

Peat Restoration Historic Environment Survey and Palaeoenvironmental Assessment:

Fleet Moss

Final Report

Prepared for:	Tessa Levens Yorkshire Peat Partnership c/o Yorkshire Wildlife Trust 1 St George's Place York North Yorkshire YO24 1GN
Prepared by:	Jim Brightman BA (Hons), MLitt, MfA Solstice Heritage Crabtree Hall Business Centre Little Holtby Northallerton North Yorkshire DL7 9LN
Project Ref:	SOL1314-27
Report Ref:	DOC1314-15
Dates of Fieldwork:	February - March 2014
Date of Report:	March 2014



©Solstice Heritage 2014

CONTENTS

List of Figures.....	1
List of Tables.....	1
Acknowledgements.....	2
Executive Summary.....	3
1. Introduction.....	4
1.1 Project Outline.....	4
1.2 Aims and Objectives	4
1.3 Chronology.....	4
1.4 Assumptions and Limitations.....	5
1.5 Copyright	5
2. Methodology and Sources	6
2.1 Pre-Fieldwork.....	6
2.2 GPS Survey	6
2.3 Palaeoenvironmental Assessment.....	6
2.4 Assessment of Vulnerability	7
2.5 Health and Safety	7
2.6 Specialist Assessment and Analysis	7
2.7 Reporting	7
2.8 Data Transfer	8
2.9 OASIS	8
3. Landscape Character	9
3.1 Site Location	9
3.2 Geology.....	9
3.3 Land-Use.....	9
3.4 Survey Conditions	9
4. Results – Historic Environment Survey	10
4.1 Chronological Note	10
4.2 Prehistoric.....	10
4.3 Medieval to Post-medieval	10
4.4 Post-Medieval	11
4.5 Post-Medieval to Modern.....	11
5. Results – Palaeoenvironmental Assessment	12
5.1 Peat Form and Existing Chronology	12
5.2 Peat Sections	12
5.2.1 Section A.....	12
5.2.2 Section B.....	13
5.3 Wood Sample Identification	13
5.3.1 Methodology	13
5.3.2 Results	13
5.3.3 Discussion	14
5.4 Radiocarbon Dating	14
6. Conclusions.....	15
6.1 Constraint Areas	15
6.1.1 Access Tracks.....	Error! Bookmark not defined.
6.1.2 Red Constraint Areas	15
6.1.3 Amber.....	15
6.1.4 Green.....	15
6.2 Palaeoenvironmental Recommendations	15
7. Sources	17
7.1 Bibliography.....	17



7.2 Websites	17
Appendix 1 – Additional Figures	18
Appendix 2 – Gazetteer of Sites	22
Appendix 3 – Photographic Register	33



LIST OF FIGURES

Fig. 1 The Devil's Apronful scheduled cairn in its landscape context	Error! Bookmark not defined.
Fig. 2 Probable round cairn below Cloven Crag evident partly through differential vegetation cover.	Error! Bookmark not defined.
Fig. 3 Hollow way north of Simon's Seat	Error! Bookmark not defined.
Fig. 4 Large cairn at the east edge of the Hazlewood Moor survey area.	Error! Bookmark not defined.
Fig. 5 Spread stone of a cairn on the southern flanks of Brown Hill in an area of peat erosion. .	Error! Bookmark not defined.
Fig. 6 Stone bank/wall of possible prehistoric date on the east side of Pike Stones Hill.....	Error! Bookmark not defined.
Fig. 7 The possible settlement at White Stones Green.....	Error! Bookmark not defined.
Fig. 8 Part of the rectilinear structure at White Stones Green.	Error! Bookmark not defined.
Fig. 9 Earth and stone boundary feature in the south of the Hazlewood Moor survey area.	Error! Bookmark not defined.
Fig. 10 Part of the Maidenkirck Quarry complex.....	Error! Bookmark not defined.
Fig. 11 Tips of quarrying/dressing waste on the north side of Pickles Gill.	Error! Bookmark not defined.
Fig. 12 Wall footings of a rectilinear stone building associated with the hollow ways at Incan Slade.	Error! Bookmark not defined.
Fig. 13 Typical area of blanket exposure and erosion near Simon's Seat.	Error! Bookmark not defined.
Fig. 14 Hagged peat near Simon's Seat and close to Section A	Error! Bookmark not defined.
Fig. 15 Extensive and active erosion of a deep peat sequence on the edge of a gully at Agill Heads.	Error! Bookmark not defined.
Fig. 16 Preserved organic material visible within a heavily dried and eroding carpet of peat.	Error! Bookmark not defined.
Fig. 17 One of the more developed areas of peat cover in the south of Hazlewood Moor ..	Error! Bookmark not defined.
Fig. 18 Typical sequence of deposits for much of Hazlewood Moor.	Error! Bookmark not defined.
Fig. 19 Section A.....	Error! Bookmark not defined.
Fig. 20 Section B.....	Error! Bookmark not defined.
Fig. 21 Section C.....	Error! Bookmark not defined.
Fig. 22 Section D.	Error! Bookmark not defined.
Fig. 23 Mapped results of historic environment survey	19
Fig. 24 Barden Fell peat sections.	20
Fig. 25 Hazlewood Moor peat sections.....	Error! Bookmark not defined.
Fig. 26 Constraint areas within the study area	21

LIST OF TABLES

Table 1 Barden Fell and Hazlewood Moor Photograph Register.....	33
---	----



ACKNOWLEDGEMENTS

Solstice Heritage would like to thank Tessa Levens of the Yorkshire Peat Partnership for commissioning the survey, and for their support throughout. Thanks are also extended to Miles Johnson and Robert White, Countryside Archaeological Advisor at the Yorkshire Dales National Park Authority who not only supplied the required information to commence the survey, but has also provided ongoing advice and support through the course of the project. Solstice would also like to thank Malcolm Sunter, the landowner at Fleet Moss, who has been supportive and accommodating of the survey.

