ENVIRONMENTAL REMAINS FROM A MOATED SITE AT MARSTON MORETAINE, BEDFORSHIRE.

By Rob Scaife, with Nick Blake and Kate Nicholson

ABSTRACT

The archaeological investigation of on of Marston Moretaine's three moated sites (NGR SP 9955 4108) was carried out by Hertfordshire Archaeological Trust (now Archaeological Solutions Ltd) in February to March 2003 and January to February 2004. The moat was identified, and two boreholes were sunk through its deposits, to obtain samples for analysis of stratigraphy, pollen, diatoms and plant pacrofossils The moat was shown to have been muddy and seasonally water filled rather than having been a permanently water holding feature. The landscape of the area was shown to have been predominantly grassland, with some areas of managed woodland surviving.

INTRODUCTION

Kate Nicholson

In February and March 2003 Hertfordshire Archaeological Trust (HAT, now Archaeological Solutions Ltd) carried out an archaeological Trial Trench Evaluation on land south and east of Manor Road, Marston Moretaine, Bedfordshire (NGR SP 9955 4108) (Fig. 1) in advance of the redevelopment of the site for residential purposes (Rowlandson *et al*. 2003). A subsequent watching brief was undertaken during the cutting of service trenches in January/ February 2004 (Roberts *et al*. 2004). The archaeological investigation was commissioned by MEPK Architects on behalf of the Aragon Housing Association.

The investigations revealed the remains of a moat whose position could be approximately correlated with that shown on mid 19th century maps of Marston Moretaine (Fig. 2). Two boreholes were sunk into the moat to reveal the stratigraphy and to allow samples of pollen, diatoms and plant macrofossils to be extracted.

BACKGROUND

Marston Moretaine is located in west Bedfordshire, *c*. 6.5 km south south west of Kempston. The site lies on the southern edge of the village between the church of St Mary to the east and the Manor Road housing estate to the west. Prior to the project commencing, the site comprised an area of *en bloc* garages and hardstanding, serving adjacent residential properties, within an area of some 0.19ha. (Fig. 1). The underlying geology of the site is the Oxford Clay, with local drift deposits of sand/gravel the overlying soils are of the Evesham 3 association.

The entry in the Domesday survey for the manors of Marston and Wroxhall indicates that woodland was plentiful in the area, there being enough to support a total of 600 pigs (Williams and Martin 2002). The village itself seems to have been small until the 18th or 19th century, though there are records of it having had a weekly market and annual fair for a time in the 14th century (Page 1912, 311). Parts of the parish church of St Mary the Virgin, located *c*. 50m east of the site, date to *c*. 1340 AD (*ibid*., 311).

A possible deserted medieval village is attested by uneven ground to the south of the church (Page 1912, 308), but no documentary evidence exists to substantiate this, and no archaeological investigations have been carried out in the area to date. Fieldwork east of the moat at Moat Farm (Shotliffe and Crick 1999) identified areas of medieval settlement and agricultural field systems dating to the 12th to 13th centuries and later.

Moated sites, or homestead moats, are widely distributed throughout England and lowland Wales, but with particular concentrations in East Anglia and the south Midlands (Aberg 1978). They are generally accepted to be a mid 12th to late 14th century phenomenon (Taylor 1973). It is possible that they had a defensive function (Le Patourel and Roberts 1978, 46), but in the majority of cases the moats are too narrow to make viable defensive features or are crossed by permanent causeways, and the platform enclosed by the moat is rarely raised above the level of the surrounding land. It is more likely that they reflect economic growth, increasing population and unprecedented prosperity in the period prior to the Black Death. Although some undoubtedly functioned as fish ponds or habitats for water fowl, moated sites are likely to have been a fashionable expression of status among a newly emergent class of prosperous free farmers (Rackham 1994; Taylor 1973; Hunter 1999, 126).

Several moated sites are known in the vicinity of Marston Moretaine, three within the village itself (HER 53, 54 and 8317 – the site of the current investigation). All three of the village's moats are shown on the Tithe Map of *c.* 1840 and a map of 1859, the moat at the current site is not indicated on the 1st edition Ordnance Survey map (1883), though a line of trees approximately follows the course of the moat's western arm, as shown on the earlier maps (Fig. 2).

The Churchyard of St Mary's, immediately to the south west of the site, was extended in 1873 and in 1899 (HER 8930; Page 1912, 308). The extended churchyard enclosed the eastern arm and much of the interior of the moated site. Records of the 1899 extension state that *"horses and carts were lent gratuitously for carting earth to fill up old moats and for other levelling"* (List of Subscribers for 1899 extension; HER 8930), and it is likely that this refers to the current site. However, given its absence on the 1883 OS Map, it is possible that it was a remaining depression that was filled in during 1899. The moat was still evident in aerial photographs taken by the RAF in 1946, its west arm (within the area of the site) being visible as an earthwork and its northern arm as a less regular depression. After World War II a number of garages were constructed on the site. These were demolished in advance of the site's redevelopment.

In describing the extension of St Mary's Churchyard in 1899, the Victoria County History describes the site as a "*moated farmhouse*" (Page 1912, 308). However, it is not clear whether the presence of a farmhouse on this site was remembered in the early 20th century, or if this was an assumption about the nature of moated sites.

