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PORTINGBURY HILLS, HATFIELD BROAD OAK, TAKELEY, ESSEX

Environmental Archaeological Assessment Report

NGR: TL 533 204

Site Code: HNA17

Scheduled Monument No: SM EX 98, HA 1002168

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1. NON-TECHNICAL SUMMARY

A programme of environmental archaeological assessment was undertaken on a borehole from the ditch at the Portingbury Hills site, in order (1) to clarify the nature of the sub-surface stratigraphy, and to investigate the nature, depth, extent and date of any organic/peat deposits within the ditch feature; (2) to investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity; (3) to investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland) in this area of Hatfield Forest.

The results of the environmental archaeological assessment and associated radiocarbon dating of the organic sediments within the ditch have improved our knowledge of the chronology and palaeoenvironmental history of the site. The two new radiocarbon dates for the organic sediments provide a *terminus ante quem* for the cutting of the ditch, which must have occurred prior to 395 to 205 cal BC (2345 to 2155 cal BP). These organic sediments provide a palaeoenvironmental record for the Middle Iron Age or later, with evidence for a combination of open meadow-type environments with cereal cultivation/crop processing, and some phases of woodland regeneration which might be indicative of phases of less intensive human activity in the local area.

Further analysis of the pollen assemblage recorded within borehole QBH4 at Portingbury Hills is recommended, in order to provide a more detailed vegetation reconstruction during the infilling of the ditch, and a better understanding of the associated phases of human activity identified during the assessment.

2. INTRODUCTION

2.1 Site context

This report summarises the findings arising out of the environmental archaeological assessment undertaken by Quaternary Scientific (University of Reading) on samples from a ditch feature at Portingbury Hills, Hatfield Broad Oak, Takeley, Essex (National Grid Reference: TL 533 204; Scheduled Monument No: SM EX 98, HA 1002168; Figure 1). Quaternary Scientific were commissioned by Essex County Council to undertake the investigations. The site lies within Hatfield Forest, a 403.2 hectare biological Site of Special Scientific Interest, National Nature Reserve and Nature Conservation Review site. The Forest contains a variety of historic environment features, including individual earthworks, earthwork complexes, historic buildings and associated below ground archaeology relating to the human occupation, exploitation and use of the Forest during the medieval, post medieval and modern periods (Essex County Council, 2016). Selected features within Hatfield Forest may pre-date the medieval period, with an Iron Age date speculated for Portingbury Hills (Essex County Council, 2016). Portingbury Hills itself is an earthwork enclosure consisting of three features: a hill and mound connected by a zig-zag causeway (formed by two parallel ditches) to another rectangular enclosure, measuring 30 by 21 metres and surrounded by a large ditch with a bank of up to 11 metres wide (Huggins, 1978).

The British Geological Survey (BGS) show the area of Hatfield Forest underlain by superficial deposits of Quaternary Till (Diamicton), overlying Thames Group (Clay, Silt, Sand And Gravel) bedrock (http://mapapps.bgs.ac.uk/geologyofbritain/home.html). Waterlogged deposits are thought to have accumulated in a number of areas of the Forest, including in the valley of the Shermore Brook, and in the ditch of Portingbury Hills (Essex County Council, 2016).

1.2 Geoarchaeological, Palaeoenvironmental & Archaeological Potential

Given the possibility of identifying waterlogged and potentially organic deposits in the ditch at Portingbury Hills, the site offers an opportunity to contribute to our understanding of vegetation history and landscape evolution in Hatfield Forest. The palaeoenvironmental potential of the sequences at the site thus requires further investigation. On the basis of the postulated date for Portingbury Hills, it is possible that organic units may have been accumulating at the site from the Iron Age period onwards. Organic-rich sediments (in particular peat) have high potential to provide a detailed reconstruction of prehistoric environments. In particular, there is the potential to increase knowledge and understanding of the interactions between hydrological change, human activity, vegetation succession and environmental change in this area of Hatfield Forest. Significant vegetation changes include the early Holocene/early Mesolithic transition from pine-dominated to mixed-deciduous dominated woodland; the late Mesolithic/Neolithic decline of elm woodland, the Neolithic colonisation and decline of yew woodland; the late Neolithic/early decline of wetland and dryland woodland. Such investigations are carried out through the assessment/analysis of palaeoecological remains (e.g. pollen, plant macrofossils & insects) and radiocarbon dating. In addition, soils and peat represent potential areas that might have been utilised or even occupied by prehistoric people, evidence of which may be preserved in the archaeological (e.g. features and structure) and palaeoenvironmental record (e.g. changes in vegetation composition).

1.3 Aims & Objectives

Additional borehole records are required in order to enhance our understanding of the sub-surface stratigraphy of the Portingbury Hills site, and for any further palaeoenvironmental assessment/analysis of the deposits. The aim of the palaeoenvironmental assessment is to establish a vegetational and landscape history of the site using the palaeoenvironmental evidence to supplement and enhance the known cartographic and documentary history of Hatfield Forest. Four significant research aims relevant to the geoarchaeological investigations at the site are therefore outlined here:

1. To clarify the nature of the sub-surface stratigraphy, and to investigate the nature, depth, extent and date of any organic/peat deposits within the ditch feature;
2. To investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity;
3. To investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland);
4. To integrate the new geoarchaeological record with other recent work in the local area for publication in an academic journal.

In order to address the first three of these aims, a total of four geoarchaeological boreholes were put down within the ditch feature as shown in Figure 2, and a programme of environmental archaeological assessment undertaken on one of these (QBH4).