EXECUTIVE SUMMARY

This report details the results of a historic environment survey and palaeoenvironmental assessment by Solstice Heritage and commissioned by the Yorkshire Peat Partnership (YPP) in advance of peat restoration work at Fleet Moss in the Yorkshire Dales National Park (YDNP). The work was requested, and a specification prepared by the Countryside Archaeological Advisor at the Yorkshire Dales National Park Authority (YDNPA) to ensure risk to the historic environment was assessed in advance of the commencement of works.

The survey area comprised 293 hectares of variably managed moorland at the watershed between the Wensleydale and Wharfedale drainage basins. Initial data was provided by the YDNPA detailing known heritage assets within the survey area and by the YPP detailing areas of peat erosion and exposure, and also gullies and grips to be targeted during restoration work. The survey comprised walkover and GPS survey of any historic environment and palaeoenvironmental features identified with information about the feature entered directly into an attached data table. Following processing to an agreed format this digital data has been supplied to the YPP and YDNPA, along with mapping of constraint areas abstracted from the survey data.

Very few extant archaeological features were identified, principally due to the extensive and deep peat coverage across most of the survey area. The majority of those features identified related to small-scale stone extraction, sheltering both for animal and herder and possible tracks, all likely to be of post-medieval or later date. Based upon the surveyed features, a 'traffic light' system of constraint areas has been produced. A 10m 'red' buffer has been applied around the majority of sites and avoidance of these areas is recommended. Where features recorded in the Historic Environment Record (HER) could not be identified, or where features are particularly robust, these have been ascribed an 'amber' constraint area where work is recommended to proceed with caution. All other areas are designated as 'green' where, although care is advised, there are no specific archaeological constraints.

The principal interest of the survey area relates to the potential of the deep and eroding peat deposits to have both a significant inherent palaeoenvironmental potential, and also evidential value relating to the potential to contain or seal archaeological finds and features. Previous work had identified remains of the Glen Garry tephra within the Fleet Moss peat, an important chronological marker dated to a volcanic eruption in the late 3rd century BC (Barber et al. 2008). As part of this work, three areas were recorded where eroding sections preserved securely stratified wood samples at or beneath the base of the peat. One of these ecofacts was sampled, identified tentatively as betula (birch) and submitted for radiocarbon dating. A date of 3501-3115 cal. BC (95.4% confidence) was returned, with the most likely spike in the calibration relating to 3381-3322 cal. BC (43.8% confidence), dating the onset of peat formation to the early to mid-Neolithic.

Caution should be exercised during the restoration work and, where possible, excavations should always aim to have a minimal impact on the peat in all parts of the survey area. It was noted during the survey that the peat cover could be broadly divided into two forms, though the distinction is variable and nuanced and recommendations should be considered in all areas based upon visual inspection of the specific areas to be restored at the time of works. The difference in form is principally based on the extensive presence of a stable turf cover in Type 2 areas, and the lack of turf cover and corresponding instability in Type 1 areas. Type 2 areas will be much more robust and suffer less impact from the tracking of plant. Type 1 areas will be, at best, much more susceptible to damage by the presence of plant, and, at worst, be inaccessible to work vehicles given the unstable and irregular nature of the heavily hagged and eroded peat. The proposed peat restoration will, by necessity, impact on the peat resource and, whilst impact should be minimised in line with the recommendations below it is considered that minor impact in the course of the works is justified against the long-term benefits of the preservation of such a significant palaeoenvironmental resource.

1. INTRODUCTION

1.1 PROJECT OUTLINE

This report documents the results of historic environment survey and palaeoenvironmental assessment in advance of peat restoration works at Fleet Moss in the Yorkshire Dales National Park (YDNP), to be carried out under the management of the Yorkshire Peat Partnership (YPP) (see Appendix 1 Fig. 23). The peat restoration will take the form of blocking of 20th century grips using cut peat plugs and re-grading and re-vegetation of areas of bare and hagged peat.

The survey work was undertaken by Jim Brightman 14th October and 15th November 2013.

1.2 AIMS AND OBJECTIVES

The overarching aim of the project is:

- To provide a pre-intervention record of archaeological and palaeoenvironmental remains in order to inform the moorland restoration process.

Feeding into the successful delivery of the project aim are these specific objectives:

- To identify, locate, and provide a detailed record of the historic environment, and to assess the significance of historic features within the survey area
- To assess the palaeoenvironmental potential of the blanket peat within the survey area
- To indicate those archaeological and palaeoenvironmental remains which are vulnerable to damage through machine access, re-profiling or the cutting of peat plugs
- To provide an accurate, useable summary of this information in both report form (this document) and also in a digital form that can be integrated within the Yorkshire Dales Historic Environment Record (YDHER).

1.3 CHRONOLOGY

Where chronological and archaeological periods are referred to in the text, the relevant date ranges are broadly defined as follows:

- Palaeolithic (Old Stone Age): 1 million – 12,000 BP (Before present)
- Mesolithic (Middle Stone Age): 10000 – 4000 BC
- Neolithic (New Stone Age): 4000 – 2400 BC
- Bronze Age: 2400 – 700 BC
- Iron Age: 700 BC – AD 43
- Roman/Romano-British: AD 43 – 410
- Anglo-Saxon/Anglo-Scandinavian: AD 410 – 1066
- Medieval: AD 1066 – 1485
- Post-medieval/Industrial: AD 1485 – 1900
- Modern: AD 1900 – Present

1.4 ASSUMPTIONS AND LIMITATIONS

Data and information obtained and consulted in the compilation of this report has been derived from a number of secondary sources. Where it has not been practicable to verify the accuracy of secondary information, its accuracy has been assumed in good faith. The information accessed from the YDNPA HER represents a record of known assets and their discovery and further investigation. Such information is not complete and does not preclude the future discovery of additional assets and the amendment of information about known assets which may affect their significance and/or sensitivity to development effects. All statements and opinions arising from the works undertaken are provided in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

1.5 COPYRIGHT

Solstice Heritage will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

2. METHODOLOGY AND SOURCES

2.1 PRE-FIELDWORK

Prior to commencement of field survey, a meeting was held with the YDNPA Countryside Archaeological Advisor with the following aims:

- To obtain digital HBSMR data in a suitable format for integration into the project GIS and upload to the GPS unit for field survey
- Examination of additional datasets held within the YDHER relevant to the survey areas
- Discussion of any specific archaeological, palaeoenvironmental or logistical issues relating to each survey area
- Agreement of required fields for data collection to allow ease of data concordance at post-fieldwork stage
- Final confirmation of working methodology.