PREVIOUS ARCHAEOLOGICAL WORK

A watching brief immediately north of the current site did not uncover any remains of the moat. Finds were predominantly modern brick and concrete rubble, possibly associated with known dumping in this area when garages were constructed after World War II (HER 8317). Subsequent work in advance of a cycle path immediately adjacent to the site revealed only a small area of burning possibly representing a path (Albion Archaeology 2001).

THE ARCHAEOLOGICAL INVESTIGATIONS

The evaluation trenches (each 30 x 1.8m) were excavated using a 180° mechanical excavator. Topsoil and recent overburden was mechanically excavated, thereafter all further excavation was undertaken by hand. Exposed surfaces were cleaned as appropriate and examined for archaeological features. The archaeological monitoring comprised the observation of all groundworks, inspection of subsoil and natural deposits for archaeological features, the examination of spoil heaps and the recording of soil profiles. During both phase of the investigation, all deposits were recorded using *pro-forma* recording sheets, drawn to scale and photographed as appropriate. A metal detector was in use throughout the investigation, and excavated spoil was searched for residual finds.

Detailed descriptions of the features and finds have been reported elsewhere (Rowlandson *et al* 2003; Roberts *et al* 2004); what is presented here is a summary of that information. In this report, all deposits and the single feature identified during the archaeological monitoring phase of the investigation have had their labels changed from the L1000 series to the L2000 series, as numbers were reused between the two phases of the investigation.

RESULTS OF THE INVESTIGATIONS

The Oxford Clay was found to slope downwards towards Elstow Brook, to the south east of the site; it was encountered at a minimum depth of 0.50m and a maximum depth of 0.71m beneath the modern ground surface (the latter in a service trench south eastof the trial trenches). The overlying deposits in the trial trenches were of crushed brick rubble and grey/ brown clay loam (0.3m thick) overlain by tarmac (0.12-0.20m thick). In the service trench, two alluvial (overbank) deposits (combined 0.26m thickness) overlay the Oxford Clay, and were overlain by made ground (0.12m thick) and topsoil (0.3m thick).

Four archaeological features were encountered (Fig. 3). F1004 and F1008 were aligned north east to south west; they are thought to represent a late 19^{th} or 20^{th} century feature which is assumed to cut the moat; they are not shown on historic maps of the village. F1006 and (probably) F2005 are thought to represent the moat.

The moat

The north-south aligned feature (F1006) has been interpreted as a part of the western arm of the medieval moat shown on maps of 1840 and 1859 (see above). Only a small part of it was seen in the trench and, owing to health and safety considerations and the narrowness of the trench, it could not be excavated. Instead, two boreholes were sunk at either end of the trench (Fig. 3); in this way the depth (between 2.23 and 2.32m) and deposit model were ascertained and samples were obtained for the analysis of pollen, diatoms and plant macrofossils (see below). No archaeological finds were recovered from this feature during the site evaluation or during the processing of the core samples taken from the two bore holes.

F2005 was aligned east-west and was observed as a linear depression extending eastwards across the churchyard (Fig. 3). Its depth is unknown as it was seen only within the 1m deep service trench which was subject to observation. The upper fills of F2005 comprised redeposited natural clay (L2007) and a deliberate silty clay backfill (L2006). The lowest fill encountered (L2008) contained modern building rubble, probably incorporated during ground levelling in the late 19th century (see above), but otherwise it resembled the grey/ green silty and organic fills of F1006.

An attempt (Fig. 4) has been made to correlate the points at which the moat has been attested archaeologically (in the trial trench, the service trench and the boreholes) and by earthworks (the linear depression running through the churchyard) with its position as shown on maps of *c*. 1840 and 1859. The two sets of information do not appear to be entirely in accordance with one another, and doubt is cast overt the interpretation of F2005. The inconsistency could be due to fluctuations in the moat's size and shape, resulting in the moat as surveyed in *c*. 1840 and 1859 being slightly smaller than its true extent seen archaeologically; fluctuations in the moat's apparent size and shape may be demonstrated by the differences seen on the two maps. Another explanation could be inaccuracy in the 19th century surveys. A third possibility is that the moat was more complex in shape than was apparent from the earthworks visible in the 19th century; the depression crossing the churchyard may relate to an internal feature, and it is possible that Borehole 2 is sunk into another such feature, or that the south west corner of the moat was located further north than is suggested by the 19th century maps.

ENVIRONMENTAL ANALYSIS OF THE BOREHOLE SAMPLES

The stratigraphy of the moat

Rob Scaife and Nick Blake

On the 13th March 2003 two boreholes were sunk along the arm of the moat adjacent to the church at either end of excavated trench in order to obtain samples for environmental analysis (Fig. 3). This was carried out with a powered coring device (Cobra) and ancillary gouges and extension rods (Eijelkamp) provided by the University of Southampton. This work enabled the moat sediments to be sampled and stratigraphy to be described.

The stratigraphy of the two boreholes was recorded at the site as follows. Colours are given according to a standard Munsell Soil Colour Chart

Borehole 1

Depth cm	
0 – 10	Cement floor.
10 – 26	Gravel and sharp sand foundation.
26 - 126	Top of moat sediment fill. Grey/olive green medium silt. Homogeneous throughout with no archaeological material or other inclusions apparent. Colour 5Y 4/1 or 5Y 4/2. Cess component?
131 - 135	Dark grey silt lens (5Y 3/1).
135 - 153	Grey /olive green fine to medium silts as above (5Y 4/2).
153 - 164	Dark brown/black, humic peaty layer/inclusions, slightly laminated. (10YR 3/2).
164 - 176	Dark grey silt, containing some plant fragments (monocots.) at *c*. 174cm.