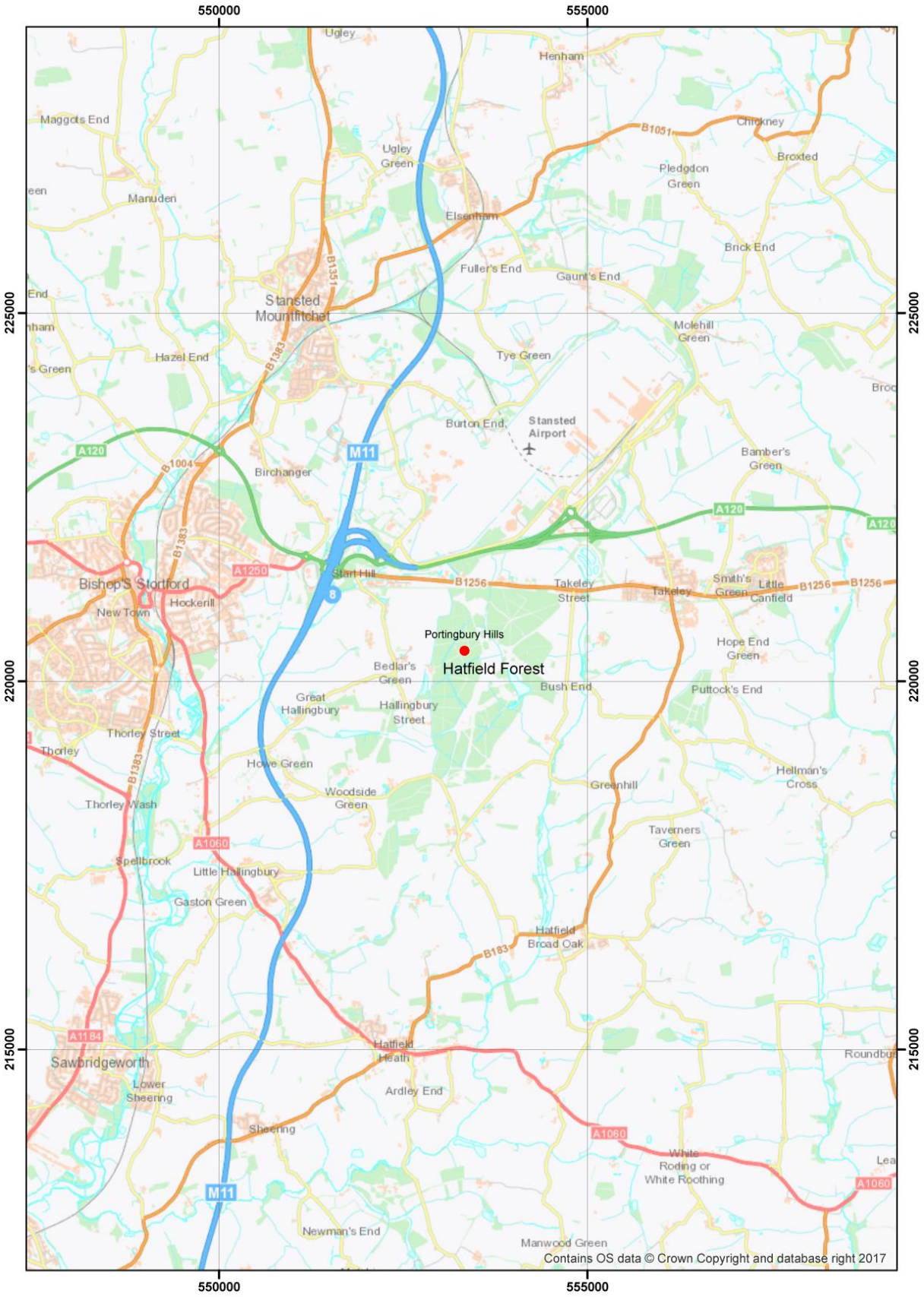

Figure 1: Location of Portingbury Hills, Hatfield Broad Oak, Takeley, Essex. Figure provided by Essex County Council.

