrated a depth of 1.50m and a thickness of 0.65m of humified peat was recorded. As seen at site 10, the peat is underlain by blue/grey silts and clays and overlain by peaty topsoil. No wood was present in the peat at this site. Two

additional cores, 14a and 14b, spaced 10m apart along a north-west/south-east transect, showed no peat was present at either of these locations.

4.1.8 To test for the presence of peat in a north-east to south-west direction between core locations 10 and 14, a further transect of four cores, spaced at 10m intervals (10a, 10b, 10c and 10d), was conducted. Small peat deposits, just less than 0.20m in depth, were found in cores 10a and 10d to the north and south of core 10 but the other cores recorded stiff clays and topsoil only. Two additional cores (10f and 10e), spaced at 10m intervals along a north-west/south-east transect centred on location 10, showed no peat was present at either of these locations.

4.1.9 The results suggest that small accumulations of remnant peat are present in shallow hollows in the topography. The peat deposits at site 14 represent the thickest accumulation recorded in the study area (0.65m). At site 10, shallower deposits of 0.46m, appear to extend and thin out, at approximately 10m either side of the main core along a north-east/south-west transect.

4.2 Impact Survey

4.2.1 While conducting the survey it soon became apparent that of the 11 sites highlighted for the survey only three were at direct risk (Figs 2 and 3). The remaining eight, comprising; several bridges, drains and a relatively modern stack of cut peat, lie far enough away from the spoil heap sites that they are highly unlikely to be disturbed at all, therefore these sites will not be discussed further.

4.2.2 The three sites most likely to be impacted upon are described in the gazetteer as follows (OA North 2011) and shown on:

- NTSMR 181545; Trackway, Post-Medieval (for the purposes of this report designated as Site A, Figs 2 and 3). A sinuous trackway running downslope to the moss on the south-west side of Park End Farm. It is approximately 626m long and has been cut into the slope with a slight revetment wall on the west side. It is partially shown on the First Edition OS mapping;
- NTSMR 181546; Boundary Wall, Post-Medieval (for the purposes of this report designated as Site B, Figs 2 and 3). Fragmentary roughly linear wall foundations located in a field to the south-west of Park End Farm. It is orientated roughly north-west/south-east but curves to the north-west on the northern end where it reaches a boundary junction at some field gates. It is shown on the First Edition OS mapping;
- NTSMR 181351; Owlet Lane, Medieval to Post-Medieval (for the purposes of this report designated as Site C, Figs 2 and 3). Owlet lane, shown demarcating the northern edge of Brigsteer Park Wood on the First Edition OS 6" map of 1859. The site was originally a walled drove lane measuring approximately 329m long by 3.5m to 4m wide. The northern wall has been demolished and survives as a slight foundation bank.

4.2.3 All three sites, lie in relatively close proximity within a single field located to the south-west of Park End Farm, which in turn is within the northernmost end of the study area. The south-western corner of this field has been designated an area for spoil dumping and this will likely result in these sites or significant parts of them being affected.

5 DISCUSSION AND POTENTIAL

5.1 Auger Survey

5.1.1 The core survey revealed that over most of the site, blue/grey silts and clays and light brown stiff clays are overlain by topsoil. In three small areas, in the southern part of the study area, centered on cores 03, 10 and 14, remnant peats are found in probable topographic hollows. The history of the Lyth Valley suggests that the area was utilised for peat extraction in the past (Hodgkinson *et al* 2000).

5.2 Impact Survey

5.2.1 Sites A and B lie on the incline of the field (Plate 5), which slopes significantly to the west before it levels off approximately 10m below Site A. Any spoil dumped in this area should be restricted therefore to the lower part of the field in order to avoid covering part of the trackway.

5.2.2 Site C is situated furthest away from any proposed spoil heap but may be at risk from plant working and vehicular access within the area. 'Owlet Lane' (Site C) is currently the main access track through this field and a public right of way (Plate 6). While used at the moment by small vehicle and foot traffic, repeated use by heavier machinery while work in the area is undertaken may cause irreparable damage. For this reason, it may be necessary to arrange other points of access for plant equipment.

5.3 Palaeoenvironmental Potential

5.3.1 The very thin remnant peats found at the site are unlikely to be of significant palaeoenvironmental value. The archaeological and palaeoecological potential of the moss at this site is deemed to be low, given the poor peat survival. No further work is recommened.

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ILLUSTRATIONS

List of Figures

Figure 1: Site location plan

Figure 2: Location of boreholes on Earthworks proposal plan map

Figure 3: Location of boreholes on lidar image

List of Plates

Plate 1: Topography of site; location of Core 3 in shallow former drainage channel

Plate 2: Grey clay underlying topsoil in core 32

Plate 3: Using GPS to locate points 19-22

Plate 4: Core 3 (South), clayey peat beneath topsoil

Plate 5: Looking north along site A

Plate 6: Looking south along Owlet Lane (site C)