176 - 219	Very stiff, mottled clay/silt with black ? Manganese flecks. Colours 10YR 5/2 and 10YR 6/6. Puddled clay base to moat?
219 - 223	Black/grey basal humic silt. 10YR 3/1.
223	Base of moat sediments.
223 - **	Oxford Clay Bedrock.

Borehole 2

Depth cm	
0 - 10	Cement floor.
10 - 49	Hard core/brick rubble.
49 - 54	Brown, sandy silt. (10YR 4/4 or 3/4).
54 - 62	Pale grey, humic silt (5Y 3/2).
62 - 83	Pale grey and buff compact clay silt (10YR 6/2 and 10YR6/4). Some small calcareous fragments.
83 - 96	Dark grey humic silt (5Y 3/2).
96 - 120	Pale grey/olive green humic silt. Becoming more humic and brown downwards. Humic lens esp. at 112-114cm. (5Y 5/2 to 5Y 4/2).
120 - 144	Fine to medium silt. Pale grey and olive grey with dark grey mottling (5Y 4/4 and 5Y 4/1).
144 - 164	Fine to medium silt. Pale grey and olive grey with dark grey mottling (5Y 4/4 and 5Y 4/1).
164 - 192	Very stiff silty clay. Pale grey with yellow/orange mottles as above (5Y 5/2). Calcareous specks. Puddled clay moat base?
192 - 216	Dark grey, homogeneous silt (5Y 4/1).
216 - 232	Large wood (trunk) fragment resting on bedrock base of moat.
232	Base of moat.
232 - **	Oxford Clay.

Sampling for Environmental remains

As mentioned above, there was no archaeological evidence observed in the moat sediments. The sediments are moist or wet (especially the base of borehole 2) and are fine grained and in places humic. Much of the main fills of the moat were also greyish or olive green which is typical of moat fills and is also suggestive of a cess component. This material therefore offered potential for environmental sampling which would further characterise the moat fills and hopefully provide information on local land use and environment in general. Pollen samples were obtained at 4 and 8cm intervals, as appropriate, from both cores. These samples were also used to examine diatoms in order to characterise the pollution status of the moat. Larger samples were also taken for examination of any seeds which might be present (none were seen during the detailed examination of the core sediments). The size of these samples was dictated by the diameter of the core (10cm) and is, thus, rather small compared with samples which may be obtained from excavation trenches. However, analysis of water-logged seeds generally utilises small samples and those obtained here ought under normal circumstances to prove adequate for analysis and identification of the autochthonous flora. Wood was present at the base of borehole 2. This was a substantial timber and sufficient wood is present to obtain a radiocarbon date for the basal fills and broad age of the moat.

Summary and Conclusion

Two boreholes sunk into the fills of this medieval moat recorded the depth of the profiles at between 2.23 and 2.32m. The fills comprised typical grey/olive green silts and clay which may also indicate a strong cess component. The sediments were largely homogeneous with few inclusions and no archaeological/artefacts present. Between 1.76m and 2.19m in borehole 1, a stiff mottled clay may be a puddled clay seal over initial/primary organic sediment. Samples for pollen, diatoms and plant macrofossils were obtained.

Analysis of the moat sediments for pollen
Rob Scaife

Introduction

It was anticipated that the water-logged sediments within the moat would provide suitable preserving conditions for pollen and that data relating to the local medieval environment might be obtained from a palynological study of the sediment fills. With the exception of one stratigraphical horizon, sub-fossil pollen and spores were recovered from a range of samples which provide information on the local environment of the moat. These data are assessed here.

Pollen Procedures

Two profiles were examined and sampled for environmental analysis. Material taken from borehole 1 was selected for more detailed analysis. Pollen sub-samples of 2ml volume taken from this core were processed using standard techniques for the extraction of the sub-fossil pollen and spores (Moore and Webb 1978; Moore *et al.* 1991). Micromesh sieving (10u) was also used to aid with removal of the clay fraction where present in these sediments. Absolute pollen frequencies were calculated using added exotic/spike (*Lycopodium* tablets) to the known volumes of sample (Stockmarr 1971). The sub-fossil pollen and spores were identified and counted using an Olympus biological research microscope fitted with Leitz optics. A pollen sum of 200-300 or more grains of dry land taxa per level was counted for each level where possible plus pollen of marsh taxa (largely Cyperaceae), fern spores and miscellaneous elements which were counted outside of the basic pollen sum. Although additional samples are available for analysis, it is perhaps unlikely that much additional data would accrue from their analysis as the pollen spectra proved to be homogenous throughout (see below). A pollen diagram has been plotted using Tilia and Tilia Graph (Fig. 5). Percentages have been calculated in a standard way as follows:

Sum	% total dry land pollen (tdlp)
Marsh/ aquatic	% tdlp + sum of marsh/ aquatics
Spores	% tdlp + sum of spores
Misc.	%tdlp + sum of misc. taxa

Taxonomy, in general, follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992) for plant descriptions. These procedures were carried out in the Palaeoecology Laboratory of the School of Geography, University of Southampton.

