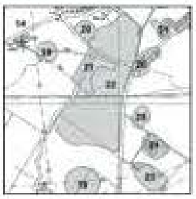
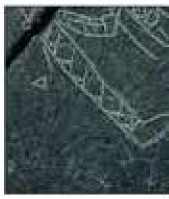
MOLY/02







MOOR LANE, YORK

Auger survey and palaeoenvironmental assessment

commissioned by Barwood Strategic Land II LLP

February 2015

HEADLAND ARCHAEOLOGY

MOOR LANE, YORK

Auger survey and palaeoenvironmental assessment

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project info

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REGISTERED CIfA ORGANISATION

CONTENTS

LIST OF ILLUSTRATIONS

MOOR LANE, YORK

Auger survey and palaeoenvironmental assessment

An auger survey was undertaken on land at Moor Lane, York, as part of a programme of evaluation in connection with the promotion of the site for residential-led development. The survey consisted of 22 hand driven augers at pre-selected locations, following trial trenching which had identified an organic deposit of presumed Windermere Interstadial date sealed beneath wind-blown sand.

The aim of the survey was to identify the extent of the organic deposit and to undertake dating and palaeoenvironmental assessment of previously sampled material.

The coring demonstrated that organic horizons were extremely localised and limited in extent. The previously recovered material was dated to 13,281—13,102 cal BP, confirming its late glacial date; plant macrofossils were identified within it.

A small area of peat relating to the Holocene Askham Bog sequence was also identified at one auger location.

The peat sequences detected are not considered to be of particular archaeological or palaeoenvironmental interest in comparison to other previously studied sequences in the locality and have limited potential to provide further information about climatic conditions at the end of the Windermere Interstadial.

1 INTRODUCTION

Headland Archaeology undertook a trial trench evaluation at Moor Lane, York in November/December 2014. In the course of this work an organic peat horizon of potential palaeoenvironmental significance was located within one of the evaluation trenches. Following discussions between the client's archaeological consultant (Matt Morgan, The Environmental Dimension Partnership) and the archaeological advisor to the planning authority (John Oxley) it was agreed that further information about the extent and nature of the peat horizon was required.

A limited programme of hand-driven augers was agreed as the appropriate method of gathering this information. This was designed to provide further information about the presence and thickness of peat deposits and the depth of the sub-peat topography in order to assist in establishing the archaeological potential of the survey area. A project design covering the work was agreed with the archaeological advisor to the planning authority (Kimber 2014).