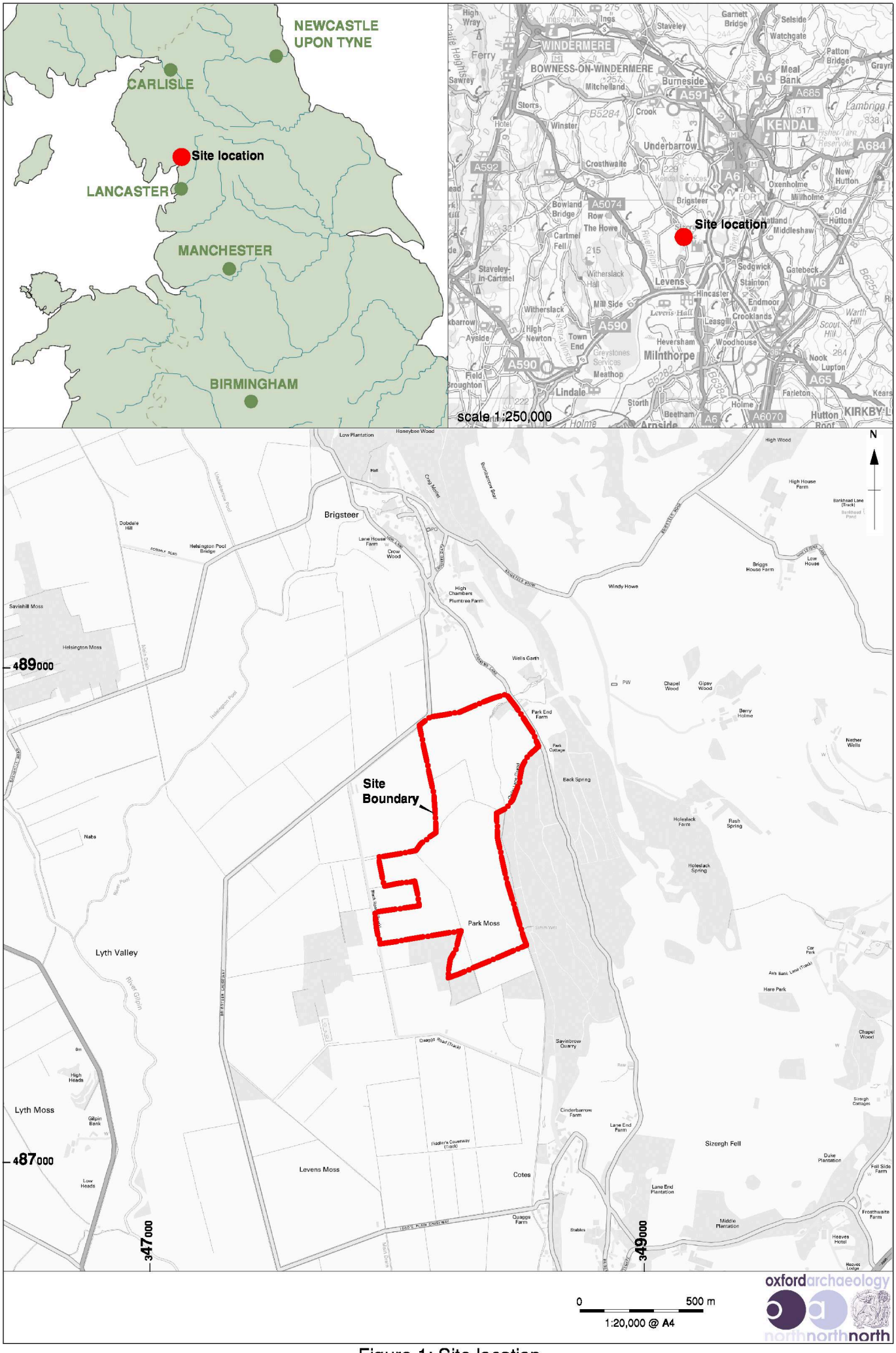

Figure 1: Site location

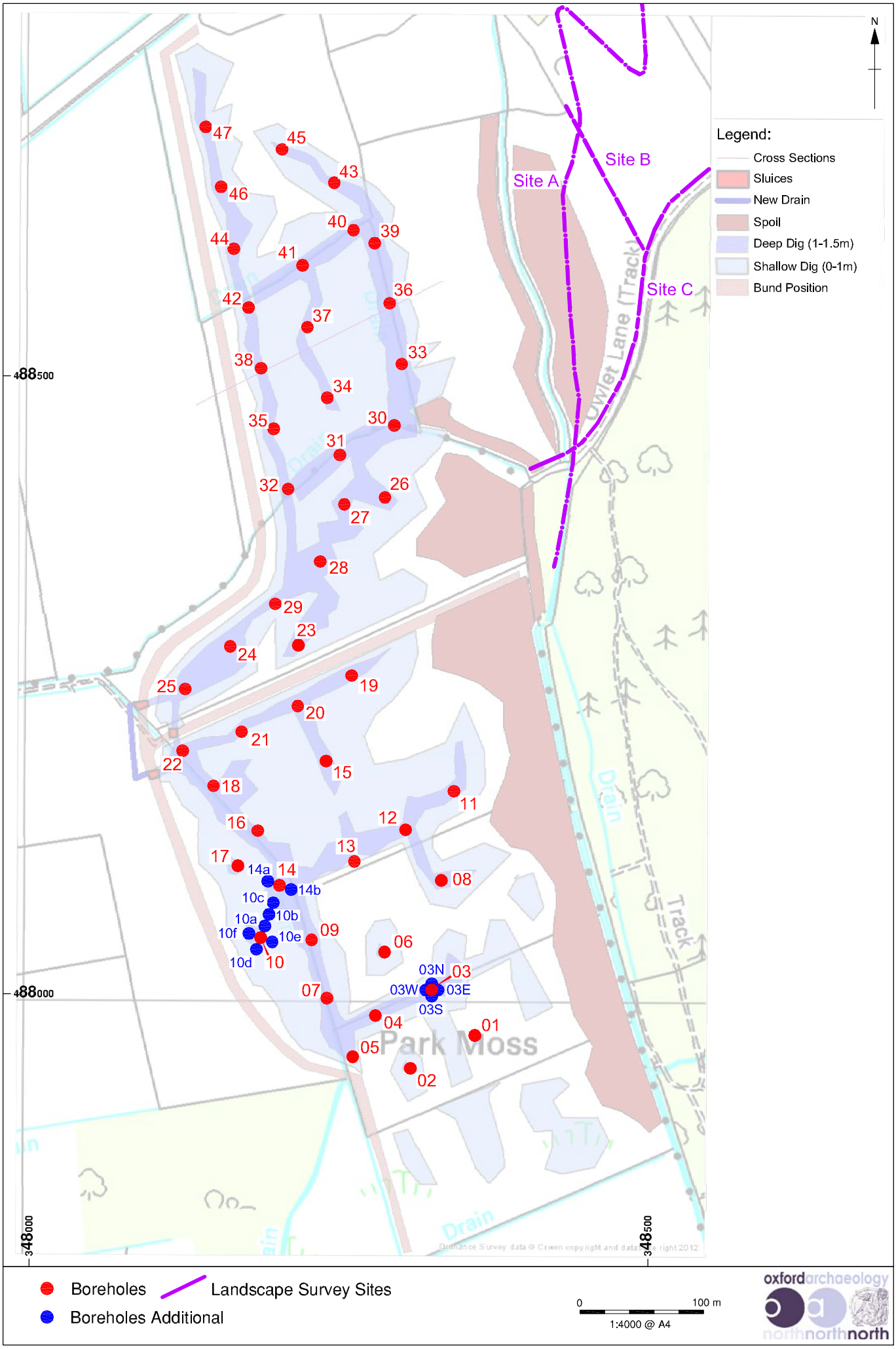

Figure 2: Borehole locations

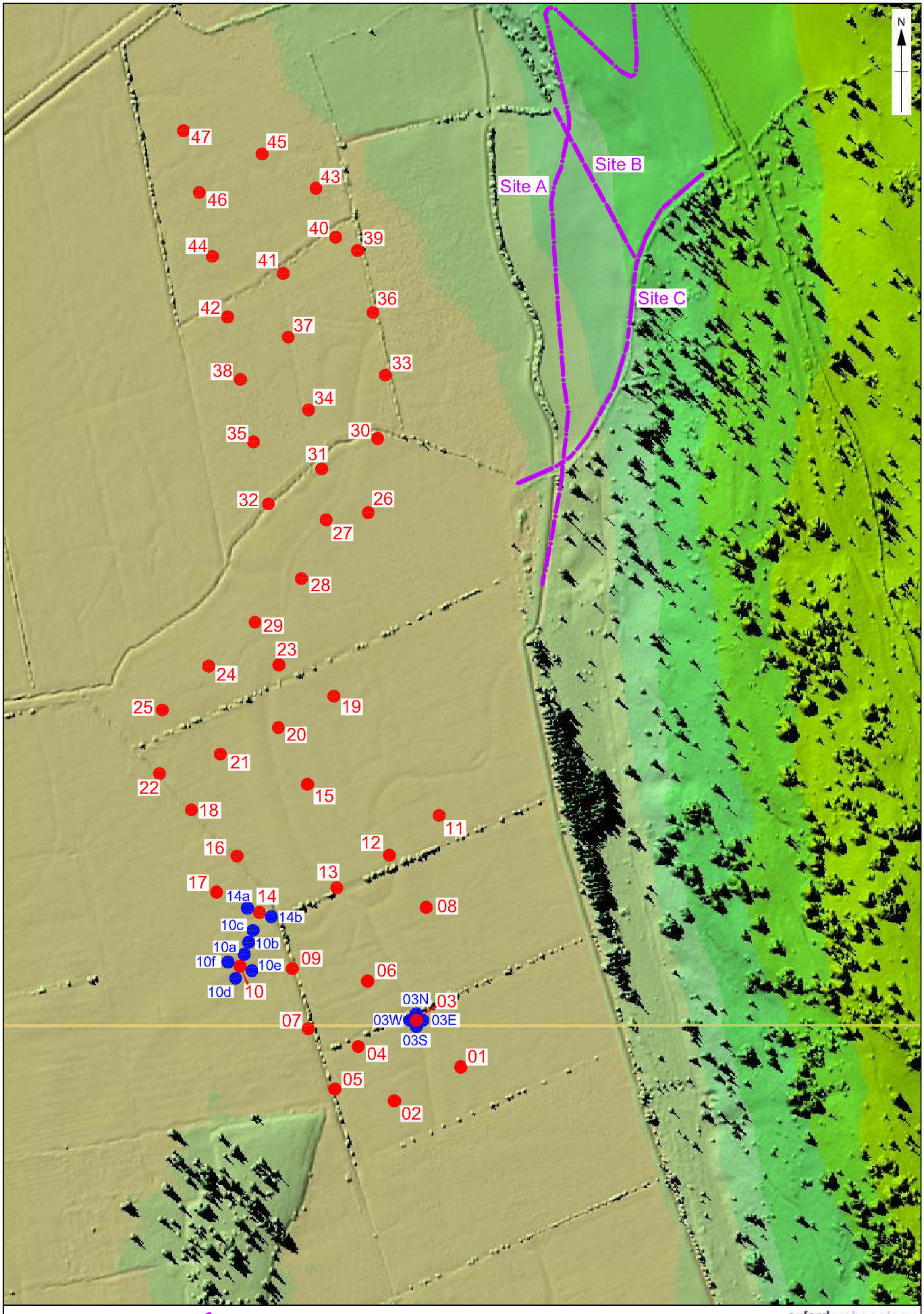

Figure 3: Borehole locations superimposed on Lidar Image

Plate 1: Location of Core 3 in relative shallow ?former drainage channel.

Plate 2: Grey clay deposit underlying shallow topsoil (Core 32).

Plate 3: Using GPS to locate points on transect 19-22

Plate 4: Core 3 (South) Clayey peat beneath topsoil (18cm) and overlying grey clay (33cm).

Plate 5: Looking north along site A

Plate 6: Looking south along Owlet Lane (site C)

APPENDIX 1: WRITTEN SCHEME OF INVESTIGATION

Park End Farm
Brigsteer
Cumbria

Auger Core Survey and Palaeoenvironmental Assessment

Written Scheme of Investigation

Oxford Archaeology North

November 2013

National Trust

OA North Tender No: t16251
NGR: SD 485 888 centred

1. INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 The National Trust (hereafter the 'client') has requested that Oxford Archaeology North (OA North) submit proposals for an auger core survey and palaeoenvironmental assessment. The site concerns land adjacent to Park End Farm, Brigsteer, in Cumbria, (centred NGR SD 485 888 centred), where a raised water level management plan has been proposed. Due to the site being within an area of wetland and of high archaeological potential, the impact of the proposed development on any peat deposits and archaeological remains is required prior to any construction works commencing on site. The potential of the site to provide an enhanced wetland habitat through the Government Stewardship (ES) Higher Level Scheme was assessed by RMA (2010).