The Pollen Data

Pollen has been examined from the lower half of the sediments fills which relate to the early period of sediment accumulation, assuming that is that there has not been any cleaning of the moat. Recent pollen was absent between 170cm and 216cm although very substantial numbers of pre-Quaternary (Jurassic) pollen and spores are present. These were also numerous in the lowest samples analysed at 220cm and 168cm In sediments above and below this unit, medieval pollen and spores were found to be abundant with absolute values ranging from 13,700 at 168cm to 540,000 grains/ml at 156cm.

Overall, the pollen assemblages are dominated by herbs with few trees and shrubs. With the exception of the lowest sample there is little variation in the pollen spectra and thus apparently little change in the local habitat through the period represented by sediment accumulation. As such, no pollen zones have been defined for this sequence. The principal floral characteristics are described as follows.

Trees and shrubs: As noted, there are few of these. The lowest sample at 220cm has slightly higher values (23% of total pollen) due to higher values of *Ulmus* (elm; 16%) with small numbers of *Quercus* (oak) and individual occurrences of *Betula* (birch) and interestingly, *Juglans regia* (walnut). In the upper samples values are much reduced to only sporadic/occasional occurrences of these types (except *Juglans*) with the addition of *Alnus* (alder), *Fraxinus excelsior* (ash), *Pinus* (pine) and *Corylus avellana* (hazel).

Herbs: These are dominant throughout with Poaceae (grasses) being most important (to 90% of total pollen). Other herbs include moderately diverse assemblages which include elements from waste and disturbed ground (ruderals including *Fallopia convolvulus*, *Persicaria maculosa* type, and possibly *Sinapis* type and Chenopodiaceae), cereal pollen (including Secale cereale) and taxa from grassland (e.g. *Plantago lanceolata*, *Ranunculus*, *Medicago* and *Trifolium* types).

Aquatic: There are fewer aquatic taxa than might be expected from moat sediments. The basal sample at 220cm has substantially greater numbers of Cyperaceae (sedges; to 34%) than overlying levels which have only sporadic occurrences. *Typha angustifolia* type (reed-mace and bur reed) and *Potamogeton* type (pond weed) are similarly present in the basal sample but are absent above. A small number of *Lemna* grains (duckweed) were found only at 168cm. Their numbers are, however, similarly small especially if the moat contained standing water.

Spores: *Pteridium aquilinum* (bracken), *Sphagnum* (bog moss) and liverwort spores occur sporadically throughout the profile. Pre-Quaternary spores of Jurassic age derived from the local geology are abundant in the basal levels. This especially the case between 220cm and 168cm in samples which were devoid of medieval pollen. It is possible that these sediments were used to seal the moat.

Discussion

There have been few pollen studies carried out on the sediment fills of moats. This is largely due to the undoubtedly complex taphonomy of pollen which was introduced from numerous sources including both natural and of secondary origin. There may also be the problems caused by the periodic cleaning out of sediments. However, given that there are often waterlogged sediments remaining, even where sites have been back-filled and become vegetated over, these sites have enormous potential for the study of environmental change over the past 1000 years. The analysis of sub-fossil pollen and spores in moat fills would be expected to provide data on the local environment including exotic plant introductions (gardens?), the more regional vegetation, the local vegetation growing in and around the moat. The few studies previously carried out have demonstrated that useful information can in fact be gained from pollen analysis of such sediment fills, especially when related to other palaeoenvironmental studies/disciplines.

Previous studies include Hampton Court Palace moat (Scaife in Keevill 1996) and the Tower of London (Keevill 1997; Scaife in Keevill 2004). Previously studied moated manor sites include Oldhall Copse, Woking, Surrey (Finden-Browne 2000) and Parsonage Farm, Kent (Scaife 2004). Study of the former was able to elucidate the character of the local park land and gardens and the species of tree planted locally (lime and the earliest record of horse chestnut) as well as the more regional vegetation (Robinson 1996; Scaife 1996). The latter sites afforded the opportunity to examine sequences of organic and minerogenic sediments which have accumulated since the medieval period.

The taphonomy of pollen in moats is complex with contained pollen and spores possibly coming from a variety of sources. Pollen derived from 'normal' airborne means or insect vectors is likely to derive from areas close to the site. However, given the archaeological nature of moats, the sediment fills are also highly likely to contain much pollen from secondary sources which may be very varied and include human and animal faeces, offal, domestic waste including floor coverings and food remains all of which may contain considerable quantities of pollen. These inputs can strongly influence and bias pollen assemblages (Greig 1981; 1982) by reducing the relative percentages of natural, local and regional pollen input. Crop processing debris (Robinson and Hubbard 1977) and faeces, especially, can contain substantial quantities of cereal pollen and associated arable weeds which may end up in many archaeological contexts such as moats, ditches and wells. Cereal pollen recovered here may derive from such sources. Evidence for faecal input is not great but, *Ascaris* (round worm) cysts are present in the upper moat fills suggesting ordure may have been disposed of in the moat. It is, however, surprising that whip worm (*Trichuris*) was not found.