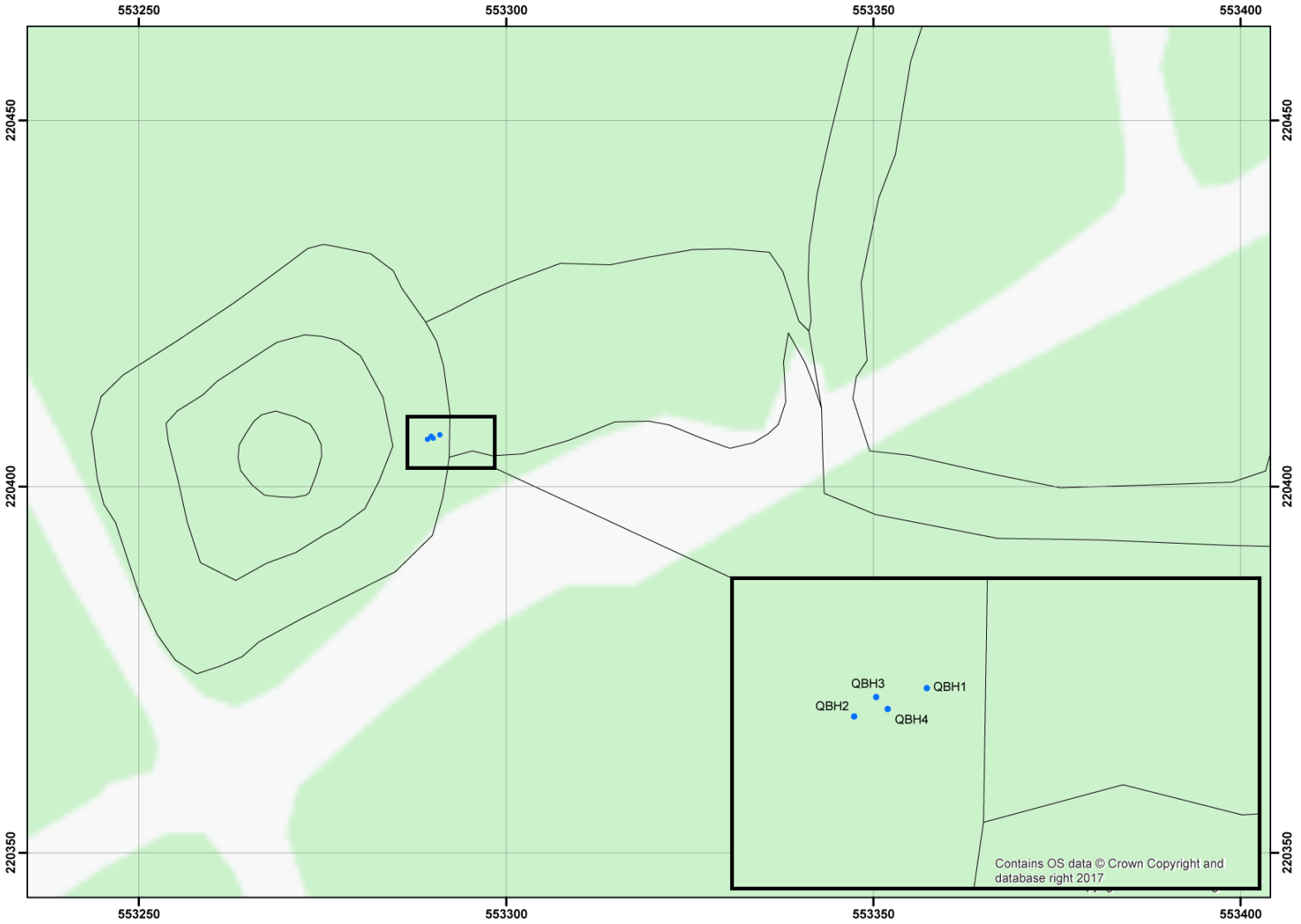

Figure 2: Location of the geoarchaeological boreholes at Portingbury Hills, Hatfield Broad Oak, Takeley, Essex. Survey data provided by Essex County Council/Historic England.

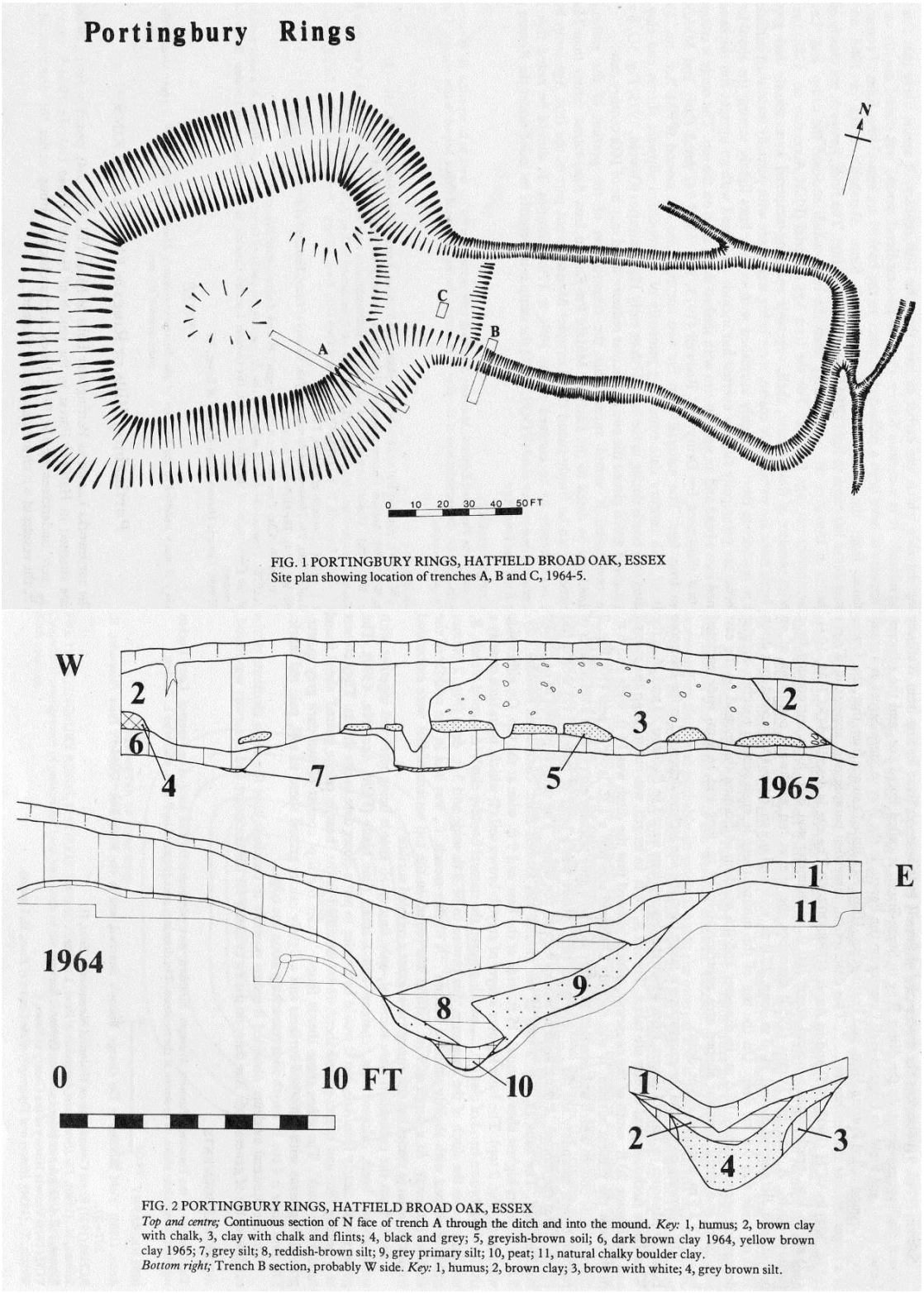

Figure 3: Results of the Portingbury Rings excavation as shown by Wilkinson (1978).