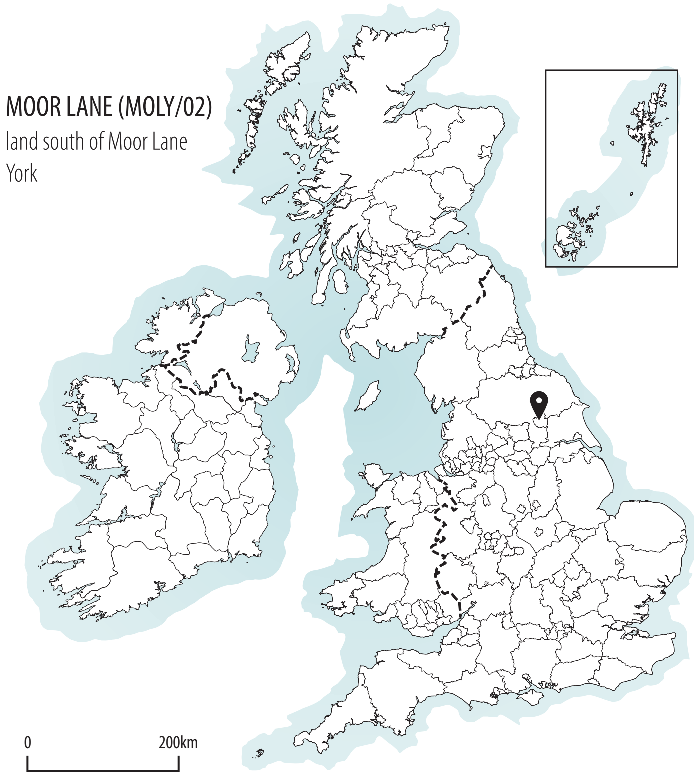
1.1 SITE DESCRIPTION

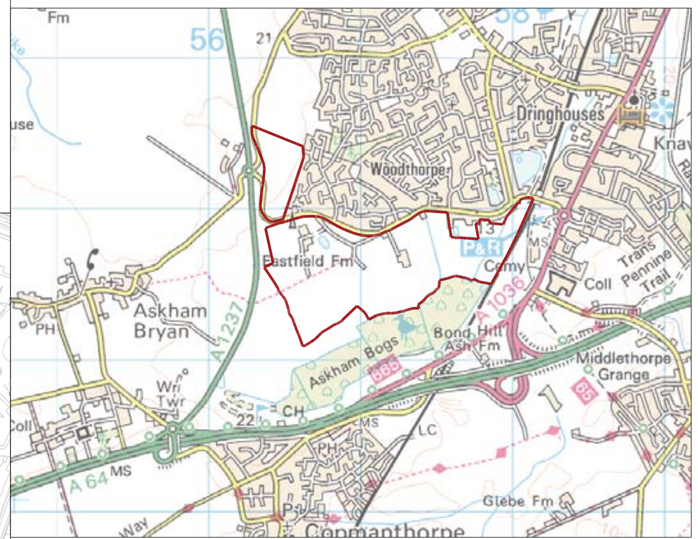
The site comprises an area of agricultural land between Askham Bog to the south, the A1237 to the west and the western edge of York to the north and east, approximately 98ha in area.

The underlying solid geology within the site comprise the Vale of York sand and gravel formation to the east of the area, and the Alne Glaciolacustrine formation to the west.

The area investigated by the auger survey comprised a limited part of the south-eastern fringes of the site (Fields 18, 19, 21 & 25). This area bordered the adjacent Askham Bog and was located over glaciolacustrine deposits related to its early inception as a water feature in the late glacial period. In general all of the augers were taken at points below an elevation of 13m AOD.

MOOR LANE (MOLY/02)
land south of Moor Lane
York





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KEY
- site boundary
- trench location
- auger point location
- organic layer
- sandy layer

N
0 500m
scale 1:7,500 @ A3

ILLUS 1
Site location

1.2 ARCHAEOLOGICAL BACKGROUND

Askham bog was investigated by coring in the 1970s (Hall et al 1979). It lies within a landscape hollow, with approximately 2m of laminated lacustrine clays forming the base of the feature. About halfway through this clay sequence is a narrow band of organic rich material containing evidence of a typical late-glacial flora, thought to represent the c2,000 year warming period of the Windermere Interstadial (15,000–13,000 cal BP). Above lacustrine clays is a thick deposit of highly organic mud followed by sequences of peat.

The Holocene sequences of the bog were investigated in greater detail through pollen analysis (Gearey & Lillie 1999). The work demonstrated the existence of a 6m vegetation sequence, with peat inception beginning at 10,290-9,980 cal BP.

Trial trenching was completed by Headland Archaeology in November 2014. In some parts of the evaluation area close to the edges of Askham Bog, the trenching found evidence for a deposit of clean sand approximately 0.5m thick (east end of Trench 61; SE end of Tr 66, Tr 68 & Tr 88). The sand deposit was investigated and was generally found to overlie sterile glaciolacustrine clays. In one sondage at the SE end of Tr 68 a thin layer of organic rich peat was found to underlie the sand.

The sand layer was thought to be wind-blown sand of late glacial date, deposited in an arctic desert environment from the erosion of terminal moraine deposits (S Carter, E Tetlow pers comm). The organic material found within Tr 68 may therefore relate to a water feature of an interstadial period, most likely the Windermere interstadial i.e. being comparable in date to the organic layer found within the basal clay sediments in Askham bog proper.

Inspection of the 50cm resolution LiDAR data of the area around Tr 68 showed that the distribution of wind-blown sand was generally limited to below the 13m OD contour, although not all trenches at this elevation contained sand. The organic material was located on the 12.5m contour, however it was not observed in Trench 61, which was also located at this elevation.

The organic material was thought to be a relatively localised phenomenon, its distribution probably defined by the buried sub-surface topography.

2 OBJECTIVES

The objectives of the auger survey were:

- to establish the extent of the organic layer – in particular is it continuous or patchy; is it confined to below the 12.5m contour?
- to thereby refine the existing sub-surface deposit model from the trial trenching with a high confidence rating;
- to establish the palaeoenvironmental and archaeological potential of any organic sediments; and
- to produce and deposit a satisfactory archive and disseminate the results of the work via grey-literature reporting and publication as appropriate.