In all of previously studied sites, herbs are dominant with a substantial diversity of herbs present reflecting the diversity of human made habitats. Typically, non cereal Poaceae (wild grasses) form the single most important pollen group in all of the moat sequences noted and this appears to be the case at Marston Moretaine. It is difficult to define the source of these grasses but a taphonomic mix is most plausible coming from sources within the moats, adjacent grassland/pasture, thatching and especially from animal faeces and offal waste (animals fed on hay) which may have been disposed of in the moat and river/stream courses flowing into the moat. It should be noted that the substantial percentages of grasses and other local herbs will have had a depressing effect on the percentages of other pollen types within the pollen sum and may have important effects on the representation of the more regional elements. Thus, although it appears from the pollen data that woodland is almost absent in the region, it is likely that a range of woodland habitats remained. These are likely to have been managed. Of interest here, are the high values of elm (*Ulmus*) and a record of walnut (*Juglans regia*) in the lower level. The quantities of the former suggest, considering the local over-representation of grassland taxa, that elm was growing extremely close to the site, perhaps even on the moated platform or on managed land or even gardens nearby (the manor house is thought to have been located within *c*. 375m north west of the investigation site). Walnut, may similarly be a constituent of the local estate. This tree is generally considered to be a Roman introduction to Western Europe as a whole and as such is represented sporadically in English Roman and post Roman sediment contexts (Scaife in Sidell *et al.* 2000). Once introduced it continued to be a valuable ornamental tree as well as providing a number of other utilities (nuts, dye).

Summary and Conclusions

Pollen has been recovered from the sediment fills of this moat. Because there have been very few studies of such sites, this study usefully adds to our knowledge of the range of taxa and understanding of the taphonomy of pollen found in such situations. The following principal points come from this study.

- Pollen was generally abundant in the organic sediment fills with the exception being between 168cm and 219cm. This may have been a puddled layer of clay added to the base of the moat to seal it. These levels contained large numbers of Jurassic palynomorphs. Pollen was present immediately below this sediment unit implying that it was perhaps added as an after measure, as noted, to seal the moat. A small number of pollen rains of duckweed were found immediately above this horizon implying a possible short phase of standing water.
- The general paucity of aquatic plants indicates that the moat did not have standing water for long periods. It was most probably a seasonally wet, muddy and winter flooded feature. This accords with diatom and plant macro-fossil data.
- The pollen spectra, in common with the few other data available from moats, are dominated by grasses and associated pastoral taxa. These come from the moat perimeter and other local habitats.
- Small quantities of cereal pollen and associated segetal taxa may represent local arable cultivation but are more likely to derive from secondary sources such as faecal debris.
- There is little evidence of woodland. However, higher values of elm pollen plus record of walnut in the lowest level probably come from growth in proximity to moat (perhaps from a managed estate or gardens). The record of walnut is of interest.
- There are surprisingly few aquatic (macrophytes) present. This may suggest that the moat failed to contain standing water for long periods.

Analysis of the moat sediments for Diatoms
Rob Scaife

Introduction

Diatoms are microscopic single celled plants which largely live in fresh, brackish and salt water but with some terrestrial and less aquatic types. These secrete a silica skeleton (frustule) which may be preserved in suitable sediments such lacustrine organic muds. If present, sub-fossil diatoms might, therefore be expected to provide a useful indication of the freshwater status of the environment in which the sediments were deposited. This study was undertaken in an attempt to elucidate whether the moat had contained standing water.

Method

Preparation/concentration of diatom frustules was carried out by means of digestion of humic/organic material using Hydrogen Peroxide. Samples were dried on microscope cover-slips and mounted on microscope slide using Naphrax mounting medium. Examination was carried out at high power x400 and x1000 using a biological microscope (as for pollen). Identification was carried out with the aid of Sims (1996), An Atlas of British Diatoms.

Three samples were examined. These were taken from the basal level at 220cm which contained more marsh pollen taxa (largely sedges) and from depths of 140cm and 160cm above the intervening layers which were devoid of pollen.

Results and conclusions

Diatoms were absent in the basal level with the exception of a badly degraded and unidentifiable frustule. Samples at 160cm and 140cm were also extremely poor in quantity and diversity of diatoms with only small numbers of a single taxon (type) found. This appears to be *Pinnularia intermedia* (to be confirmed), an extremely diverse and difficult group.

This diatom type is typical of wet ground including mud as opposed to fully aquatic conditions. If the identification of *Pinnularia intermedia* is correct, the absence of freshwater taxa would be expected if this was indeed a true moat (Cameron 2004). The presence of this taxon would verify findings of pollen analysis, that the ditch held no long term standing water and that its infilling with sediments may have been through progressive silting in a wet, muddy (winter) environment.

Analysis of the moat sediments for plant macrofossils
Rob Scaife

Introduction and method

After the description of the stratigraphy and sub-sampling for pollen analysis, remaining sediments in the cores were bulk sampled for plant macrofossil extraction and for further examination of the sediments themselves. Plant macrofossils comprise water-logged seed remains or other plant material; in this case they could derive either from plants growing within the moat or from the disposal of waste material (e.g. food remains) in the moat.

Two samples were processed in beakers using very dilute Hydrogen Peroxide to deflocculate the clay and silt. Once dissaggregated the samples were washed in sieves down to 0.25mm mesh. The remaining plant remains were then examined in distilled water under a binocular microscope (Wild M3c) to magnifications of x40.

Results and conclusions

The two samples of 255g (153-164cm) and 480g (120-150cm) were disappointing in their seed content. The former yielded only occasional seeds from *Sambucus nigra* (Elder), Poaceae (grasses) and *Urtica dioica* (nettle). Other plant material in this sample included mainly monocotyledonous (grass and sedge) remains and stems of horsetail fern (*Equisetum*). The sample at 120-150cm comprised only monocot. remains (largely rootlets) with single seeds of cf. *Cerastium* (chickweed) and *Juncus* sp. (rushes). No seeds or remains of true aquatic taxa were recovered from these sediments. As suggested by the pollen analysis, it is possible that the moat did not have standing water for long periods and that the sediment fills represent a gradual, seasonal infilling.