Following this consultation a small additional amount of project time was spent based at the YDNPA offices enhancing the existing HBSMR records for the survey area. This principally involved using modern digital vertical aerial photography to correct the location of historic features originally plotted from early edition Ordnance Survey mapping.

2.2 GPS SURVEY

The walkover survey involved surface identification of surviving features followed by recording as point, lines and polygons using a mapping-grade GPS. Recording also included high-resolution digital photography of surviving remains, along with notes on nature and extent of survival, dimensions, interpretation, setting and additional environmental information, where relevant. The survey followed the standards and guidance given in *Understanding the Archaeology of Landscapes – A Guide to Good Recording Practice* (Ainsworth *et al.* 2007). Point records were only used in the instance of single discrete artefacts or ecofacts of significance which could not be accurately portrayed using line or polygon topology.

Information about each heritage asset or area of palaeoenvironmental interest was recorded directly onto the GPS instrument as an attached data table, using categories and data-types which allowed easy integration into the YDNPA HER. This also allowed direct daily download of field data into the project GIS as UID-linked, ESRI-compatible shapefiles. The survey involved the use of a handheld DGPS unit and digital photographic equipment. The handheld DGPS unit offered real-time accuracy of at least 2-3m as specified in the project specifications. A digital photographic record was compiled to augment the survey record. This included digital photography of all historic environment and palaeoenvironmental features surveyed.

2.3 PALAEOENVIRONMENTAL ASSESSMENT

Areas of exposed, hagged and bare peat were inspected and archaeological features, small finds and ecofacts within the peat were to be recorded and photographed, and where necessary and practicable, collected. A representative 10% of all grip sections were examined. Ecofacts were targeted to ensure that samples were suitably diagnostic, from a secure and recordable context and substantial enough to be identified and provide a radiocarbon determination (see below). Large areas of tree (or other substantial timber) remains preserved and exposed within peat sections were photographed and recorded by GPS, as were small finds. Large lithic scatters or other small find

concentrations were to be delimited within the GPS survey and a representative sample of the artefactual material will be recorded.

At two suitable locations an area of exposed peat face was cleaned with hand tools to provide a standing section through as many of the peat horizons as was possible. These sections were drawn and photographed to provide a record of the peat stratigraphy, particularly in relation to the presence/absence of *grenzhorizonts*, archaeological and palaeoenvironmental features and deposits, and evidence of peat cutting or other intrusions.

2.4 ASSESSMENT OF VULNERABILITY

As part of the survey features were assessed for their vulnerability to the moorland restoration activities. This has been expressed as a simple 'traffic light' system relating to a buffer area around the known heritage assets. Archaeological features mapped during the survey as lines or areas have been given a 10m buffer for those features deemed to be of 'amber' or 'red' vulnerability. Those HER sites and lines recorded as points that could not be located during the survey have also been given a 10m buffer to offset any potential error in the original recording of their position.

2.5 HEALTH AND SAFETY

All archaeological work was undertaken in a safe manner in compliance with the *Health and Safety at Work Act 1974*. A full risk assessment was undertaken in advance of the commencement of work, a copy of which was carried for the duration of the fieldwork. Solstice Heritage has a full Safety, Health and Environment Policy.

Solstice Heritage also has a Lone Working Policy and best practice system which was employed on this project. The policy and the records relating to its implementation on this project have been maintained and can be supplied to YPP on request.

2.6 SPECIALIST ASSESSMENT AND ANALYSIS

Where palaeoenvironmental samples were collected which required specialist assessment (particularly relating to species identification of wood samples), then this was undertaken by a suitably qualified specialist (see below). Lists of all intended specialists were included in the initial Project Design and are not repeated here.

2.7 REPORTING

Following completion of fieldwork and any immediate assessment required, all information has been synthesised in a project report (this document), including as a minimum:

- Name of client
- A non-technical summary
- List of contents
- Project Outline
- Aims and Objectives of the project
- Plan(s) of the survey area(s) showing the position of all significant historic features and including the grips and hagged/bare peat areas supplied by YPP. All plans tied to OS grid at a suitable scale
- Themed constraint/risk plans in e.g. red/amber/green shades where there is an assessed vulnerability of historic features to the planned restoration work
- Descriptive gazetteer of all identified historic environment features

- Copies of any relevant documentary material
- Photographic catalogue and reproduced digital images of selected features, artefacts and ecofacts
- Catalogue of archive contents
- Notes and bibliography
- List and key to drawings and photographs
- List of staff involved in the survey work and dates of survey
- Assessment of significance of historic environment remains
- Palaeoenvironmental report, including an assessment of the significance of any palaeoecological remains and a characterisation of the palaeoenvironmental resource, with recommendations for any specialist analysis
- Acknowledgements

One bound paper copy and one digital copy has been supplied to the client and to the YDNPA. A further bound copy has also been provided to the client for submission to the landowner.

2.8 DATA TRANSFER

During the pre-fieldwork stage a final agreement was reached on the data fields to be recorded during survey. These related to existing HBSMR data fields and information was recorded against these headings directly onto the GPS unit during field survey. This ensured that the downloaded information is fully concordant with the YDNPA HBSMR with minimal post-processing. The survey processing has been undertaken in Quantum GIS and ESRI ARCGIS.