1.1.2 ***Location, Geology and Topography*:** the site is situated in the Lyth Valley, Cumbria (centred NGR SD 485 888) and covers an area approximately 1 km by 0.5 km. OA North previously surveyed the archaeology of the Lyth Valley wetlands as part of the North West Wetlands Survey (Hodgkinson *et al* 2000). The most significant wetland archaeological site recorded from nearby is the corduroy trackway that ran from Foulshaw Moss (Munn Rankin 1910; Hodgkinson *et al* 2000) and the same track was also described at nearby Rawson's Moss by Barnes (1904).

1.1.3 Wimble *et al* (2000) carried out a detailed programme of pollen analysis and dating from two nearby peat deposits at Foulshaw Moss (NGR SD 460 825) and Heslington Moss (NGR SD 466 889). Another pollen study site is that at the Roundsea Wood National Nature reserve (Birks 1982).

1.1.4 The site is situated on Park Moss, which lies on the floodplain of the River Gilpin in an area of carboniferous limestone overlain by Pleistocene tills (Hodgkinson *et al* 2000). The soil in the study area is a uniform loamy soil over grey clay and to the north and south this overlies fen, wood and/or bog peats, over soft grey clay (RMA 2010). The site is situated in an area of complex Holocene (Post-Glacial) stratigraphy, which was influenced both by changing sea-levels and climate change (Hodgkinson *et al* 2000).

1.2 QUALITY ASSURANCE

1.2.1 Oxford Archaeology (OA) is a Registered Archaeological Organisation with the **Institute of Field Archaeologists (no 17)**. OA is not at present ISO certified but operates an internal QA system governed by standards and guidelines outlined by English Heritage and the Institute of Field Archaeologists.

1.2.2 ***Standards:*** it is OA's stated policy to adhere to current professional standards set by IFA, English Heritage, Association of Local Government Archaeological Officers, Museums Organisations. OA helps the profession to develop and establish standards by serving on national working parties (eg recently on archives), and conforms with current legislation and national and local policy standards for archaeology health and safety and other relevant matters.

1.2.3 OA has established technical manuals, procedures and policies which control its work covering field recording, finds retention and discard, finds storage and handling, environmental sampling and processing, archiving and post-excavation. These have been developed to conform with best professional practice.

1.2.4 ***Staff:*** OA ensures that its staff are fairly recruited, fairly employed, and properly qualified for their work whether by formal qualification or by established and verifiable experience. OA have established terms and conditions of employment and a system of staff representation to ensure regular consultation on employment matters.

1.2.5 OA ensures that staff remain committed and enhance their abilities using annual staff appraisals, supporting formal and informal training and educational courses.

1.2.6 ***Procurement of services and materials:*** OA procures subcontracted work on the basis of value for money, considering quality, track record and service, as well as cost. OA regularly reviews quality of subcontracted work and uses tendering procedures for major sub-contracts.

1.2.7 Procurement of materials is on the basis of quality and availability, as well as cost, especially in respect of long-term storage of archives (OA adheres to archive quality photographic materials and processes, archive quality boxes etc).

1.2.8 ***Working Practices:*** management procedures ensure that all work conducted within the Company and all end product reports to clients are monitored and evaluated whilst they are in progress, during compilation, and after completion.

1.2.9 ***Data Acquisition and Security:*** for fieldwork projects OA always removes records and finds from site every day, and ensures equipment is secured.

2. OBJECTIVES

2.1 To initially determine the presence/absence of peat deposits within the proposed areas of deeper excavation in the development area.

2.2 If peat deposits are recorded.

- To identify significant variations in the deposit sequence indicative of localised features, such as topographic highs or palaeochannels and possible marine influences;
- To determine, as far as possible, the date, function, survival and likely interpretation of any identified peat deposits;
- To provide information that will enable an assessment to be made of the potential significance of any identified peat deposits in local, regional and (if relevant) national contexts;
- To recover peat samples for later analysis of pollen and sediments and for radiocarbon dating. The location of each sample will be recorded**;**
- To assess the palaeoenvironmental potential of the peat.

2.3 To make available the results of the investigation.

3 METHOD STATEMENT

3.1 INTRODUCTION

3.1.1 The following work programme is submitted in line with the objectives summarised above.

3.2 AUGER SURVEY

3.2.1 The survey will comprise a series of cores in those areas where the excavation works will exceed one metre. The cores will be taken at regular sampling intervals in the areas highlighted as "deep dig" on the NT Park End (5) Site design 2500 as supplied by the client. The sampling intervals will be defined by the fieldwork team after they have assessed the site topography.

3.2.2 The total number of cores will include at least three short transects across the palaeochannel shown in Figure 4 (RMA, 2010).

3.2.3 Each location will be recorded in three dimensions either with a GPS or total station.

3.2.4 The equipment will comprise a standard hand operated Eijkelkamp soil auger. A selection of different auger heads will be employed in order to deal with the variety of sediment types that may be encountered (Bucket, Stoney soil, Gouge, and Screw auger).

3.2.5 Each location will be augered until the underlying bedrock/glacial tills/boulder clay have been proven, providing no obstructions are encountered.

3.2.6 Each profile will be recorded on a summary *pro forma* sheet and significant layers identified. Relative depths will be noted and a description of the deposits using standard quaternary (Late Devensian and Holocene) terminology (colour texture, compaction and inclusions) will be made. This will follow the English Heritage Geoarchaology and Environmental Archaeology Guidelines (Ayala *et al* 2007; IfA 2008; Campbell *et al* 2011).

3.2.7 In the first instance, the depth and extent of any peat deposits will be recorded and the data will be included in the site report. If peat deposits are recorded the data from the coring survey could be entered into specialist computer software (Rockworks 14 and Logplot) and the relevant diagrams would be produced. These diagrams would be used by the OA North's environmental archaeologists to interpret the lithology of the study area.

3.2.8 ***Sub-surface Deposit Model:*** a GIS (QGIS or ArcGIS) project could be established, incorporating all available base-mapping data and the proposed borehole locations. Should the client possess any Ascii LiDAR data for the proposed development, or be intending to purchase this, it would be useful to have access to it. Alternatively, if required, OA North could purchase this from the Environment Agency and pass the cost on. If LiDAR data is acquired, it could be built into the GIS project and used to construct a DTM surface model in order to provide a wider topographical context for the borehole transects.