3. METHODS

3.1 Field investigations & lithostratigraphic descriptions

A total of four geoarchaeological boreholes (boreholes QBH1 to QBH4) were put down within the ditch feature at Portingbury Hills in October 2017 by Quaternary Scientific (Figure 2). The borehole core samples were recovered using an Eijkelkamp window sampler and gouge set using an Atlas Copco TT 2-stroke percussion engine. This coring techniques provide a suitable method for the recovery of continuous, undisturbed core samples and provides sub-samples suitable for not only sedimentary and microfossil assessment and analysis, but also macrofossil analysis. Spatial co-ordinates for each borehole were obtained using a Leica Differential GPS (see Table 1). Laboratory-based lithostratigraphic descriptions of the new borehole samples was carried out using standard procedures for recording unconsolidated sediment and peat, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter) and inclusions (e.g. artefacts). The procedure involved: (1) cleaning the samples with a spatula or scalpel blade and distilled water to remove surface contaminants; (2) recording the physical properties, most notably colour; (3) recording the composition e.g. gravel, fine sand, silt and clay; (4) recording the degree of peat humification, and (5) recording the unit boundaries e.g. sharp or diffuse. The results are displayed in Tables 2 to 5 and in Figure 4.

Old Woman's Weaver Marsh

Additional attempts were made at coring in the area of the Old Woman's Weaver Marsh (centred on National Grid Reference 553596, 220817). Due to the dense nature of the vegetation in this area, hand-coring equipment (a Russian/D-section auger) was used, although many of these came down on to a stoney clay thought to represent the Quaternary Till (Diamicton) (see Discussion).

Table 1: Spatial data for the new geoarchaeological boreholes

Name	Easting	Northing	Elevation (m OD)
QBH1	553290.95	220407.06	96.40
QBH2	553289.31	220406.42	96.55
QBH3	553289.80	220406.86	96.47
QBH4	553290.07	220406.58	96.40

3.2 Organic matter determinations

A total of 28 subsamples from borehole QBH4 were taken for determination of the organic matter content (Table 6; Figure 4). These records were important as they can identify increases in organic matter possibly associated with more terrestrial conditions. The organic matter content was determined by standard procedures involving: (1) drying the sub-sample at 110^{0}C for 12 hours to remove excess moisture; (2) placing the sub-sample in a muffle furnace at 550°C for 2 hours to remove organic matter (thermal oxidation), and (3) re-weighing the sub-sample obtain the 'loss-on-ignition' value. The samples were then re-weighed after 2 hours at 950°C for determination of the calcium carbonate content (see Bengtsson & Enell, 1986).

3.3 Radiocarbon dating

Two subsamples of unidentified twig wood (<2-3 years old) were extracted from towards the base of the two organic-rich units within borehole QBH4 for radiocarbon dating. The samples were submitted for AMS radiocarbon dating to the BETA Analytic Radiocarbon Dating Facility, Miami, Florida. The results have been calibrated using OxCal v4.2 (Bronk Ramsey, 1995; 2001 and 2007) and the IntCal13 atmospheric curve (Reimer *et al.*, 2013). The results are displayed in Figure 4 and in Table 7.

3.4 Pollen assessment

Eight subsamples from borehole QBH4 were extracted for an assessment of pollen content. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) adding two tablets of the exotic clubmoss *Lycopodium clavatum* to provide a measure of pollen concentration in each sample; (3) deflocculation of the sample in 1% Sodium pyrophosphate; (4) sieving of the sample to remove coarse mineral and organic fractions (>125µ); (5) acetolysis; (6) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm^3); (7) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the University of Reading pollen type collection and the following sources of keys and photographs: Moore *et al* (1991); Reille (1992). The assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of pollen grains and spores, and the principal taxa on four transects (10% of the slide) (Table 8).

3.5 Macrofossil assessment

A total of three small bulk samples were extracted from borehole QBH4 for the recovery of macrofossil remains including waterlogged plant macrofossils, wood, insects and Mollusca. The extraction process involved the following procedures: (1) removing a sample of either 5 or 10cm in thickness; (2) measuring the sample volume by water displacement, and (3) processing the sample by wet sieving using 300µm and 1mm mesh sizes. Each sample was scanned under a stereozoom microscope at x7-45 magnifications, and sorted into the different macrofossil classes. The concentration and preservation of remains was estimated for each class of macrofossil (Table 9). Preliminary identifications of the waterlogged seeds (Table 10) have been made using modern comparative material and reference atlases (e.g. Cappers *et al.,* 2006; NIAB, 2004). Nomenclature used follows Stace (2005).

4. RESULTS, INTERPRETATION & DISCUSSION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS & RADIOCARBON DATING

The results of the lithostratigraphic descriptions are displayed in Tables 2 to 5 and in Figure 4. The full sequence of sediments recorded in the boreholes comprises:

Unit 1 - Topsoil (humic)
Unit 2 - Ditch fill – predominantly silty/clayey with some organic-rich (peaty) units
Unit 3 - Diamicton – clayey, gravelly with some cobble-sized clasts

4.1 Diamicton

The basal unit recorded within the boreholes was a stoney clay and silt, with frequent gravel or cobble sized clasts of chalk, recorded at between 93.78 and 93.40m OD in borehole QBH4. This unit was not reached in boreholes QBH1 to QBH3, but is considered to represent the 'natural' surface in to which the ditch was cut, and equivalent to the 'natural chalky boulder clay' described by Wilkinson (1978) at the base of their trench B and the superficial geology of Quaternary Till (Diamicton) shown by the BGS.

4.2 Ditch fill

The material infilling the ditch was recorded in boreholes QBH1 to QBH4 as a predominantly silty clay with occasional sand or gravel clasts, although organic sub-units were present in boreholes QBH2, QBH3 and QBH4. This material is consistent with the infilling of the ditch by a combination of both low-energy alluvial and colluvial processes, with finer material being washed in to the ditch from its edge and the adjacent mound and possibly redistributed under waterlogged conditions. Although no conclusively anthropogenic material was identified in the boreholes, some of the sediment may also have been dumped in to the ditch over time.