In addition to the reporting and digital data transfer, all accompanying digital images and any drawn and written field records have been compiled into an orderly site archive for deposition with the YDNPA HER. The archive has been compiled in accordance with the *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives* (IfA 2009), the *UKIC Guidelines for the Preparation of Excavation Archives for Long Term Storage* (Walker 1990), and *The Management of Research Projects in the Historic Environment* (EH 2006a) and the *MoRPHE Technical Guide 1 Digital Archiving and Data Dissemination* (EH 2006b).

It is intended that the archive will include:

- A copy of this report
- Primary field illustrations (peat sections)
- Copy of the radiocarbon dating certificate (also included as an Appendix to this report)
- DVD containing digital versions of: all project reporting, digital photography, GIS files, survey data and Illustrative material.

2.9 OASIS

Solstice Heritage is registered with the Online Access to Index of Archaeological Investigations (OASIS) Project and fully supports all project documentation and records being made available through the OASIS website. An OASIS record has been created for this project, and a copy of the project report will be uploaded. As per the project brief, the OASIS record will be accompanied by an index of sites in a readable format, characterising sites in terms of the current *Thesaurus of Monument Types* (<http://thesaurus.english-heritage.org.uk/>) and in a form compliant with MIDAS Heritage to Level 1 (see FISH 2012). The OASIS record number for this project is: **solstice1-172338**.

3. LANDSCAPE CHARACTER

3.1 SITE LOCATION

The Fleet Moss survey area totals 293ha (centred SD879836) and the peat restoration work is funded through a Higher Level Environmental Stewardship Agreement in place with the landowner.

3.2 GEOLOGY

The dominant geology of the survey area is Carboniferous limestone of the southern reaches of the Yoredale Series, though local conditions have allowed the accumulation of moisture on this normally impermeable bedrock and therefore the development of the significant ombrotrophic mire and associated blanket peat. The peat itself is the dominant drift geological feature across the survey area.

3.3 LAND-USE

The survey area is a block of unenclosed moorland that varies between limestone grassland and areas of peat cover with associated acid vegetation. In parts of the survey area, the peat cover is known to be particularly deep, and to the north-west of Fleet Moss Tarn, deposits of the Glen Garry tephra layer have been identified surviving; one of only three examples mapped in England (www.tephrabase.org). The south-west part of the survey area is dominated by Fleet Moss proper, a fenced area of extensive and deep peat haggings (evident on the accompanying illustrations covered with open areas of exposed peat). To the north and east there are less extensive areas of exposed peat and less tall hags, though there are still substantial areas of blanket bog, mainly with a stabilising turf layer. This north-east portion of the survey area is used for animal grazing and part is managed as a shooting moor.

3.4 SURVEY CONDITIONS

The extensive peat cover within the survey area meant that generally visibility of archaeological remains, other than those of late post-medieval to modern date, was poor. Vegetation cover was generally low with few areas of extensive heather cover and it is not considered that this did not hinder identification of historic remains. The survey was delayed due to heavy snowfall and there was still some small patches of snow lying when fieldwork commenced, but again this is not considered to have had a detrimental effect on identification of archaeological remains.

4. RESULTS – HISTORIC ENVIRONMENT SURVEY

4.1 CHRONOLOGICAL NOTE

With much upland survey there is little opportunity to refine the chronology of recorded sites until evaluation or excavation can provide diagnostic artefacts or material suitable for scientific dating. It is possible to assign rough periods to monuments by form, but further refinement without clear evidence is problematic at best and misleading at worst, hence the division of all sites identified into a maximum of only four likely chronological categories: Prehistoric, medieval to post-medieval, post-medieval and post-medieval to Modern.

4.2 PREHISTORIC

Although principally dealt with in the palaeoenvironmental assessment below, mention of the three recorded finds of preserved wood (**8, 9, 10**) at or beneath the base of peat units is made here as it has relevance to the potential of the survey area to host remains of prehistoric date. The Fleet Moss peat contains a horizon of the Glen Garry tephra (Pilcher and Hall 1996), an ash deposition related to an Icelandic volcanic event, and therefore a highly significant chronological marker within the vertical unit. The Glen Garry tephra has been radiocarbon dated at the Walton Moss site in Cumbria to 260-16 cal. BC (at 95.4% confidence), with a likely date of 226 cal. BC modelled by a wiggle-match of the calibrated dates (Barber *et al.* 2008, 31).

Three discrete examples of wood sealed beneath, or at the base of, eroding peat units have been recorded as part of this survey work, and one was sampled and submitted for radiocarbon determination. Whilst this is, again, discussed below in the palaeoenvironmental assessment, a date of 3501-3115 cal. BC (95.4% confidence) was returned, with the most likely spike in the calibration relating to 3381-3322 cal. BC (43.8% confidence), indicating the onset of peat formation to the early to mid-Neolithic. The importance of these two chronological fixpoints in relation to archaeological remains is that there is a potential for significant finds and remains to be preserved within and beneath the peat.

4.3 MEDIEVAL TO POST-MEDIEVAL

The majority of features within the catalogue (see below) and the accompanying GIS layers have been characterised as likely medieval to post-medieval in date, with most of these accounted for by the line of the Old Cam Road (**7**) and its accompanying marker mounds (**11-20**) that are recorded within the HER but could not be identified on the ground. These sites have been identified from 19th century Ordnance Survey mapping as a route across the moss and it is considered likely that there are truncated and overgrown sub-surface remains surviving in some areas. One stone-built cairn (**3**) was located during the walkover c.100m north of the nearest boundary mound recorded in the HER. It measured c.5.5m diameter and c.0.5m in extant height. It is likely that it dates to the last few centuries as the stones are loosely bonded and not overgrown with a turf horizon, but is included here due to its potential association with road and marker mounds recorded in the HER.

Two small wall footings were also identified during the walkover and, as with the mound described above, may have their origins in the medieval periods, but are considered more likely to relate to post-medieval land use. The first wall footing (**6**) runs up and down the steep eastern side of New Close Gill in the far north-east of the study area. It appears to be the footing of a demolished drystone wall and has little further significance. The second wall identified (**5**) is an 'L'-shaped and heavily overgrown wall footing abutting the steep natural scarp at the south-east corner of the survey area. The wall has

developed a turf cap and has been ruinous for longer than most of the other features identified. It is possible it forms part of a larger enclosure against the scarp edge and is most likely a sheepfold.