DISCUSSION AND CONCLUSONS

Kate Nicholson

The archaeological investigation revealed parts of two arms of a moat known from cartographic and documentary sources to have remained open until the late 19th century and to have formed a rectangular enclosure. The nature and function of the enclosed area are not known. No finds were recovered from the moat, but this type of feature is thought to date to the mid 12th to late 14th centuries.

Two boreholes were sunk into the moat, and the resultant cores were examined in order to determine the stratigraphy of the moat sediments and samples were extracted for the analysis of pollen, diatoms and plant macrofossils. The moat's stratigraphy was found to comprise layered grey/ olive green organic silts and pale grey clay silts with lenses of dark humic silt.

Pollen, diatom and plant macrofossil analysis indicated (though very little evidence of the latter category was present) that the moat was generally muddy but only seasonally filled with standing water, despite being cut into the Oxford Clay bedrock. The presence of Jurassic pollen in the fill of the moat between 168 and 120 cm may suggest that the stiff silty clay deposit at this level was deliberately placed to seal the moat (perhaps in an effort to make it hold water) at some point after it was first dug. Duckweed pollen recorded in a sample from the immediately overlying deposit may imply that this was successful for a time, but samples higher up the sequence contained only sporadic pollen of aquatic species.

The medieval landscape

Analysis of pollen samples indicated a predominantly grassland environment, though with (managed) wooded areas surviving. The Domesday survey indicates that in 1086 the two manors of the parish had enough woodland between them for 600 pigs to be kept (Williams and Martin 2002). It is possible that this woodland was located on the ridge of high ground to the north of Marston Moretaine, where areas of the ancient woodland still survive (Marston Thrift, Holcot Wood, Wooton Wood and Salford Wood). Another possibility is the area around the site was wooded at the time of the

Domesday survey, but had been cleared by the time the moat was dug (probably at some point in the late 12th to late 14th centuries).

The suggestion has been made that the walnut pollen and large amounts of elm pollen (as compared to other tree species) in the lowest sample taken from the ditch may have come from trees in a managed estate or garden. There are three moated sites (including that subject to this investigation) in Marston Moretaine; any one of them could potentially have had high status occupants who may have planted gardens or managed estates as a display of their prestige.

Evidence for the disposal of ordure in the moat (see Scaife, above) is consistent with the suggestion (cf. Page 1912, 308) that the enclosed platform was occupied, though such waste could have originated further afield. If a building was present on the enclosed platform, the moat could be considered to be an expression of its occupants' status (c.f. Rackham 1994; Taylor 1973; Hunter 1999, 126).

ACKNOWLEDGEMENTS

Archaeological Solutions Ltd (formerly HAT) would like to thank MEPK Architects for commissioning the archaeological work and their client, the Aragon Housing Association, for funding it. AS is also grateful to VE Parrott (Oakley) Limited, for their assistance (in particular Mr David Moore for his assistance).

The archaeological evaluation was directed by Matt Sutherland and the archaeological monitoring and recording by Steve Turner, both on behalf of AS; the project was managed for AS by Jon Murray. Finds were co-ordinated by Louise Wood and Claire Wallace.

Authors:

Rob Scaife and Nick Blake: School of Geography, University of Southampton, Highfield, Southampton, SO17 1BJ.
Kate Nicholson: Archaeological Solutions Ltd, 98-100 Fore Street, Hertford, Hertfordshire, SG14 1AB.

BIBLIOGRAPHY

Aberg, F.A. (ed) 1978 *Medieval moated sites*. Council for British Archaeology Research Report 17.

Albion Archaeology 2001 *Archaeological watching brief at the Church of St Mary the Virgin, Marston Moretaine, Bedfordshire* Albion Archaeology Unpublished Report 01/29.

Bennett, K.D., Whittington, G. and Edwards, K.J. 1994 'Recent plant nomenclatural changes and pollen morphology in the British Isles'. *Quaternary Newsletter.*

Cameron, N.V. 2004 Diatom analysis. in Keevill, G. *'The Tower of London Moat. Archaeological Excavations 1995-9'*. Oxford Archaeology with Historic Royal Palaces.

Finden-Browne, H. 2000 ‘The vegetation history of Oldhall Copse, Old Woking’ *Proceedings of the Surrey Archaeological Society* 87,157-168’.

Greig, J.R.A. 1981 'The investigation of a Medieval barrel-latrine from Worcester'. ***Journal of Archaeological Science*** 8, 265-282

Greig, J.R.A. 1982 'The interpretation of pollen spectra from urban archaeological deposits'. in Hall, A.R. and Kenwood, H. (eds.) *Environmental archaeology in the urban Context* Council for British Archaeology Research Report 43, 47-65.

Hunter, J, 1999, *The Essex Landscape*, ECC Chelmsford.

Keevill, G. 1997 ‘The Tower of London’ *Current Archaeology* 154, 384-387

Le Patourel, H.E.J. and Roberts, B.K. 1978 ‘The significance of moated sites’ in F.A. Aberg (ed), 1978 *Medieval moated sites*. Council for British Archaeology Research Report 17.

Moore, P.D. and Webb, J.A. 1978 ***An illustrated guide to pollen analysis***. Hodder and Stoughton, London.