The highly organic units in boreholes QBH2, QBH3 and QBH4 are described variously as very organic clay, very organic silt or silty peat; in boreholes QBH2 and QBH4 two distinct organic units were recorded, with only one identified in QBH3. In QBH4 the lower of these units (94.49 to 94.44m OD), described as a very dark grey moderately humified silty, herbaceous peat (up to 30% organic content), was radiocarbon dated to 395 to 205 cal BC (Iron Age; 2345 to 2155 cal BP). The base of the upper organic unit in QBH4 (94.99 to 94.68m OD), described as very organic silt or an organic sandy silt (although recorded by loss-on-ignition analysis as up to 52% organic), were radiocarbon dated to 370 to 200 cal BC (Iron Age; 2320 to 2150 cal BP).

In the absence of any evidence for disturbance/redistribution of these deposits, the organic units recorded within boreholes QBH2 to QBH4 appear to represent *in situ* organic accumulation, and are thus indicative of waterlogged, boggy conditions within the ditch, supporting the growth of sedge fen type vegetation during the Middle Iron Age.

4.3 Topsoil

The modern topsoil at the site is described as an organic rich, clayey soil, for which the underlying silty and clayey sediments of the ditch fill form the parent material.

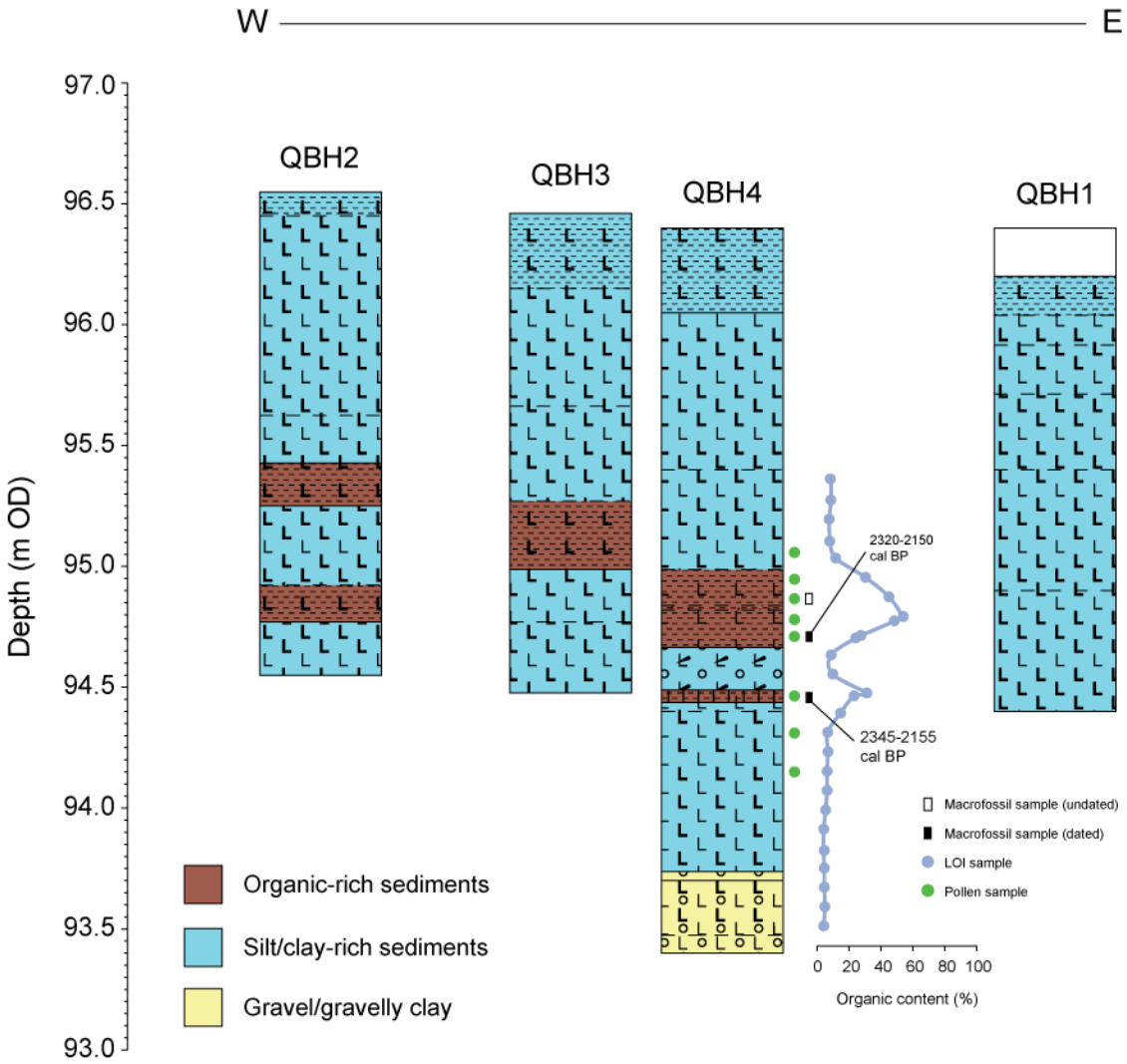

Figure 4: Results of the lithostratigraphic descriptions, organic content analysis (LOI) and radiocarbon dating of borehole QBH4, Portingbury Hills, Hatfield Broad Oak, Takely, Essex.

Table 2: Lithostratigraphic description of borehole QBH1, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
96.40 to 96.20	0.00 to 0.20	VOID	TOPSOIL
96.20 to 96.04	0.20 to 0.36	Very dark grey organic-rich, clayey topsoil. Diffuse contact in to:	
96.04 to 95.92	0.36 to 0.48	As3 Ag1; dark grey silty clay with modern rooting. Diffuse contact in to:	DITCH FILL
95.92 to 95.72	0.48 to 0.68	As3 Ag1 Ga+ Gg+; grey mottled reddish brown silty clay with traces of sand and occasional chalk fragments. Diffuse contact in to:	
95.72 to 95.40	0.68 to 1.00	As3 Ag1; grey with occasional reddish brown silty clay. Blocky. Diffuse contact in to:	
95.40 to 94.90	1.00 to 1.50	As3 Ag1 Gg+; grey/reddish brown silty clay with occasional chalk fragments. Diffuse contact in to:	
94.90 to 94.40	1.50 to 2.00	As3 Ag1 Gg+; grey silty clay with occasional chalk fragments. Orange mottling. Becoming firmer with depth.	