3.2.9 The lithostratigraphic information collected during the auger survey would be input, as depths below ground level, into specialist computer applications (Rockworks 14 and Logplot). This would enable the correlation of the major

lithostratigraphic units between data points, using an appropriate interpolation (*ie* Inverse distance). It would then be possible to use the model to generate cross-sections or thickness plots along the transects. Should the data be of sufficient quality to sustain this, the spatial distribution of deposits and buried topography across the study area could be modelled as two-dimensional or three-dimensional views, exportable to GIS.shp file. The interpreted dataset would be used to reconstruct the extent of the peat deposits.

3.2.10 It may be necessary for OA North's environmental manager to attend site to discuss the sampling strategy, depending on the deposits, and request advice from English Heritage's Regional Science Advisor.

3.3 ***Retrieval of Cores for Palaeoenvironmental aseessment, analysis and Scientific dating*;** following the auger survey, if peat deposits are identified, these could be sampled for palaeoenvironmental assessment, analysis and scientific dating. Cores could be retrieved, if commissioned, at one or more selected locations to retrieve peat for AMS dating, ecofactual evidence environmental assessment and analysis of pollen and other biological indicators. Duplicate cores would be taken at the locations using a hand-held Russian-type peat corer. If the deposits prevent hand-coring it might be necessary to use a terrier rig. This will require a variation in the price and will follow consultation with the client.

3.4 ***Environmental assessment*:** an assessment of the environmental potential of the site will be undertaken through the examination of suitable deposits by the in-house environmental archaeologists, who will examine the potential for further analysis. This will be undertaken, if commissioned, in accordance with English Heritage Guidelines (Campbell *et al* 2011).

3.4.1 The cores may be assessed for pollen, fungal spores and plant macrofossils. In addition, the samples may be assessed for diatoms. The data would be presented in a written report and recommendations made for future analysis.

3.4.2 Material would be selected for AMS dating. The position of the dates will be selected to provide range finder dates for the top and bottom of the profiles, a total of two dates for each core. If no suitable plant macrofossils were identified in the peat, it might be necessary to date the humin and humic acid fractions at each level and would result in a minimum of four dates at each coring location. The material will be submitted to Dr Gordon Cook at Scottish Universities Environmental Research Centre (SUERC) for dating.

3.4.3 The cores would be stored then in the offices of Oxford Archaeology North in Lancaster for future analysis.

3.4.4 The project will be carried out by a suitably qualified OA North environmental archaeologist, under the overall direction of **an OA North project manager.**

3.4.5 The site archive will include both a photographic record and maps showing the locations of the cores.

3.4.6 ***Contingency plan:*** a contingency costing may also be employed for unseen delays caused by prolonged periods of bad weather, vandalism, and/or the discovery of unforeseen complex deposits which require specialist advice. This

has been included in the Costings document and would be charged in agreement with the client.

3.4.7 ***Access:*** liaison for basic site access will be undertaken through the client and it is understood that there will be access for both pedestrian and plant traffic to the site.

3.5 **REPORT AND ARCHIVE**

3.5.1 ***Report:*** four bound copies of a written synthetic report will be submitted to the client. The report will include:

- a site location plan related to the national grid;
- a front cover to include the NGR;
- the dates on which the fieldwork was undertaken;
- a concise, non-technical summary of the results;
- an explanation to any agreed variations to the brief, including any justification for any analyses not undertaken;
- a description of the methodology employed, work undertaken and results obtained;
- an historical and archaeological background;
- plans at an appropriate scale showing the location and position of cores;
- a description of any environmental or other specialist work undertaken and the results obtained;
- a copy of this WSI and indications of any agreed departure from the details;
- the report will also include a complete bibliography of sources from which data has been derived.

3.5.2 ***Confidentiality:*** all internal reports to the client are designed as documents for the specific use of the client, for the particular purpose as defined in the project brief and project design, and should be treated as such. They are not suitable for publication as academic documents or otherwise without amendment or revision.

3.5.3 ***Archive:*** the results of all archaeological work carried out will form the basis for a full archive to professional standards, in accordance with current English Heritage guidelines (*Management of Archaeological Projects*, 2nd edition, 1991). The project archive will include summary processing and analysis of all features, finds, or palaeoenvironmental data recovered during fieldwork, which will be catalogued by context.

3.5.4 The deposition of a properly ordered and indexed project archive in an appropriate repository is essential and archive will be provided in the English Heritage Centre for Archaeology format and a synthesis will be submitted to the Cumbrian SMR (the index to the archive and a copy of the report). OA North practice is to deposit the original record archive of projects with the appropriate Record Office.

4. HEALTH AND SAFETY

4.1 OA North provides a Health and Safety Statement for all projects and maintains a Unit Safety policy. All site procedures are in accordance with the guidance set out in the Health and Safety Manual compiled by the Standing Conference of Archaeological Unit Managers (1997). A written risk assessment will be undertaken in advance of project commencement and copies will be made available on request to all interested parties.

4.2 Full regard will, of course, be given to all constraints (services etc) during the evaluation, as well as to all Health and Safety considerations. As a matter of course, the Unit uses a U-Scan device prior to any excavation to test for services, however, this is **only an approximate location tool**. Any drawings or knowledge of live cables or services that may pose a risk to OA North staff during evaluation **must be made known to the project manager** of OA North before site work. This will ensure the risk is dealt with appropriately.

4.3 A portable toilet with hand washing facilities will be provided and located on or adjacent to the site.

4.4 Any known contamination issues or any specific health and safety requirements on site should be made known to OA North by the client or main contractor on site to ensure all procedures can be met.

4.5 Should areas of previously unknown contamination be encountered on site the works will be halted and a revision of the risk assessment carried out. Should it be necessary to supply additional PPE or other contamination avoidance equipment this will be costed as a variation.

5 OTHER MATTERS

5.1 PROJECT MONITORING

5.1.1 Whilst the work is undertaken for the client.

5.2 WORK TIMETABLE

5.2.1 ***Auger Survey:*** approximately five days will be required to undertake the fieldwork for this element.