Moore, P.D., Webb, J.A. and Collinson, M.E. 1991 ***Pollen analysis*** Second edition. Blackwell Scientific, Oxford

Page, W. (ed) 1912 *Victoria County History of Bedfordshire*. University of London Centre for Historical research.

Rackham, O, 1994 *The Illustrated History of the Countryside*. Phoenix Press, London

Roberts, B, Turner, S. and Williams, J. 2004 *Land south and eat of Manor Road, Marston Moretaine, Bedfordshire; archaeological monitoring and recording*. Hertfordshire Archaeological Trust Unpublished Report 1441.

Robinson, M. 1996 ‘The plant macrofossil remains’ in Keevill, G.D. and Bell, C. ‘The excavation of a trial trench across the moat at Hampton Court Palace’, *Transactions of London and Middlesex Archaeological Society* 47,145-156.

Robinson, M. and Hubbard, R.N.L.B. 1977 ‘The transport of pollen in bracts of hulled cereals’. ***Journal of Archaeological Science*** 4,197-199.

Rowlandson, I., Sutherland, M. and Wilkins, B. 2003 *Land south and eat of Manor Road, Marston Moretaine, Bedfordshire*; *an archaeological evaluation*. Hertfordshire Archaeological Trust Unpublished Report 1286.

Scaife, R.G. 2000 in Sidell, J., Wilkinson, K., and Cameron, N. ***The Holocene Evolution of the London Thames.*** Museum of London Monograph 5.

Scaife, R.G. 2004 *West of Station Road: Parsonage Farm (PFM 98): Pollen Assessment Analysis*. Report for Oxford Archaeology/CTRL on Manor House Moat.

Scaife, R.G. 2004 Pollen analysis. in Keevill, G. ***'The Tower of London Moat. Archaeological Excavations 1995-9'.*** Oxford Archaeology with Historic Royal Palaces'.

Scaife, R.G. 1996 'Pollen samples' in Keevill, G.D. and Bell, C. 'The excavation of a trial trench across the moat at Hampton Court Palace', ***Transactions of London and Middlesex Archaeological; Society*** 47, 153-154.

Shotliffe, D. and Crick, J. 1999 'Iron Age settlement within the Oxford clay Vale at Beancroft Road, Marston Moretaine', *Bedfordshire Archaeology* 23, 32-42.

Sims, P.A. 1996 (ed.) ***An Atlas of British Diatoms.*** Arranged by B. Hartley based on illustrations by Barber H.G. and J.R. Carter. Biopress; Bristol

Stace, C. A 1992 *New Flora of the British Isles.* Cambridge : Cambridge University Press.

Stockmarr, J. 1971 'Tablets with spores used in absolute pollen analysis'. ***Pollen et Spores*** 13,614-621.

Taylor, C, 1973, *The Cambridgeshire Landscape*. Hodder and Saughton, London

Williams, A and Martin, H.G. 2002 *Domesday Book*: *a complete translation*. Penguin, London.