3 METHODOLOGY

3.1 FIELDWORK

The presence, distribution and depth of sediments was assessed using a hand-operated reconnaissance gouge auger. The depth of superficial deposits and buried sediments, their composition, surviving condition and nature were recorded at each auger point in order to show maximum topsoil/sand/organic depths and the extent of these as litho-stratigraphic units.

A total of 22 auger points were taken. These comprised the planned 20 auger points, plus an additional two augers to narrow down the extent of the previously located organic material. Auger locations were targeted on areas where wind-blown sand was located by the trial trenching. In general augering continued until confident identification of the basal glaciolacustrine clay was made; at three auger locations (AP16, 17 & 21) refusal was experienced before this due to the compaction of sediments but confidence in the results is still considered to be high.

All of the auger locations were surveyed in the field using a Trimble GPS to provide OD heights of the current ground surface.

3.2 PALAEOENVIRONMENTAL ASSESSMENT

One ten litre sample recovered during the course of archaeological works carried out at Moor Lane, near Askham bog, York, the site of a former glacial lake, was received for palaeoenvironmental assessment. The sample was from organic rich material sandwiched between lacrustine clay and a layer of wind-blown sand and tentatively relates to the climatic oscillation of the Windermere (Late Devensian) Interstadial. The deposit was laminated with lenses of silt and organic material visible. The aims of the assessment were to assess the presence and condition of waterlogged plant remains and to comment on plant communities and the palaeoenvironment.

A 250ml sub-sample was sieved through meshes of 4mm, 1mm and 500µm for the recovery of plant macrofossils. All samples were scanned using a stereomicroscope at magnifications of x10 and up to x100 where necessary to aid identification. Identifications, where provided, were confirmed using modern reference material and seed atlases including Cappers et al. (2006).

A bog bean seed (Menyanthes sp) identified by the assessment was submitted for Accelerator Mass Spectrometry dating at SUERC.

4 RESULTS

4.1 SEDIMENTS IN TRENCH 68

During the previous trial trenching a machine-dug sondage was excavated through sand deposits revealed in Trench 68. This showed basal layer of laminated clay and fine to medium sand, overlain by a 0.04m thick layer of fibrous peat. Overlying the peat was a 0.46m thick sequence of pale yellowish white sand, banded with thin grey-brown sand horizons which may indicate either an organic component or post-depositional chemical changes. The sand deposits were sealed by the subsoil & topsoil horizon.

4.2 AUGER SURVEY

Full details of all augers taken are given in Appendix 1.

Where sufficient depth could be reached, sterile glaciolacustrine clays were encountered at all auger locations. The upper horizon of this material ranged in elevation from 10.62m OD to 12.17m OD; the average elevation was 11.61m OD.

The organic horizon identified during the trial trenching was not further detected in the auger survey, despite AP22 being excavated within approximately 2m of its location.

Deposits of sand of Aeolian origin were located at all auger locations apart from AP9, 10 & 18. The sand ranged in thickness from 0.25m to 1.40m, with an average thickness of 0.59m. The top of this horizon was observed at elevations of between 11.06m OD to 12.54m OD; the average elevation was 12.11m OD.

At AP20 a 0.15m thick deposit of dark reddish brown peat was found to overlie sand deposits, and was sealed by topsoil. This auger location was immediately adjacent to Askham bog, and the peat is almost certainly a fragment of the Holocene peat sequences present within the bog proper.

4.3 PALAEOENVIRONMENTAL ASSESSMENT

Results of the assessment are presented in Appendix 2 (waterlogged samples). Material suitable for AMS (Accelerated Mass Spectrometry) radiocarbon dating is shown in the tables.

The sample showed good organic preservation with monocoyledon (e.g. grass, sedge), stem, rhizome fragments and moss leaves. Occasional bog bean (*Menyanthes trifoliata*), pond weed (*Potamogeton* sp) and water crowfoot (*Ranunculus aquatilis* type) were also identified.

The presence of the above aquatic taxa are suggestive of nutrient rich standing water. It would therefore seem likely that the monocotyledons include emergent aquatics. The assemblage is consistent with a fringe community at the edge of a bog or shallow lake.

4.4 RADIOCARBON DATING

A date of 13,281-13,102 cal BP (at 2σ) was returned from the bog bean seed sent for radiocarbon dating (Appendix 3).