5.2.2 ***Retrieval of cores:*** approximately two days will be required to undertake the fieldwork for this element, if commissioned.

5.2.3 ***Report:*** the report and archive will be produced following the completion of all the fieldwork and environmental assessment. It is hoped that the final report will be available four weeks after OA North receives the results of the scientific dating, and the archive deposited within six months.

5.2.4 ***Scheduling:*** OA North would require a formal written agreement and would commence the work as soon as possible thereafter dependant on existing scheduling constraints.

5.3 INSURANCE

5.3.1 OA North has a professional indemnity cover to a value of £2,000,000; proof of which can be supplied as required.

6. STAFFING

6.1 The project will be under the direct management of **an OA North project manager** but for the purposes of this tender all correspondence should be addressed to Elizabeth Huckerby.

6.2 The fieldwork will be undertaken by an OA North environmental archaeologist experienced in this type of project. Due to scheduling requirements it is not possible to provide these details at the present time. All OA North environmental archaeologists are experienced in auger surveys

6.3 **Elizabeth Huckerby BA MSc** (OA North environmental manager) will be responsible for managing the environmental and dating programme. Elizabeth has extensive knowledge of the palaeoecology of the North West through her work on the English Heritage-funded North West Wetlands Survey.

6.4 ***Elizabeth Stafford (Head of Geoarchaeological Services, OA):*** Elizabeth would oversee the geoarchaeological element of the project and integrate this into the deposit model. She currently manages Geoarchaeological Services (GS) for OA, which is a specialist unit, created in 2000, specifically to provide advice and assistance on projects with a strong geoarchaeological emphasis. GS comprises a team of specialists whose activities include borehole, test pitting and geophysical surveys, remote sensing and LiDAR interpretation, sediment analysis, deposit modelling with 3-D visualization and GIS analysis. Elizabeth has been heavily involved in projects undertaken in advance of construction of High Speed 1 (formerly the Channel Tunnel Rail Link) in Greater London and Kent. These include geoarchaeological investigations of the Holocene alluvium on the Thames marshes, Pleistocene deposits at Purfleet, and large-scale survey and excavation of multiperiod sites in the Ebbsfleet Valley. Elizabeth's current major projects include investigation of Pleistocene and Holocene sequences associated with Crossrail and Thameslink through Greater London and the M25 Widening Scheme in South Essex. She is also co-ordinating the joint Oxford Archaeology/Durham University, English Heritage-funded, monograph for the ALS Dissemination Project: *Lost Landscapes of the Palaeolithic* (EH Project Number 5458).

6.5 ***Mairead Rutherford (Project Officer, OA North):*** Mairead will be an integral part of the fieldwork coring team and, with her geographical training will play an important role in interpreting the deposits in the field. She is an extremely experienced palynologist and fungal spore specialist. Prior to joining the staff at OA North, Mairead was attached to the University of Durham's Geography Department and has maintained close links there with Dr Jim Innes, who has worked extensively in Merseyside and SW Lancashire. She was a member of the Aggregate Levy team for the Swale Ure Washlands, Yorkshire.

6.6 ***Denise Druce (Project Officer, OA North):*** Denise would form part of the coring team. She was responsible for the coring programme for the Alt Valley Flood Alleviation Scheme, for the Upland Peat Survey and more recently at Sizergh Castle, so will play an important role in the field. Denise is familiar with the palaeoecology of North West England and is currently working on

the post-excavation of Carlisle Northern Development Route prehistoric site. Denise is also familiar with prehistoric sites along the Severn Estuary and sites in Wales.

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APPENDIX 2: CORING LOGS

Borehole No. 1				
Easting 348360.25			**GL ELEV (mOD) 4.65**	
Northing 487967.02			**Total depth (m) 3.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.16	Topsoil		Loose with modern roots
0.16	1.00	Clay	Abrupt	Blue/Grey, medium stiff
1.00	3.00	Clay	Gradual	Grey silty clay and water, sticky

Borehole No. 2				
Easting 348308.16			**GL ELEV (mOD) 4.47**	
Northing 487940.48			**Total depth (m) 1.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.07	Topsoil		Loose with modern roots
0.07	1.37	Clay	Abrupt	Stiff brown/grey clay,
1.37	1.50	Clay	Gradual	Sticky, grey

Borehole No. 3				
Easting 348325.42			**GL ELEV (mOD)**	
Northing 488003.73			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.08	Topsoil		Loose with modern roots
0.08	0.36	Peat	Gradual	Medium dark brown, humified, crumbly
0.36	0.50	Clay	Abrupt	Stiff, sticky blue/grey clay, orange streaks
0.50	1.00	Clay	Gradual	Blue/grey clay and water

Borehole No. 3 (South)				
Easting 348325.45			**GL ELEV (mOD)**	
Northing 487998.77			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.18	Topsoil		Loose with modern roots
0.18	0.33	Clayey peat	Gradual	Fine grained; crumbly, medium brown
0.33	0.50	Clay	Abrupt	Stiff brown/grey clay

Borehole No. 3 (North)				
Easting 348325.45			**GL ELEV (mOD)**	
Northing 488008.77			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose with modern roots
0.20	0.50	Clay	Abrupt	Blue/Grey, medium stiff

Borehole No. 3 (West)				
Easting 348320.46			**GL ELEV (mOD)**	
Northing 488003.70			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose with modern roots
0.15	0.50	Clay	Abrupt	Blue/Grey, very stiff

Borehole No. 3 (East)				
Easting 348330.46			**GL ELEV (mOD)**	
Northing 488003.70			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose with modern roots
0.15	0.50	Clay	Abrupt	Blue/Grey, medium stiff

Borehole No. 4				
Easting 348279.88			**GL ELEV (mOD) 4.37**	
Northing 487983.09			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose with modern roots
0.20	1.00	Clay	Abrupt	Very stiff, sticky light brown clay

Borehole No. 5				
Easting 348261.53			**GL ELEV (mOD) 4.05**	
Northing 487949.91			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Loose, dark brown, organic
0.25	0.50	Clay	Abrupt	Stiff light brown clay