4.4 POST-MEDIEVAL

An area of quarrying was identified adjacent to the southern boundary of the survey area **(4)** above Fleet Moss Edge. The quarrying is small-scale stone getting opportunistically won from an exposed outcrop and is most likely to have been cut to supply the adjacent enclosure boundaries. A second area of depressions and delves **(1)** was identified along the western boundary of the survey area and was tentatively recorded as post-medieval extraction, though it is in an area of undulating peat and limestone solution hollows and may be natural rather than anthropogenic.

4.5 POST-MEDIEVAL TO MODERN

A small ruined rectangular stone-built structure was recorded on the north side of Bleaberry Gill **(2)**. The building measured c.8m x 6m and comprised rough drystone walling and the remains of a wooden doorframe, suggesting a fairly recent construction. Fragments of sawn thin timber beams, also of a relatively modern style, carried a stone slate roof with 20th century ceramic ridge tiles. No clear internal arrangements could be discerned but it is likely that the building was a small shelter of some kind for shepherds or other workers who were required to spend prolonged time near the moss.

5. RESULTS – PALAEOENVIRONMENTAL ASSESSMENT

5.1 PEAT FORM AND EXISTING CHRONOLOGY

The study area is dominated by deep ombrotrophic mire, which, where sections are visible, tends to a clear diplotelmic structure, though significant areas have little to no acrotelm with visible catotelm above the fluctuating watershed, and therefore can be classified as primary eroded bog (after Lindsay 1995). The extant form of the mire can be roughly divided into two types, both broader in character than the varying watershed, spur and valley side mesotopes that collectively comprise the bog. These two areas have been named Type 1 and Type 2 areas and are, respectively: heavily hagged and eroding areas in the moss proper; and more stable peat cover in the north and east of the survey area where a turf horizon of peaty soil has stabilised substantial areas. The two areas of distinct character have been given a rough outline on Fig. xx below, derived from aerial photography and field observation. This must be considered a rough distinction as there are many localised differences within these areas, and recommendations given below should be applied to the observable terrain on the ground and not only to the artificially sharp-edged polygons.

As is noted above, the Fleet Moss peat contains a horizon of the Glen Garry tephra, a key chronological marker that has been recently dated to the late 3rd century BC through a programme of radiocarbon determination on a microtephra horizon in Cumbria (Barber *et al.* 2008). The Glen Garry tephra at Fleet Moss was recovered at a relatively shallow depth of 0.35-0.38m in a hand dug monolith sample of a total 3m depth (Pilcher and Hall 1996), and the height of the tephra within the peat unit suggested that the onset of peat formation at Fleet Moss was most likely in the Neolithic or Early Bronze Age (c.4000-2000 cal. BC). See below for a refinement of the chronology of the moss based on a radiocarbon determination undertaken during this project.

5.2 PEAT SECTIONS

In addition to the various eroding sections photographed, the three preserved wood samples recorded by GPS, and the sample submitted for radiocarbon determination, two standing sections of peat were cleaned and drawn to provide a detailed example of its structure. The tallest areas of exposed peat were largely unsuitable for drawing given the graded and sloping nature of many of the hags, and so the two sections drawn were selected to inform on specific features of interest and not necessarily to be representative of the height of eroded and exposed peat.

5.2.1 SECTION 1

Section 1 was examined and recorded as feature (10) noted above – an eroding section where fragments of wood were observable at the interface of the catotelm and underlying clay substrate. Section 1 was located on the west-facing side of one of the principal tributary gullies flowing north-north-west from the moss proper into the Bardale Beck. The section is relatively simple and is representative of many of the eroding gullies in the survey area.

The upper deposit is an organic-rich 'peaty soil' turf horizon which provides some level of stability to the peat unit as a whole. The turf horizon measures c.0.08m in average thickness. Beneath the turf layer is a well-developed acrotelm containing visible decomposing plant material ranging from fibrous but unidentifiable to relatively recent material with clear roundwood and leaf mould form, though there are no clearly differentiated horizons visible to the naked eye. The acrotelm measures c.0.45m in average thickness. The catotelm is a thin layer of fibrous peat partially within the current local water table. The catotelm measures c.0.15m in average thickness though the distinction between this

deposit and the underlying clay substrate is graded and unclear. The peat as a whole sits above a light grey clay substrate visible across much of the survey area in gullies and other areas of erosion. Whilst there are occasional areas of visible buried soil horizons (see Section 2), in the majority of cases the gleying effect of the overlying waterlogged material has resulted in little observable difference (macroscopically) in the pre-peat strata. The principal feature of interest in Section 1 was a preserved fragment of wood at the interface of the catotelm and substrate. This is presumably associated with the local vegetation prior to peat formation, though for this survey it was considered that the wood sample described in sections 5.3 and 5.4 below was a more secure for recovering a radiocarbon determination. The total depth of the peat sequence from the modern ground surface to the natural substrate at this point was c.0.66m.

5.2.2 SECTION 2

Section 2 was examined c.300m to the west of Section 1 on the west-facing side of another of the tributary gullies to the Bardale Beck. The principal reason for cleaning and drawing this section was to provide a record of one of the examples of preserved organic horizons beneath the peat. The basic sequence, form and depth of deposits is similar to that of Section 1, with a thin turf horizon (c.0.07m in thickness) overlying a developed acrotelm (c.0.5m in thickness) and a thin catotelm (c.0.18m in thickness). Between the catotelm and underlying clay substrate there are the gleyed remains of a pre-formation soil horizon. The horizon is irregular in form but is visible as a darker, clay-heavy material. At the top of the buried soil at the left (north) side of the cleaned section there is also a heavily sandy deposit that has accumulated prior to the onset of peat formation, potentially as the result of a single, high-energy water deposition event.