5 DISCUSSION

5.1 AUGER SURVEY

The most significant results of this survey are:

- The very localised extent of pre-Holocene peat deposits; and
- The localised extent of the Holocene peat deposits, which on the results of the previous trenching and the auger survey could only cover an area in Field 25 of at most 25m across.

The pre-Holocene peat deposit from the Trench 68 area appears to have survived only in a very localised area. The more extensive presence of the intact overlying wind-blown sand deposits suggests that there has not been significant truncation of these early deposits. It seems likely that this thin organic layer represents the remains of a small and short-lived water feature on the fringes of Askham Bog proper.

The sand deposits seen across much of the auger survey area are almost certainly aeolian (wind transported) sediments. Given the inland location of the survey area, movement of this quantity of sand would be unusual in the climatic and environmental conditions persisting during the Holocene period. This points towards their accumulation in a periglacial (artic desert) environment, such as existed during the close of the last glaciation in the Younger Dryas/ Loch Lomond Stadial after around 13,000 BP. The Windermere Interstadial radiocarbon date from the underlying peat sediments supports this interpretation with a great deal of strength.

The most likely explanation for the formation of the sequence is that following climatic deterioration, shallow water features around the edges of the bog were gradually in-filled by fine sediments, preserving the bases of the features and the organic material within them.

5.2 PALAEOENVIRONMENTAL AND ARCHAEOLOGICAL CONTEXT

Radiocarbon evidence places deposit development at the end of the Windermere/Lateglacial interstadial, an episode of climatic amelioration that commenced at some point c. 14-13ka BP. It is hypothesised that the thermal maxima was attained synchronously across the British Isles (Coope et al. 1977). Summer temperatures warmed by up to 9°C (from 8.5°C to 17.5°C) and winter by approximately 20°C from -20°C to 0°C (Briffa and Atkinson 1997), nonetheless, insect evidence from across the British Isles does suggest that these temperatures were highly variable on millennial and centennial scales (Briffa and Atkinson 1997).

The Windermere Interstadial coincides with the Magdalenian/ Creswellian hunter-gatherer societies of Upper Palaeolithic culture. Human settlement of the British Isles from this period is known from around 35 sites – mostly caves - and was almost certainly small-scale, sporadic and brief (Pettitt & White 2012). In the Yorkshire area evidence for Upper Palaeolithic activity is limited to a few diagnostic stone tools found mainly in the course of detailed research on Mesolithic occupation sites such as Starr Carr (Roskhams & Whyman 2005: 49). It therefore appears very unlikely that any measureable form of human activity dating to the interstadial period would be present or detectable in the area.

The previous work undertaken on Askham Bog the 70s and the 90s revealed the existence of up to 6m of sediment accumulation (Hall et al 1979; Geary & Lillie 1999). The stratigraphy found by these investigations included two meters of laminated inorganic silts and clays from the basal sediments, indicating deposition in open water during the late-glacial period prior to climatic improvement and soil maturation. An organic band was encountered midway through the basal clay. Plant macrofossil remains recovered included monocotyledonous leaves, moss fragments and the reproductive bodies (oospores) of the calcareous alga Chara (Hall et al 1979). Pollen recovered from the organic band included meadowsweet (*Filipendula* sp), docks (*Rumex* sp) and meadow rue (*Thalictrum* sp) together with willow (*Salix* sp), birch (*Betula* sp) and pine (*Pinus* sp) trees and shrubs (Hall et al 1979). It was concluded that the deposit probably reflects the climatic oscillation of the Windermere Interstadial (Gearey et al 1999), characterised by an improvement in climate, with vegetation similar to that of arctic tundra, with herbs, grasses, mosses, lichens and low growing shrubs in a landscape largely devoid of trees (Hall et al 1979). On the basis of the plant macrofossils recovered during the recent work, and the radiocarbon date, it is likely that the organic horizon found in Trench 68 is comparable with that located at the base of the main sequence from Askham Bog.