Table 3: Lithostratigraphic description of borehole QBH2, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
96.55 to 96.45	0.00 to 0.10	Very dark grey organic-rich, clayey topsoil. Diffuse contact in to:	TOPSOIL
96.45 to 95.63	0.10 to 0.92	As3 Ag1 Gg+; greyish brown silty clay with chalk fragments and iron staining. Blocky. Diffuse contact in to:	DITCH FILL
95.63 to 95.43	0.92 to 1.12	As3 Ag1; grey soft silty clay. Variously blocky to massive. Very sharp contact in to:	
95.43 to 95.25	1.12 to 1.30	Sh2 As2; very dark grey very organic clay grading in to As3 Sh1 organic clay. Sharp contact in to:	
95.25 to 94.93	1.30 to 1.62	As3 Ag1 Gg+; grey soft silty clay. Variously blocky to massive. Occasional chalk clasts >3cm in diameter. Diffuse contact in to:	
94.93 to 94.77	1.62 to 1.78	Sh2 As2 Dl+; very dark grey very organic clay with occasional detrital wood. Very sharp contact in to: Very sharp contact in to:	
94.77 to 94.55	1.78 to 2.00	As3 Ag1; grey silty clay. Firm and blocky.	

Table 4: Lithostratigraphic description of borehole QBH3, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
96.47 to 96.17	0.00 to 0.30	Very dark grey organic-rich, clayey topsoil. Diffuse contact in to:	TOPSOIL
96.17 to 95.67	0.30 to 0.80	As3 Ag1 Gg+; greyish brown silty clay with occasional chalk fragments. Diffuse contact in to:	DITCH FILL
95.67 to 95.27	0.80 to 1.20	Ag3 As1 Sh+; grey silty clay with traces of organic matter. Diffuse contact in to:	

95.27 to 94.99	1.20 to 1.48	As3 Sh1; dark grey organic clay grading to Sh3 As1 clayey peat. Very sharp contact in to:	
94.99 to 94.77	1.48 to 1.70	Ag3 As1 Ga+ Gg+; soft grey silty clay with occasional chalk fragments and traces of sand. Diffuse contact in to:	
94.77 to 94.47	1.70 to 2.00	As3 Ag1 Gg+ Dl+; grey silty clay with occasional chalk fragments and detrital wood/rooting.	

Table 5: Lithostratigraphic description of borehole QBH4, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
96.40 to 96.05	0.00 to 0.35	Very dark grey organic-rich, clayey topsoil. Sharp contact in to:	TOPSOIL
96.05 to 95.40	0.35 to 1.00	As3 Ag1 Gg+; greyish brown silty clay with occasional chalk fragments and iron staining. Blocky. Diffuse contact in to:	DITCH FILL
95.40 to 94.99	1.00 to 1.41	As3 Ag1 Gg+; greyish brown silty clay with occasional small (<10mm) chalk clasts. Frequent iron staining. Diffuse contact in to:	
94.99 to 94.84	1.41 to 1,56	Sh2 Ag2 As+; very dark grey very organic silt with traces of clay and some small charcoal fragments (<5mm). Diffuse contact in to:	
94.84 to 94.82	1.56 to 1.58	Ag2 Sh1 Ga1 Gg+; dark greyish brown organic, sandy clay with occasional small chalk clasts (<5mm). Diffuse contact in to:	
94.82 to 94.68	1,58 to 1.72	Sh2 Ag2 As+; very dark grey very organic silt with traces of clay. Sharp contact in to:	
94.68 to 94.49	1.72 to 1.91	Ag2 Dh1 Gg1 As+; dark greyish brown gravelly silt with detrital herbaceous material and occasional Mollusca fragments. Sharp contact in to:	
94.49 to 94.44	1.91 to 1.96	Sh2 $Th^2$1 Ag1; humo. 2; very dark grey moderately humified silty, herbaceous peat. Sharp contact in to:	
94.44 to 94.40	1.96 to 2.00	Ag2 As2 Dh+ Gg+; greyish brown silt and clay with traces of detrital herbaceous material/rooting and occasional gravel clasts. Diffuse contact in to:	
94.40 to 93.78	2.00 to 2.62	Ag2 As2 Dh+ Gg+; greyish brown silt and clay with traces of detrital herbaceous material/rooting and occasional gravel clasts. Iron staining. Sharp contact in to:	
93.78 to 93.75	2.62 to 2.65	Chalk cobble	DIAMICTON
93.75 to 93.47	2.65 to 2.93	As2 Ag1 Gg1; yellowish brown silty, gravelly clay. Clasts are chalk, <10mm, rounded to sub-angular. Diffuse contact in to:	
93.47 to 93.40	2.93 to 3.00	Gg2 As1 Ag1; silty clayey chalk gravel. Chalk clasts are angular, 20-30mm in diameter.	