5.3 WOOD SAMPLE IDENTIFICATION

Five fragments of waterlogged wood from a single entity sample were submitted to Laura Strafford of Archaeological Research Services Ltd for identification, who prepared the following section for inclusion in this report. The wood sample was taken from the base of a standing peat section as described above.

5.3.1 METHODOLOGY

Initial examination of the wood proved that the majority of the fragments were either knotty root wood or heavily covered in bark, with the heartwood diameter in most cases being less than 5mm. This is not ideal for identification purposes and so such examples were not examined further. Only one fragment of round wood was indicative of being identifiable, although again this was heavily covered in bark, which when removed left a heartwood diameter of approximately 10mm. A thin section was taken from the transverse section (TS), tangential longitudinal section (TLS) and the radial longitudinal section (RLS) and mounted on to a slide. The thin sections were examined at up to x200 under an incident light microscope. Identification was made according to anatomical characteristics described by Schweingruber (1990). The identifications were made without consulting a reference collection.

5.3.2 RESULTS

The knotty wood and thick bark on most of the fragments rendered them unsuitable for identification, with only one of the fragments initially submitted being potentially suitable. However, poor preservation has led the wood to take on a spongy nature that made the preparation of thin sections difficult, and left the cell structure somewhat weakened and distorted. As a result a secure identification could not be determined. However, the diffuse-porous nature of the wood along with the ray width and the hint of scalariform perforation plates is suggestive of birch (*Betula* sp.).

5.3.3 DISCUSSION

The one fragment that has been tentatively identified as birch (*Betula* sp.) is a round wood fragment <1cm in diameter, suggesting a lifespan of less than a decade or two at the most. The young nature of the wood makes diagnostic features difficult to see, and taken into consideration with the poor preservation, the identification of this wood should be seen as tentative only. Nonetheless, the fact that this specimen is a young round wood fragment makes it an ideal candidate for dating.

5.4 RADIOCARBON DATING

The sample of waterlogged wood identified above was taken from a standing peat section above Flaith Brow (9) and submitted for radiocarbon determination. The sample was taken from a section eroded by a small spring and was located at the base of the catotelm at the interface with an underlying clay substrate (see section description above). This sample was taken as it provided a *terminus post quem* for the formation of peat, and therefore an indication of the archaeological and palaeoenvironmental potential. The radiocarbon determination returned the following date:

Lab No.	Sample ID	Material	Conventional Radiocarbon Age	$^{13}\text{C}/^{25}\text{C}$ Ratio	Calibrated Age at 2 $^{\sigma}$ 95.4% probability
SUERC-53823 (GU34227)	1	Roundwood <i>betula</i> (tentative)	4588 \pm 35bp	-28.9	3501 to 3115 cal. BC

Whilst the overall span at 95.4% confidence ranges from 3501-3115 cal. BC, the most likely spike in the calibration related to 3381-3322 cal. BC (43.8% confidence), indicating the onset of peat formation was in the early to mid-Neolithic.

5.5 SIGNIFICANCE OF THE FLEET MOSS PEAT

Across the survey area, on both Type 1 and Type 2 peat cover, there are areas of significant depth and preservation of peat. Whilst this is perhaps most obvious in the Type 1 areas where there are large spreads of exposed peat, tall hags and extensive gullying, this survey has demonstrated that there are standing and eroded peat sections in Type 2 areas up to 2m in height, albeit generally more stable. Even without the chronological control within and below the peat, the surviving depth gives the Fleet Moss peat a high potential for future palaeoenvironmental research and the preservation of sealed archaeological artefacts and features.

The dating of a marker within the peat unit such as the Glen Garry tephra, coupled with the radiocarbon date obtained for this project from the interface of the peat with underlying sediment, means that the onset of peat formation at this site is likely to lie in the early to mid-Neolithic period around 3350 cal. BC. This fits well with the observation of Innes and Blackford (2003, 30) that "Neolithic and Bronze Age clearance and farming seems to have provided a stimulus for peat accumulation [though] the major spread occurred during the climatic deterioration of the Iron Age and later".

6. CONCLUSIONS

6.1 CONSTRAINT AREAS

Based upon the presence/absence and potential significance of historic environment features identified during the survey, a series of constraint areas have been abstracted. The different levels of constraint area are detailed below.

6.1.1 RED CONSTRAINT AREAS

Red constraint areas comprise a 10m buffer around historic environment features including all structural remains and possible cairns or mounds. Whilst many of these features are not of high significance in themselves, the scarcity of features of any date and significance means that, within the Fleet Moss area, even low significance features can be easily avoided. It is advised that red constraint areas are avoided entirely during restoration works.

6.1.2 AMBER

Amber constraint areas are more complex than red or green. Amber constraint areas comprise a 10m buffer around those historic environment features that are recorded in the HER but could not be identified during the walkover. Amber constraint areas also encompass the areas of quarrying or possible quarrying, which are robust landscape features. It is advised that, where possible, amber constraint areas are avoided, and where unavoidable, necessary measures should be taken to avoid damage to extant earthworks.

6.1.3 GREEN

Green constraint areas include all other parts of the survey area outside red and amber constraint areas. Whilst care should be taken to ensure minimal impact from plant there are no restrictions on access in relation to known archaeological features. Please note that working in green constraint areas should still proceed in accordance with the palaeoenvironmental recommendations below.

6.2 PALAEOENVIRONMENTAL RECOMMENDATIONS

The proposed peat restoration will, by necessity, impact on the peat resource, principally through re-profiling of vertical faces, cutting of plugs for grip blocking and damage associated with works vehicles tracking between areas of restoration. Whilst impact should be minimised in line with the recommendations below it is considered that minor impact in the course of the works is justified against the long-term benefits to the historic environment inherent in the preservation of a significant palaeoenvironmental resource (see Gearey *et al.* 2010, 32).