Further comparative sites of similar date in northern and eastern Britain have also been found. In the north, these include St Bee's Head, Cumbria (Coope and Joachim 1980), Bellmoor Quarry (Howard et al. 1999; Tetlow et al. 2005; Unpublished) and in the middle Trent Catchment, at Hemington Quarry (Greenwood and Smith 2005). At St Bee's the palaeoecological evidence was primarily from the Coleopteran assemblage (Coope and Joachim 1980). At Bellmoor Quarry, waterlogged plant and insect remains from this period indicate cut off palaeochannels filled with pond weed (*Potamogeton* sp), bogbean (*Menyanthes trifoliate*), and aquatic Rananuculus sp., surrounded sedges and other reeds (Howard et al. 1999; Tetlow et al. 2005; Unpublished). Pollen from Bellmoor also indicates a wider environment similar to that found at Moor Lane (Howard et al. 1999; Tetlow et al. 2005; Unpublished). Also in the Trent Valley, at Hemington Fields, a clast of peat which formed c. 13,350–15,150 cal BP and had been 'rolled' suggests a sedge-choked meander cut-off, possibly surrounded by dwarf birch (*Betula nana*) (Greenwood and Smith 2005). The waterlogged plant remains contained large numbers of green algae (*Chara* sp.), sedges. and aquatic *Ranunculus* sp. (the author pers. comm.). The plant remains from the base of the Askham Bog sequence are therefore quite typical of those from similar landscape features of the Windermere Interstadial period.

In terms of climatic inference for this period, much of the data has previously been obtained from insect assemblages which have been used to ascertain average climate, based on the presence of stenothermic taxa first applied by Coope (1961). Coleoptera are a particularly sensitive indicator of climate change and can be used at relatively high resolution. Comprehensive faunas have been recovered from chronologically comparable sites at St. Bee's, Bellmoor, North Nottinghamshire; Church Stretton, Shropshire; Glanllyau, near Pwllheli, North Wales; and Abingdon, Berkshire (Aalto et al. 1984; Coope and Brophy 1972; Coope and Joachim, 1980; Howard et al. 1999; Osborne 1972, 1973; Tetlow et al. 2005). Several are associated with climatic cooling at the end of the Lateglacial and the beginning of the Loch Lomond stadial c. 13,000–11,500 Cal BP these include Holme Pierrepoint and Hemington (Greenwood and Smith, 2005; Howard et al. 2011). The survival of waterlogged plant remains points to a strong potential for insect remains to also survive within these deposits.

6 CONCLUSIONS

The organic sediments have no direct relationship with identifiable human activity and are therefore exclusively of palaeoenvironmental interest. This interest is limited by the typical nature of the plant assemblage present, and the very short period spanned by the sequence, as compared to that from Askham Bog proper. As pollen studies provide information about vegetation change on a regional scale, further study of any preserved pollen within it will not add to the understanding of the formation of Askam Bog, or to the general body of knowledge about late glacial and Holocene climate change in this region.

Where this deposit does have further application is through the analysis of any insect remains. Should this type of evidence be present it would provide palaeoclimatic data for this part of the north east which is currently absent. Information of this nature is likely also to be preserved within the adjacent Askham Bog, so although any development in this area would provide an opportunity to enhance understanding of the end of the last glaciation, disturbance of these deposits would not represent an irretrievable loss of information. From a cultural heritage perspective, such information would be of limited value in understanding climatic influences on hunter-gatherer societies in the British Isles because of the very sparse nature of human occupation at this time.