Table 6: Results of the borehole QBH4 organic matter determinations, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)		Organic matter content (%)
From	To	
95.35	95.34	7.80
95.27	95.26	7.74
95.19	95.18	6.63
95.11	95.10	6.85
95.10	95.09	6.96
95.03	95.02	10.78
94.95	94.94	29.74
94.87	94.86	44.69
94.79	94.78	52.74
94.77	94.76	48.20
94.71	94.70	26.79
94.70	94.69	23.60
94.63	94.62	7.85
94.55	94.54	8.94
94.47	94.46	30.86
94.46	94.45	22.35
94.39	94.38	13.80
94.31	94.30	5.61
94.23	94.22	5.83
94.15	94.14	5.26
94.07	94.06	5.23
93.99	93.98	4.32
93.91	93.90	3.15
93.83	93.82	3.04
93.75	93.74	3.42
93.67	93.66	3.50
93.59	93.58	3.87
93.51	93.50	3.16

Table 7: Results of the borehole QBH4 radiocarbon dating, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Laboratory code / Method	Material and location	Depth (m OD)	Uncalibrated radiocarbon years before present (yr BP)	Calibrated age BC/AD (BP) (2-sigma, 95.4% probability)	δ13C (‰)
BETA 475525 / AMS	Twig wood; organic unit	94.73 to 94.68	2210 ± 30	370 to 200 cal BC (2320 to 2150 cal BP)	-26.8
BETA 475526 / AMS	Twig wood; organic unit	94.49 to 94.44	2250 ± 30	395 to 205 cal BC (2345 to 2155 cal BP)	-25.3

5. RESULTS & INTERPRETATION OF THE POLLEN ASSESSMENT

Samples were prepared for pollen assessment at regular intervals through the most organic-rich deposits of borehole QBH4. The results indicate a high concentration and preservation of remains in all samples assessed except basal sample 94.15m OD (2.25m bgl) (Table 8).

The ditch feature investigated represents a small depositional basin, and thus will have a correspondingly small pollen sources area, reflecting predominantly the vegetation of the immediate locality of the site. Towards the base of the sequence, the sample taken at 94.31m OD (2.09m bgl) indicates a relatively open environment dominated by grasses (Poaceae) and herbaceous taxa such as ribwort plantain (*Plantago lanceolata*), daisies (Asteraceae), dock / sorrel (*Rumex* undifferentiated) and buttercup (*Ranunculus* type) indicative of a relatively open meadow-type environment. Sporadic occurrences of cereals (*Cereale* type), fat hen (*Chenopodium* type) and black knapweed (*Centaurea nigra*) are also suggestive of nearby disturbed ground and/or cultivation/crop processing. Scrub woodland dominated by hazel (*Corylus* type) with sporadic oak (*Quercus*), birch (*Betula*) and ash (*Fraxinus*) also grew in the nearby vicinity.

The overlying samples contained a similar diversity of pollen, but the ratio of herbaceous to arboreal taxa varied; indeed in many of the samples, the herbaceous assemblage was far outweighed by trees and shrubs, which tended to be dominated by oak and hazel. Since the material infilling the feature may have accumulated after its primary use, it is possible that the periods of greater tree/shrub growth are representative of woodland regeneration, whilst the higher number of herbaceous taxa are indicative of more intensive human activity in the local area. Throughout this period, occasional aquatics of bogbean (*Menyanthes trifoliata*), bur-reed (*Sparganium* type) and sedges (Cyperaceae) are recorded alongside alder (*Alnus*) and willow (*Salix*) suggesting the growth of these plants either on the margins of the feature, or within other nearby damp environments.

Table 8: Results of the pollen assessment from QBH4, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

	Depth (m OD)	95.11	94.95	94.87	94.78	94.71	94.47	94.31	94.15
Latin name	Common name								
Trees									
Alnus	alder		1			1	1	2	
Quercus	oak	3	4		31	23	2	5	
Pinus	pine		2				1		
Ulmus	elm					1			
cf Taxus	yew						1		
Betula	birch					1		1	
Fraxinus	ash			1				1	
Shrubs									
Calluna vulgaris	heather							1	
Corylus type	e.g. hazel	2	6		7	11	15	17	
Salix	willow		4				11		
Herbs									
Cyperaceae	sedge family	4				1		1	
Poaceae	grass family	5	22	9	13	4	5	37	
Cereale type	e.g. barley		3	7			1	4	
Asteraceae	daisy family		3					2	
Lactuceae	dandelion family	1	2	1	1				
Plantago lanceolata	Ribwort plantain	1	1	1	1	1		4	
Chenopodium type	goosefoot family	1						1	
Caryophyllaceae	pink family				1				
Rumex undiff.	dock / sorrel							1	
Apiaceae	carrot family		1			2		3	
Ranunculus type	buttercup / water-crowsfoot						1	1	
Centaurea nigra	black knapweed			1				4	
Filipendula type	meadowsweet			1	1	1		2	
Potentilla type	cinquefoil					1			
Rosaceae	rose family					1	1		
Sinapis type	brassica family				1				
Aquatics									
Sparganium type	bur-reed		1	3					
cf Menyanthes trifoliata	bog bean				1	2			
Spores									
Pteridium aquilinum	bracken	2	2	1				1	
Filicales	ferns	1		1					

	Depth (m OD)	95.11	94.95	94.87	94.78	94.71	94.47	94.31	94.15
Latin name	Common name								
Polypodium vulgare	polypody		2					2	
Unidentifiable			20	2	16	15	3	8	
Total Land Pollen (grains counted)		17	49	21	56	48	40	87	0
Concentration*		2-3	5	2-3	5	5	5	5	0
Preservation**		2	2-3	3	4	4	3-4	3-4	0
Microcharcoal Concentration***		1	0	1	1	1	0	2	0
Suitable for further analysis		YES	YES	YES	YES	YES	YES	YES	NO

*Key: *Concentration: 0 = 0 grains; 1 =1-75 grains, 2 = 76-150 grains, 3 =151-225 grains, 4 = 226-300, 5 =300+ grains per slide; **Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent; ***Microcharcoal Concentration: 0 = none, 1= negligible, 2 = occasional, 3 = moderate, 4 = frequent, 5 = abundant*

6. RESULTS & INTERPRETATION OF THE MACROFOSSIL ASSESSMENT

A total of three small bulk samples were extracted and processed for the recovery of macrofossil remains, including waterlogged plant macrofossils, wood, insects and Mollusca (Table 9). The samples were focussed on the organic-rich units within borehole QBH4.

Macrofossil preservation was relatively low within the three samples from borehole QBH4, with no identifiable macrofossils found in the uppermost sample (94.89 to 94.84m OD). Waterlogged wood was found in low to moderate quantities in the two lower samples (94.73 to 94.68 and 94.49 to 94.44m OD), along with low quantities of insect remains. Waterlogged seeds were identified in low concentrations in the sample from 94.49 to 94.44m OD, along with low quantities of charcoal that may be suitable for identification (2-4mm in diameter).