Although no artefacts were recovered as part of this survey, the peat deposits have a demonstrated potential to contain significant palaeoenvironmental remains and also to seal archaeological deposits within buried horizons. Caution should be exercised during the restoration work and, where possible, excavations should always aim to have a minimal impact on the peat in all parts of the survey area.

As is discussed in section 5.1, the peat cover can be broadly divided into two forms, though the distinction is variable and nuanced and the following recommendations should be considered in all areas based upon visual inspection of the specific areas to be restored at the time of works. The rough extent of Type 1 and Type 2 cover is shown on Fig. xx and the difference in form is principally based on the extensive presence of a stable turf cover in Type 2 areas, and the lack of turf cover and corresponding instability in Type 1 areas. Type 2 areas will be much more robust and suffer less

impact from the tracking of plant. Type 1 areas will be, at best, much more susceptible to damage by the presence of plant, and at worst be inaccessible to work vehicles given the unstable and irregular nature of the heavily hagged and eroded peat, and these potential constraints should be considered and planned for throughout the restoration process.

8. SOURCES

8.1 BIBLIOGRAPHY

Ainsworth, S., Bowden, M., McOmish, D. and Pearson, T. 2007. *Understanding the Archaeology of Landscapes – A Guide to Good Recording Practice*. Swindon, English Heritage.

Barber, K., Langdon, P. and Blundell, A. 2008. Dating the Glen Garry tephra: a widespread late-Holocene marker horizon in the peatlands of Northern Britain. *The Holocene* 18 (1): 31-43.

English Heritage (EH). 2006a. *Management of Research Projects in the Historic Environment (MoRPHE)*. London, English Heritage.

English Heritage (EH). 2006b. *Management of Research Projects in the Historic Environment (MoRPHE) Technical Guide 1 Digital Archiving and Digital Dissemination*. London, English Heritage.

Forum on Information Standards in Heritage (FISH). 2012. *MIDAS Heritage- The UK Historic Environment Data Standard v. 1.1*. London, English Heritage.

Gearey, B., Bermingham, N., Chapman, H., Charman, D., Fletcher, W., Fyfe, R., Quartermaine, J. and Van de Noort, R. 2010. *Peatlands and the Historic Environment*. Unpublished review commissioned by the IUCN UK Peatland Programme's Commission of Inquiry on Peatlands.

Innes, J. and Blackford, J.J. 2003. Yorkshire's palaeoenvironmental resource. In Manby, T., Moorhouse, S. and Ottaway, P. (eds) *The Archaeology of Yorkshire*. York, York University Press and English Heritage. Yorkshire Archaeological Society Occasional Paper 3

Institute for Archaeologists (IfA). 2009. *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives*. Reading, Institute for Archaeologists.

Lindsay, R. 1995. *Bogs: The Ecology, Classification and Conservation of Ombrotrophic Mires*. Battleby, Scottish Natural Heritage.

Pilcher, J.R. and Hall, V.A. 1996. Tephrochronological studies in northern England. *The Holocene* 6 (1): 100-105.

Schweingruber, F.H. 1990. *Microscopic Wood Anatomy*. Birmensdorf, Swiss Federal Institute for Forest, Snow and Landscape Research. Third edition.

Walker, K. 1990. Guidelines for the Preparation of Excavation Archives for Long-Term Storage. London, UKIC Archaeology Section.

8.2 WEBSITES

English Heritage Thesaurus of Monument Types - <http://thesaurus.english-heritage.org.uk/>

TephraBase


APPENDIX 1 – ADDITIONAL FIGURES


Fig. 1 Mapped results of historic environment survey


Fig. 2 Barden Fell peat sections.


Fig. 3 Constraint areas within the study area


APPENDIX 2 – GAZETTEER OF SITES


Project UID(s)	1
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Quarry
Period	Post-medieval
Summary	Possible area of quarry delves though difficult to characterise for certain given the natural undulation of the ground in the vicinity of significant peat haggging. Possible natural solution feature accentuated by peat formation.
Image	

Project UID(s)	2
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Structure
Period	Post-medieval to Modern
Summary	Small ruined rectangular structure on the north side of Bleaberry Gill. Rough drystone walling and remains of a wooden doorframe suggest a fairly recent construction. Sawn thin timber beams also of a modern style carried a stone slate roof with 20 th century ceramic ridge tiles. The original structure measured c.6mx8m and no clear internal arrangements could be discerned.
Image	


Project UID(s)	3
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Cairn
Period	Medieval to Post-medieval
Summary	Roughly circular stone-built cairn. The lack of turf covering and its position overlying the turf horizon precludes a prehistoric origin and it is most likely a small boundary mound at the northern limit of the main moss area, though it does not align with any of the mounds noted in the HER and derived from early OS mapping (see below).
Image	

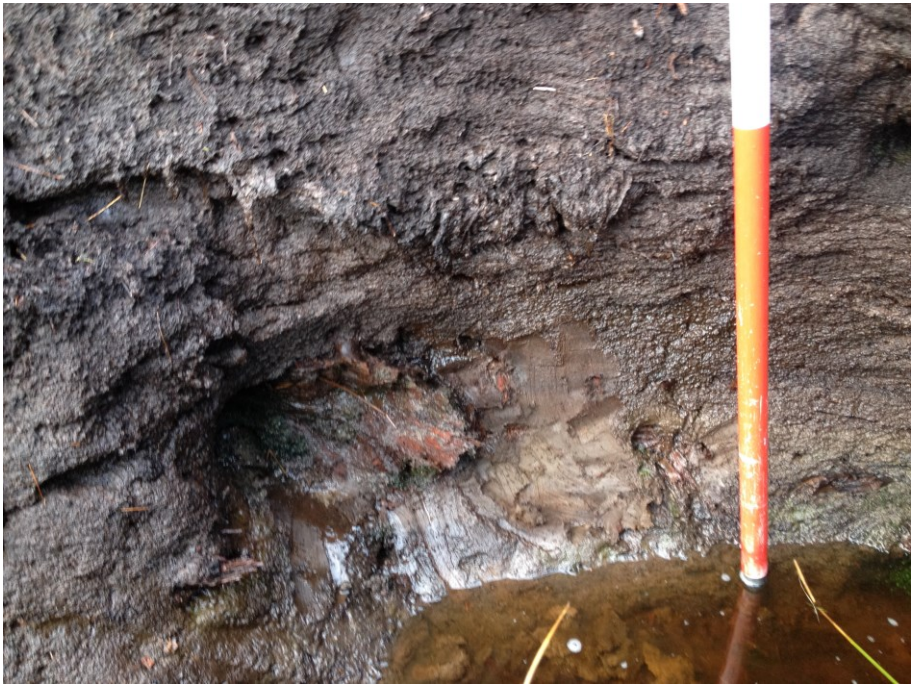
Project UID(s)	4
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Quarry
Period	Post-medieval
Summary	Area of small-scale quarrying along the line of a natural outcropping of bedrock at the southern boundary of the moss. Likely a convenient source of local stone for the post-medieval and later enclosure walls in and around the moss.
Image	