Borehole No. 6				
Easting 348287.28			**GL ELEV (mOD) 4.47**	
Northing 488034.44			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose with modern roots
0.10	0.50	Clay	Abrupt	Stiff light brown

Borehole No. 7				
Easting 348240.71			**GL ELEV (mOD) 4.33**	
Northing 487996.19			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.40	Topsoil		Muddy
0.40	1.00	Clay	Abrupt	Stiff grey grading to blue sticky

Borehole No. 8				
Easting 348333.13			**GL ELEV (mOD)**	
Northing 488092.28			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, brown
0.20	0.50	Clay	Abrupt	Extremely stiff light brown

Borehole No. 9				
Easting 348228.36			**GL ELEV (mOD)**	
Northing 488044.2			**Total depth (m) 0.30**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Muddy
0.20	0.30	Clay	Abrupt	Very stiff light brown clay

Borehole No. 10				
Easting 348187.24			**GL ELEV (mOD) 4.39**	
Northing 488046.08			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose with modern roots
0.10	0.14	Peaty topsoil		Consolidated but with modern rootlets
0.14	0.60	Peat		Dark brown, humified, woody, crumbly
0.60	1.00	Clay		Grey/blue, silty clay

Borehole No. 10a				
Easting 348190.60			**GL ELEV (mOD)**	
Northing 488055.40			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Peaty with modern roots
0.10	0.28	Peat		Humified
0.28	1.00	Silt/Clay	Abrupt	Soft, grey blue, sticky

Borehole No. 10b				
Easting 348194.00			**GL ELEV (mOD)**	
Northing 488064.81			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.50	Clay	Abrupt	Stiff, light brown, sticky

Borehole No. 10c				
Easting 348197.40			**GL ELEV (mOD)**	
Northing 488074.21			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Muddy
0.10	0.50	Clay	Abrupt	Stiff, light brown, sticky

Borehole No. 10d				
Easting 348183.80			**GL ELEV (mOD)**	
Northing 488036.59			**Total depth (m) 0.47**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Peaty
0.10	0.26	Peat	Gradual	Humified
0.26	0.47	Silt/Clay	Abrupt	Soft, blue

Borehole No. 10e				
Easting 348196.61			**GL ELEV (mOD)**	
Northing 488042.60			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Muddy
0.25	0.50	Silt/Clay	Abrupt	Soft, blue

Borehole No. 10f				
Easting 348177.80			**GL ELEV (mOD)**	
Northing 488049.40			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.10	0.50	Silt/Clay	Abrupt	Soft blue, light brown

Borehole No. 11				
Easting 348343.35			**GL ELEV (mOD)**	
Northing 488164.33			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.50	Clay	Abrupt	Stiff light brown

Borehole No. 12				
Easting 348304.29			**GL ELEV (mOD) 4.53**	
Northing 488133.12			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.50	Clay	Abrupt	Stiff light brown

Borehole No. 13				
Easting 348262.94			**GL ELEV (mOD)**	
Northing 488107.53			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.17	Topsoil		Loose, muddy
0.17	0.19	Clay	Abrupt	Sliver light brown stiff
0.19	0.24	Organics	Abrupt	Dark brown ?soil
0.24	0.25	Clay	Abrupt	Stiff light brown clay
0.25	0.50	Organics	Abrupt	Stiff, dark brown, clayey, modern rootlets
0.50	1.00	Clay/Silt	Abrupt	Soft, grey blue

Borehole No. 14				
Easting 348202.48			**GL ELEV (mOD) 4.51**	
Northing 488088.25			**Total depth (m) 1.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose with modern roots
0.10	0.50	Clay	Abrupt	Consolidated, peaty
0.50	0.61	Peat	Gradual	Humified
0.61	0.62	Clay	Abrupt	Light brown
0.62	1.15	Peat	Abrupt	Humified, dry, mossy in places, fine-grained
1.15	1.50	Clay/Silt	Abrupt	Blue grey

Borehole No. 14a				
Easting 348193.07			**GL ELEV (mOD)**	
Northing 488091.64			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Muddy
0.15	0.50	Clay	Abrupt	Stiff light brown clay

Borehole No. 14b				
Easting 348211.88			**GL ELEV (mOD)**	
Northing 488084.84			**Total depth (m) 0.30**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Disturbed
0.10	0.30	Clay	Abrupt	Very stiff light brown clay

Borehole No. 14c				
Easting			**GL ELEV (mOD)**	
Northing			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			**(From stream bottom in ditch)**
0	0.50	Silt/Clay		Soft, blue grey

Borehole No. 15				
Easting 348240.11			**GL ELEV (mOD) 4.53**	
Northing 488188.63			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose, muddy
0.10	0.50	Clay	Abrupt	Stiff light brown clay, iron staining

Borehole No. 16				
Easting 348181.17			**GL ELEV (mOD) 4.18**	
Northing 488130.24			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy
0.15	0.50	Clay	Abrupt	Stiff light brown clay

Borehole No. 17				
Easting 348168.87			**GL ELEV (mOD) 4.50**	
Northing 488104.09			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.50	Clay	Abrupt	Stiff light brown

Borehole No. 18				
Easting 348149.13			**GL ELEV (mOD)**	
Northing 488168.63			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.50	Clay	Abrupt	Stiff light brown

Borehole No. 19				
Easting 348260.81			**GL ELEV (mOD)**	
Northing 488257.69			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy
0.15	0.50	Clay	Abrupt	Stiff ,light brown, orange mottling

Borehole No. 20				
Easting 348217.27			**GL ELEV (mOD)**	
Northing 488233.1			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy
0.15	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 21				
Easting 348171.81			**GL ELEV (mOD)**	
Northing 488212.31			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Muddy, wet
0.10	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 22				
Easting 348124.21			**GL ELEV (mOD)**	
Northing 488196.98			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.13	Topsoil		Loose, muddy with modern roots
0.13	0.23	Clay	Abrupt	Stiff ,light brown, orange mottling
0.23	0.30	Soil	Abrupt	Loose, disturbed, brought down by gouge?
0.30	0.50	Clay	Abrupt	Stiff, dark brown, peaty, compacted
0.50	0.60	Soil	Abrupt	Disturbed, dark brown
0.60	1.00	Clay	Abrupt	Stiff, light brown clay / blue grey silty