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8 APPENDICES

APPENDIX 1 CORE DATA

Core	Field	Core height (m AOD)	Top (m AOD)	Base (m AOD)	Thickness (m)	Description
1	18	12.34	12.34	12.14	0.20	topsoil-dark brown, soft, silty clay
			12.14	12.04	0.10	light brownish grey, loose, soft, silty sand
			12.04	11.34	0.70	light orangey brown, soft friable, clayey sand
			11.34	11.09	0.25	light greyish brown, soft, malleable, silty clay
2	18	12.16	12.16	11.81	0.35	Topsoil - dark brown, soft, silty clay
			11.81	11.21	0.60	light brownish grey soft silty sand
			11.21	11.01	0.20	dark orangey brown, moist ,soft, silty sand
3	18	12.394	12.39	12.04	0.35	Topsoil - dark brown, soft, silty sand
			12.04	11.74	0.30	light brown grey silty sand
			11.74	11.09	0.65	dark orangey brown, moist ,soft, silty sand
4	18	12.52	12.52	12.12	0.40	Topsoil - dark brown, friable, silty clay
			12.12	11.82	0.30	greyish orange, soft, silty sand
			11.82	11.22	0.60	dark orange, soft, clayey sand
5	19	12.888	12.89	12.54	0.35	topsoil-dark brown, silty sand
			12.54	12.04	0.50	grey, silty sand
			12.04	11.94	0.10	grey, silty clay
6	19	12.721	12.72	12.32	0.40	Topsoil - dark greyish brown, silty sand, occasional small stone,
			12.32	11.97	0.35	greyish silty sand
			11.97	11.47	0.50	dark orange, clayey sand,
			11.47	10.22	1.25	dark grey, soft, clayey sand
7	19	12.574	12.57	12.22	0.35	Topsoil - dark greyish brown,
			12.22	11.82	0.40	orangey brown sand
			11.82	11.07	0.75	orangey brown, clayey sand
8	19	12.827	12.83	12.48	0.35	Topsoil - dark brown, friable, silty sand
			12.48	12.28	0.20	dark orange sand, loose, silty sand
			12.28	12.08	0.20	mid grey loose, silty sand, (lenses of clay)
			12.08	11.33	0.75	dark orange, friable, sandy clay
9	19	12.39	12.39	11.99	0.40	topsoil-dark brown, silty sand
			11.99	11.29	0.70	mid grey loose, silty clay
			11.29	11.09	0.20	dark grey silty clay
10	19	12.523	12.52	12.17	0.35	dark brown, silty sand
			12.17	11.92	0.25	clay natural-firm, blueish grey clay
11	19	12.538	12.54	12.24	0.30	Topsoil - dark brown, friable, silty sand
			12.24	11.89	0.35	mid grey, soft, clayey silty sand
			11.89	11.59	0.30	orange, soft, clayey sand
			11.59	11.29	0.30	blueish grey, natural clay
12	19	12.808	12.81	12.41	0.40	topsoil-dark brown, friable, silty sand
			12.41	12.21	0.20	mid grey, loose, silty sand
			12.21	11.46	0.75	mid orange grey, loose silty sand
			11.46	11.31	0.15	blueish grey clay natural
13	19	12.525	12.53	12.08	0.45	topsoil-dark brown, silty sandy clay, friable
			12.08	11.33	0.75	mid grey, silty clayey sand, fine loose
			11.33	11.03	0.30	orange sand, soft, clayey sand
14	19	12.578	12.58	12.23	0.35	topsoil-dark brown, friable, silty sand
			12.23	12.03	0.20	dark grey, loose, sand
			12.03	11.78	0.25	mid blue grey, clay
15	19	12.66	12.66	12.21	0.45	topsoil-dark brown silty sand
			12.21	12.16	0.05	orange grey sand, loose, clayey sand
			12.16	11.36	0.80	light grey, fine sand
			11.36	11.26	0.10	blueish grey clay
16	21	12.6	12.6	12.30	0.30	Topsoil - dark greyish brown sandy loam
			12.30	11.85	0.45	Coarse mid yellow sand
			11.85	11.56	0.29	Light / mid orangish yellow sand
			11.56	11.46	0.10	Fine pale pinkish brown sand
			11.46	11.35	0.11	Light / mid orangish yellow sand
17	21	12.629	12.63	12.23	0.40	topsoil-vegetation/turf line
			12.23	11.79	0.44	mid orange grey, loose, silty sand
18	25	12.09	12.09	11.79	0.30	topsoil-turf line, humic, friable
			11.79	11.19	0.60	greyish blue, soft, fine, sandy clay
19	25	11.823	11.82	11.42	0.40	topsoil- dark reddish brown, friable, silty sand

Core	Field	Core height (m AOD)	Top (m AOD)	Base (m AOD)	Thickness (m)	Description
			11.42	10.62	0.80	orange, soft, clay sand
			10.62	9.82	0.80	blueish clay, very wet, soft
20	25	11.612	11.61	11.21	0.40	dark brown, turf line
			11.21	11.06	0.15	dark reddish brown peat
			11.06	10.81	0.25	creamy grey, fine sand, soft
			10.81	10.51	0.30	blueish clayey sand, greyish white sand
21	19	12.406	12.41	12.01	0.40	topsoil-dark brown, silty sand
			12.01	10.61	1.40	whiteish grey sand
22	19	12.542	12.54	12.14	0.40	topsoil-dark brown, silty sand
			12.14	11.44	0.70	fine grey sand
			11.44	11.24	0.20	blue grey clay

APPENDIX 2 CATALOGUE OF PALAEOENVIRONMENTAL REMAINS

Waterlogged samples

Context	Sample	Total flot Vol (ml)	Plant remains	Material available for AMS	Comments
6808	2	250	+++	Yes	Contains *Potamogeton* sp, *Menyanthes trifoliatum*, *Ranunculus* sp, *Monocotyledon* roots, stem and rhizome and moss leaves