Project UID(s)	5
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Wall, Enclosure, Sheepfold?
Period	Post-medieval
Summary	Small length of wall footing mostly turf-covered and surviving in a small 'L' shape against the steep bank at the edge of the natural amphitheatre on this side of the survey area. The walling describes a small enclosure, most likely a sheepfold.
Image	

Project UID(s)	6
HER No	-
Site Name	-
Site Type	Monument
Monument Type	Wall
Period	Unknown
Summary	Length of wall footing running upslope from New Close Gill and most likely representing a post-medieval land division which has been removed in more recent times.
Image	

Project UID(s)	7
HER No	-
Site Name	Old Cam Road, Fleet Moss
Site Type	Monument
Monument Type	Road
Period	Medieval to Late C19
Summary	Line of old road across the moor top recorded in the HER and derived from old Ordnance Survey mapping. No visible trace on the ground in the location given, though the area is heavily covered with hagged peat.
Image	No image taken

Project UID(s)	8
HER No	-
Site Name	-
Site Type	Findspot
Monument Type	Wood
Period	Prehistoric
Summary	Surviving fragments of wood preserved in a buried clay beneath the peat unit. The buried sediment most likely represents a pre-formation A-B soil horizon that has become gleyed beneath the waterlogged peat. The peat unit above is graded and eroding.
Image	

Project UID(s)	9
HER No	-
Site Name	-
Site Type	Findspot
Monument Type	Wood
Period	Prehistoric
Summary	Surviving fragments of wood preserved at the interface of the catotelm and pre-formation soil horizon – now a gleyed clay deposit. A sample of this was taken and submitted for radiocarbon date, returning a date in the early-middle Neolithic period (see above).
Image	

Project UID(s)	10
HER No	-
Site Name	-
Site Type	Findspot
Monument Type	Wood
Period	Prehistoric
Summary	Surviving fragments of wood preserved at the base of the catotelm in an eroding peat section of substantial depth.
Image	

Project UID(s)	11-20
HER No	MYD26018, MYD26020, MYD26021, MYD26022, MYD26023, MYD26024, MYD26025, MYD26026, MYD26027, MYD26028
Site Name	-
Site Type	Monument
Monument Type	Mounds
Period	Medieval to Late C19
Summary	Series of boundary mounds relating to the early road noted above. All recorded in the HER and derived from early Ordnance Survey mapping. None of the mounds could be located on site in the locations given though a single stone cairn was identified to the north (see feature 3 above).
Image	No images taken.



APPENDIX 3 – PHOTOGRAPHIC REGISTER

Table 1 Fleet Moss Photograph Register

No.	Feature UID	Facing	Scale	Description
1	1	W	1m	Possible quarry delves
2	1	E	1m	Possible quarry delves
3	-	E	1m	Active erosion in the shallow peat coverage towards the western edge of the survey area.
4	-	SE	1m	Active erosion in the shallow peat coverage towards the western edge of the survey area, here exposed by a small gully.
5	-	E	1m	Small area of eroded peat with a stable topsoil and also showing a gleyed clay lens preserved beneath the peat unit.
6	-	E	-	View across one of the significant areas of bare peat at the source of Bleaberry Gill, showing the extent of open areas of erosion in parts of the moss.
7	2	NW	1m	Wide view across Bleaberry Gill to the ruined structure.
8	2	NW	1m	Close-up of the ruined structure showing the timbers and roofing material.
9	-	NW	1m	Active erosion in an area of peat stabilised by a turf layer.
10	9	SW	1m	Overview of an exposed section of peat from turf layer through acrotelm and catotelm and including a buried soil horizon, now a gleyed clay. A sample of waterlogged wood was taken from the base of this exposure and submitted for radiocarbon dating.
11	9	SW	0.5m	Close up of fragment of waterlogged wood taken as sample.
12	-	N	1m	Active erosion from the edge of the main blanket peat.
13	-	E	1m	Cleaned section from turf through peat to buried pre-formation horizons.
14	-	E	1m	Cleaned section from turf through peat to buried pre-formation horizons.
15	8	E	1m	Fragment of wood preserved in the clay (former soil) horizon beneath the peat unit.
16	6	SE	1m	Wall base at the east extent of the survey area.
17	5	NE	1m	Small wall base describing an enclosure or likely sheepfold in the south-east corner of the survey area.
18	5	NE	1m	Small wall base describing an enclosure or likely sheepfold in the south-east corner of the survey area.
19	-	NW	1m	Active erosion in the shallow peat coverage near the southern edge of the survey area.
20	3	N	1m	Small stone cairn identified to the north of the line of the boundary mounds recorded in the HER, but likely related.
21	10	E	1m	Fragment of wood preserved in the clay (former soil) horizon beneath the peat unit.
22	4	N	1m	Portion of small-scale quarrying against the southern edge of the survey area.

APPENDIX 4 – RADIOCARBON DATING CERTIFICATE