Borehole No. 23				
Easting 348217.7			**GL ELEV (mOD) 4.53**	
Northing 488282.19			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Muddy, wetter from 0.10m – 0.25m
0.25	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 24				
Easting 348162.67			**GL ELEV (mOD)**	
Northing 488281.25			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy, wet, modern roots
0.20	0.50	Clay	Abrupt	Stiff light brown, orange mottling, sticky

Borehole No. 25				
Easting 348126.3			**GL ELEV (mOD)**	
Northing 488246.94			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy, wet, modern roots
0.20	0.50	Clay	Abrupt	Stiff, light brown, orange mottling, sticky

Borehole No. 26				
Easting 348287.71			**GL ELEV (mOD)**	
Northing 488401.56			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.12	Topsoil		Loose, muddy, wet, modern roots
0.12	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 27				
Easting 348254.8			**GL ELEV (mOD)**	
Northing 488395.97			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy, wet, modern roots
0.15	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 28				
Easting 348235.39			**GL ELEV (mOD)**	
Northing 488349.89			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy, wet, modern roots
0.15	0.50	Clay	Abrupt	Stiff ,light brown, orange mottling

Borehole No. 29				
Easting 348199.03			**GL ELEV (mOD)**	
Northing 488315.57			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy, wet, modern roots
0.15	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 30				
Easting 348295.22			**GL ELEV (mOD)**	
Northing 488459.7			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy, modern roots
0.15	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 31				
Easting 348251.29			**GL ELEV (mOD)**	
Northing 488435.82			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose, muddy
0.15	0.25	Topsoil/Clay	Abrupt	Disturbed mixed horizon
0.25	0.50	Clay	Abrupt	Stiff, light brown, orange mottling

Borehole No. 32				
Easting 348209.48			**GL ELEV (mOD)**	
Northing 488408.4			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.09	Topsoil		Lose, muddy
0.09	0.50	Clay	Abrupt	Stiff light brown, orange mottling

Borehole No. 33				
Easting 348301.2			**GL ELEV (mOD)**	
Northing 488509.34			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose
0.15	0.30	Topsoil	Abrupt	Consolidated
0.30	0.50	Clay	Abrupt	Stiff, brown/grey clay

Borehole No. 34				
Easting 348241.02			**GL ELEV (mOD)**	
Northing 488482.03			**Total depth (m) 0.30**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Muddy
0.15	0.30	Clay	Abrupt	Stiff , brown/grey clay

Borehole No. 35				
Easting 348197.73			**GL ELEV (mOD)**	
Northing 488457			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose, muddy, modern roots
0.10	1.00	Clay	Abrupt	Stiff, brown/grey, orange mottling

Borehole No. 36				
Easting 348291.48			**GL ELEV (mOD)**	
Northing 488558.38			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Loose, muddy
0.20	0.30	Topsoil		Consolidated, modern roots
0.30	0.50	Clay	Abrupt	Stiff, brown/grey

Borehole No. 37				
Easting 348225.03			**GL ELEV (mOD)**	
Northing 488539.14			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Muddy
0.15	0.50	Clay	Abrupt	Stiff, brown/grey

Borehole No. 38				
Easting 348187.61			**GL ELEV (mOD)**	
Northing 488505.97			**Total depth (m) 0.30**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.20	Topsoil		Muddy, peaty
0.20	0.30	Clay	Abrupt	Soft, blue/grey, sticky

Borehole No. 39				
Easting 348279.38			**GL ELEV (mOD)**	
Northing 488606.9			**Total depth (m) 1.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.30	Topsoil		Loose with modern roots
0.30	0.50	Organics	Gradual	Consolidated, stiff, ?soil
0.50	1.00	Clay	Abrupt	Soft, grey/blue
1.00	1.50	Clay	Gradual	Blue, water

Borehole No. 40				
Easting 348262.24			**GL ELEV (mOD)**	
Northing 488617.41			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Muddy with organics
0.25	0.50	Clay	Abrupt	Stiff, brown/blue with orange mottling

Borehole No. 41				
Easting 348221.1			**GL ELEV (mOD)**	
Northing 488588.99			**Total depth (m) 1.00**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Muddy
0.10	1.00	Clay	Abrupt	Stiff, brown/grey to softer grey/blue

Borehole No. 42				
Easting 348177.5			**GL ELEV (mOD)**	
Northing 488554.94			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
	To			
0	0.20	Topsoil		Muddy, modern roots
0.20	0.50	Clay	Abrupt	Stiff grey, orange mottling

Borehole No. 43				
Easting 348246.73			**GL ELEV (mOD)**	
Northing 488655.76			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Muddy
0.25	0.50	Clay	Abrupt	Stiff grey, orange mottling

Borehole No. 44				
Easting 348165.58			**GL ELEV (mOD)**	
Northing 488602.44			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.10	Topsoil		Loose
0.10	0.50	Clay	Abrupt	Very stiff, sticky, brown/blue, orange mottling

Borehole No. 45				
Easting 348204.6			**GL ELEV (mOD)**	
Northing 488682.69			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose
0.15	0.50	Clay	Abrupt	Very stiff, sticky, brown/blue, orange mottling

Borehole No. 46				
Easting 348155.34			**GL ELEV (mOD)**	
Northing 488652.44			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.15	Topsoil		Loose
0.15	0.25	Organics		Consolidated peaty topsoil and modern roots
0.25	0.50	Clay	Abrupt	Very stiff, sticky, brown/blue, orange mottling

Borehole No. 47				
Easting 348142.96			**GL ELEV (mOD)**	
Northing 488700.88			**Total depth (m) 0.50**	
Depth (m)		**Sediment type**	**Upper contact**	**Description**
From	**To**			
0	0.25	Topsoil		Disturbed
0.25	0.50	Clay	Abrupt	Stiff, brown/blue, orange mottling

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