Key: + = rare (1–5), ++ = occasional (6–15), +++ = common (16–50) and ++++ = abundant (>50)

NB charcoal over 1cm is suitable for identification and AMS dating

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RADIOCARBON DATING CERTIFICATE

27 January 2015

Laboratory Code	SUERC-57448 (GU36231)
Submitter	Laura Bailey Headland Archaeology 13 Jane Street Edinburgh EH6 5HE
Site Reference	MOLY
Context Reference	6808
Sample Reference	2
Material	Seeds : Menyanthes trifoliata
$\delta^{13}C$ relative to VPDB	-25.0 ‰ assumed
Radiocarbon Age BP	11346 ± 34

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

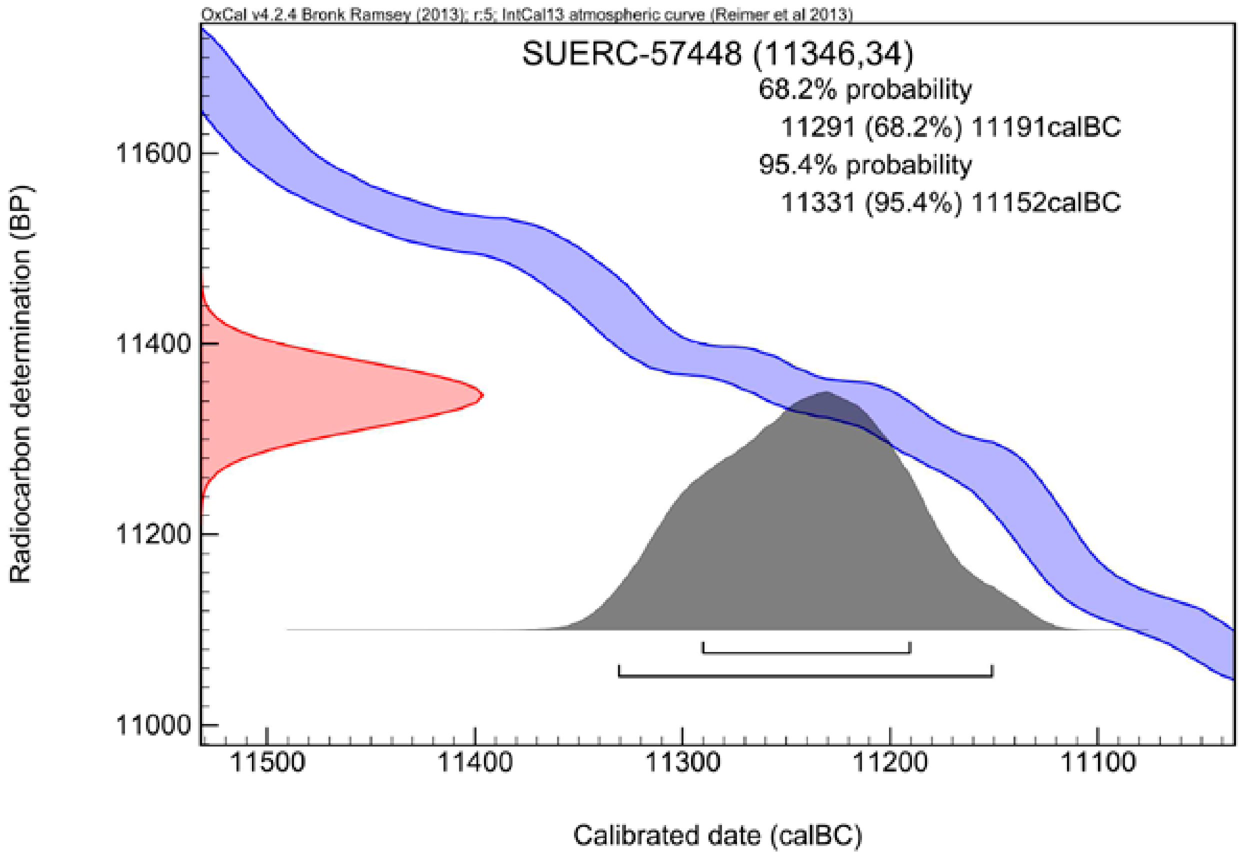
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 27/01/2015

Checked and signed off by :- P. Naysmith Date :- 27/01/2015

Calibration Plot



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