The seed assemblage (Table 10) in the samples from QBH4 is too small to attempt a full environmental interpretation, but the species present (*Sambucus nigra/racemosa* (elder) and *Ranunculus repens* (creeping buttercup)) in the sample from 94.49 to 94.44m OD are consistent with a damp environment either in or on the margins of the ditch.

Table 9: Results of the macrofossil assessment of samples from borehole QBH4, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

				Charred					Waterlogged			Mollusca		Bone			
Depth (m OD)	Unit	Volume processed (ml)	Fraction	Charcoal (>4mm)	Charcoal (2-4mm)	Charcoal (<2mm)	Seeds	Chaff	Wood	Seeds	Sedge remains (e.g. stems/roots)	Whole	Fragments	Large	Small	Fragments	Insects
94.89 to 94.84		50	>300µm	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94.73 to 94.68		50	>300µm	-	-	-	-	-	4	-	-	-	-	-	-	-	1
94.49 to 94.44		50	>300µm	-	1	-	-	-	2	1	-	-	-	-	-	-	1

Key: 0 = Estimated Minimum Number of Specimens (MNS) = 0; 1 = 1 to 25; 2 = 26 to 50; 3 = 51 to 75; 4 = 76 to 100; 5 = 101+

Table 10: Results of the seed identifications from borehole QBH4, Portingbury Hills, Hatfield Broad Oak, Takely, Essex

Depth (m OD)	Unit	Seed identification		Quantity
		Latin name	Common name	
94.89 to 94.84		-	-	-
94.73 to 94.68		-	-	-
94.49 to 94.44		*Sambucus nigra/racemosa* *Ranunculus repens*	elder creeping buttercup	1 3

7. DISCUSSION

The aims of the environmental archaeological assessment at the Portingbury Hills site were (1) to clarify the nature of the sub-surface stratigraphy, and to investigate the nature, depth, extent and date of any organic/peat deposits within the ditch feature; (2) to investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity; (3) to investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland) in this area of Hatfield Forest.

The full sequence of sediments within the ditch at Portingbury Hills was recorded within borehole QBH4. The sediments in to which the ditch was cut are recorded at the base of QBH4 as a stoney clay and silt, equivalent to the 'natural chalky boulder clay' described by Wilkinson (1978) at the base of their trench B, and the superficial geology of Quaternary Till (Diamicton) shown in this area by the BGS. The material infilling the ditch is a predominantly silty clay, with occasional sand or gravel clasts, although richly organic sub-units do exist and were recorded within three of the four boreholes (QBH2, QBH3 and QBH4). These richly organic units are described variously as very organic clay, very organic silt or silty peat; in boreholes QBH2 and QBH4 two distinct organic units were recorded, with only one identified in QBH3. In QBH4 the lower of these units (94.49 to 94.44m OD), described as a very dark grey moderately humified silty, herbaceous peat was radiocarbon dated to 395 to 205 cal BC (Iron Age; 2345 to 2155 cal BP). The base of the upper organic unit in QBH4 (94.99 to 94.68m OD), described as very organic silt or an organic sandy silt, was dated to 370 to 200 cal BC (Iron Age; 2320 to 2150 cal BP). These organic units appear to represent *in situ* organic accumulation, and are thus indicative of waterlogged, boggy conditions within the ditch, supporting the growth of sedge fen type vegetation during the Middle Iron Age.

Towards the base of the organic sequence a relatively open environment dominated by grasses and herbaceous taxa is indicative of a relatively open meadow-type environment, with evidence for cereal cultivation/crop processing and associated disturbed ground weed taxa. Scrub woodland dominated by hazel with sporadic oak, birch and ash is likely to have been growing in the vicinity of the site. In the overlying samples the pollen assemblage is similar, although the ratio of herbaceous to arboreal taxa is variable, with the herbaceous assemblage in some samples far outweighed by trees and shrubs, which tended to be dominated by oak and hazel. It is important to note that since the material infilling the feature may have accumulated after its primary use, it is possible that the periods of greater tree/shrub growth are representative of woodland regeneration, whilst the higher number of herbaceous taxa may be indicative of more intensive human activity in the area of the site. Throughout this period, occasional aquatic species and sedges are recorded alongside alder and willow, suggesting the growth of these wetland-type plants either within or on the margins of the feature, or within other nearby damp environments.

Old Woman's Weaver Marsh

During the fieldwork Additional attempts were made at coring in the area of the Old Woman's Weaver Marsh (centred on National Grid Reference 553596, 220817). Due to the dense nature of the vegetation in this area, hand-coring equipment was used to attempt several boreholes in the

vicinity of this site. However, each of these boreholes came down on to what appeared to be stoney clay, overlain by a thin humic topsoil. An additional, more intensive programme of geoarchaeological survey using a powered auger may be able to identify organic deposits in this area, although on the basis of the hand-cored boreholes, the superficial geology appears to be the Quaternary Till (Diamicton).

8. CONCLUSION & RECOMMENDATIONS

The results of the environmental archaeological investigation and the associated radiocarbon dating of the organic sediments have improved our knowledge of the chronology and palaeoenvironmental history of the Portingbury Hills site. Previous excavation of the site (Wilkinson, 1978) provided tentative evidence for an Iron Age date. The two new radiocarbon dates for the organic sediments provide a *terminus ante quem* for the cutting of the ditch, which must have occurred prior to 395 to 205 cal BC (2345 to 2155 cal BP).

Further analysis of the pollen assemblage recorded within borehole QBH4 at Portingbury Hills is recommended, in order to provide a more detailed vegetation reconstruction during the infilling of the ditch and of nearby human activities. In particular, further identification of the herbaceous assemblage within these samples may help to characterise the vegetation history of the site in more detail, and provide a better understanding of the different phases of human activity identified during the assessment.

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