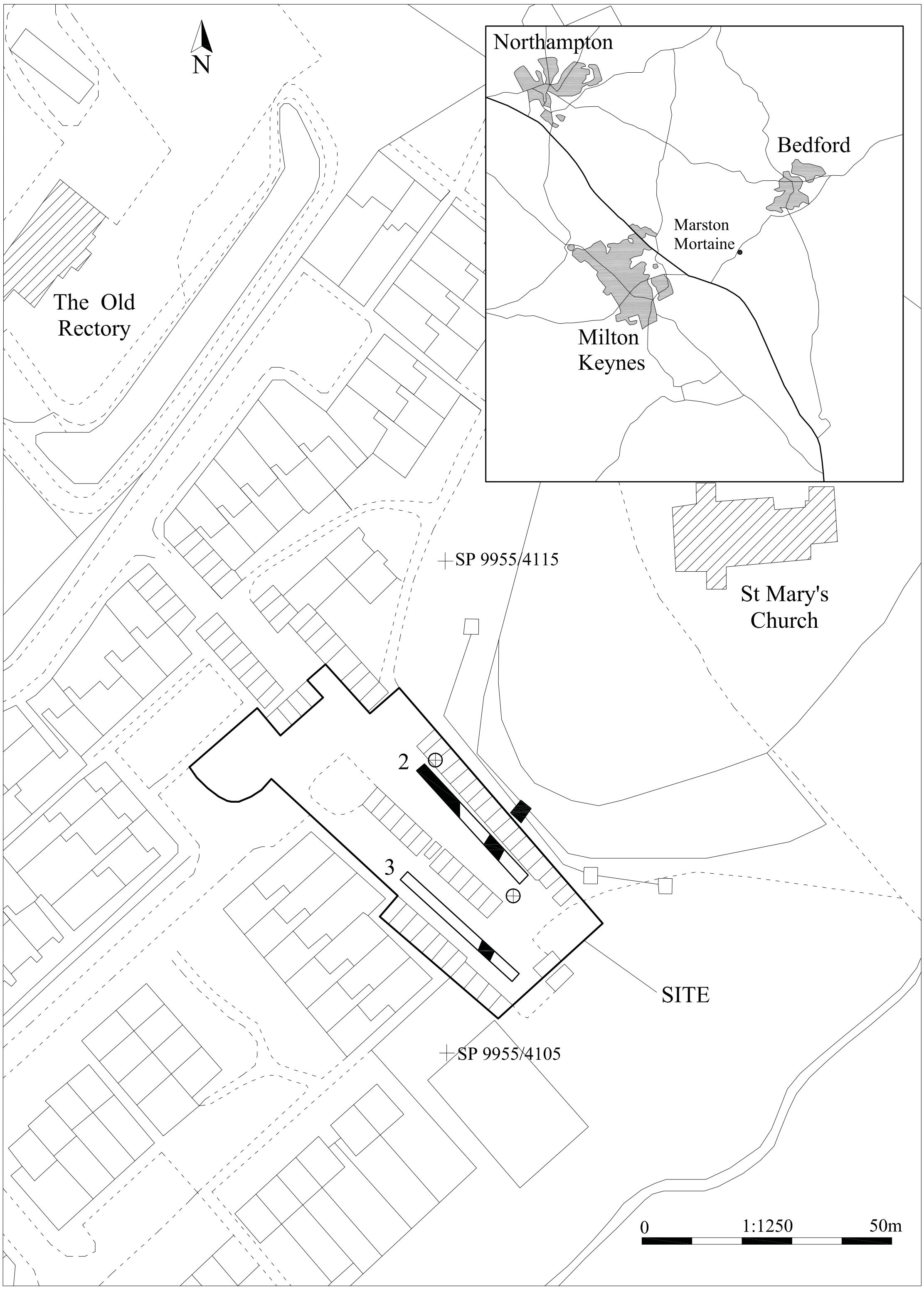

Fig. 1 Site location and detailed site location plans

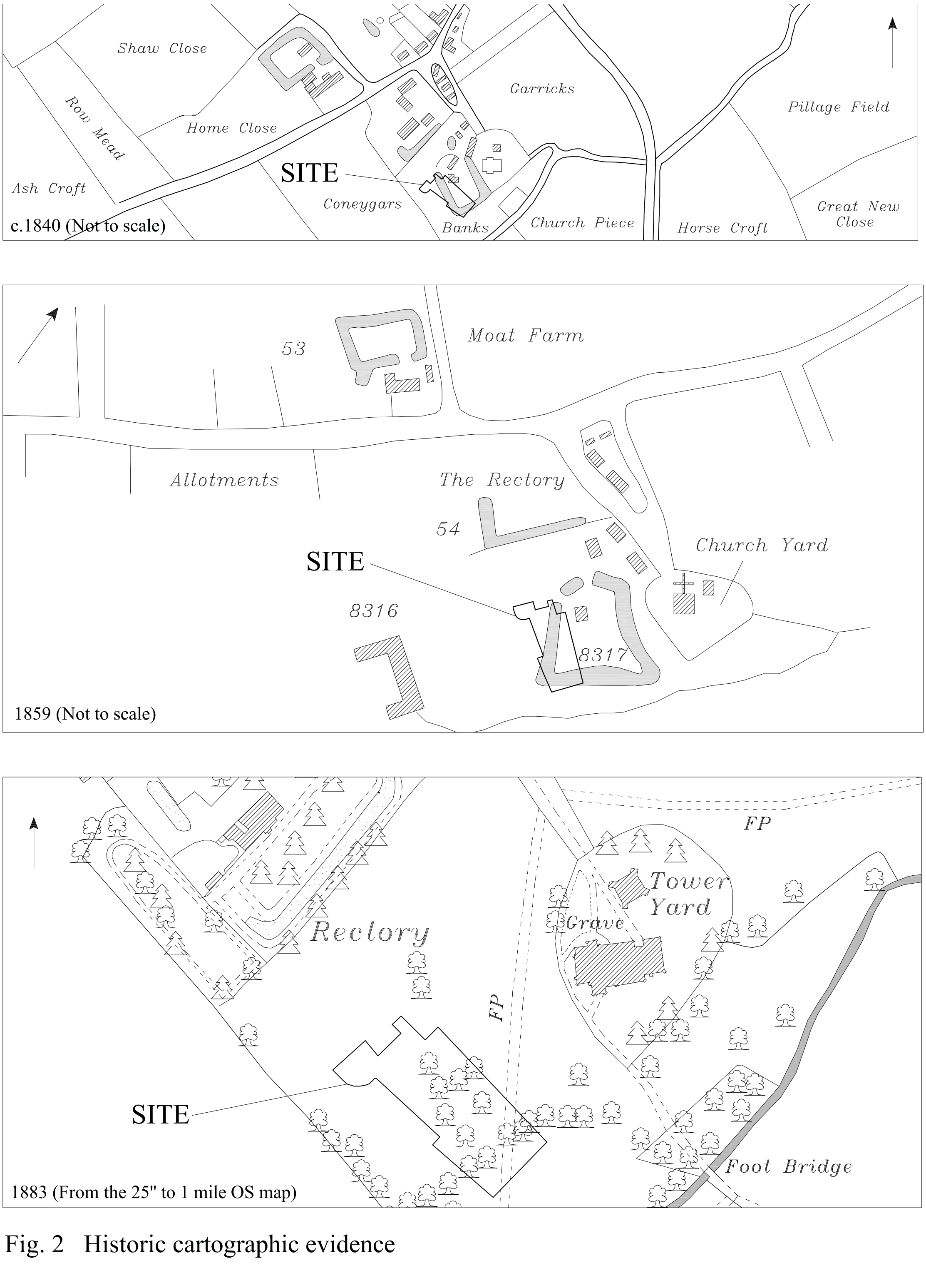

Fig. 2 Historic cartographic evidence

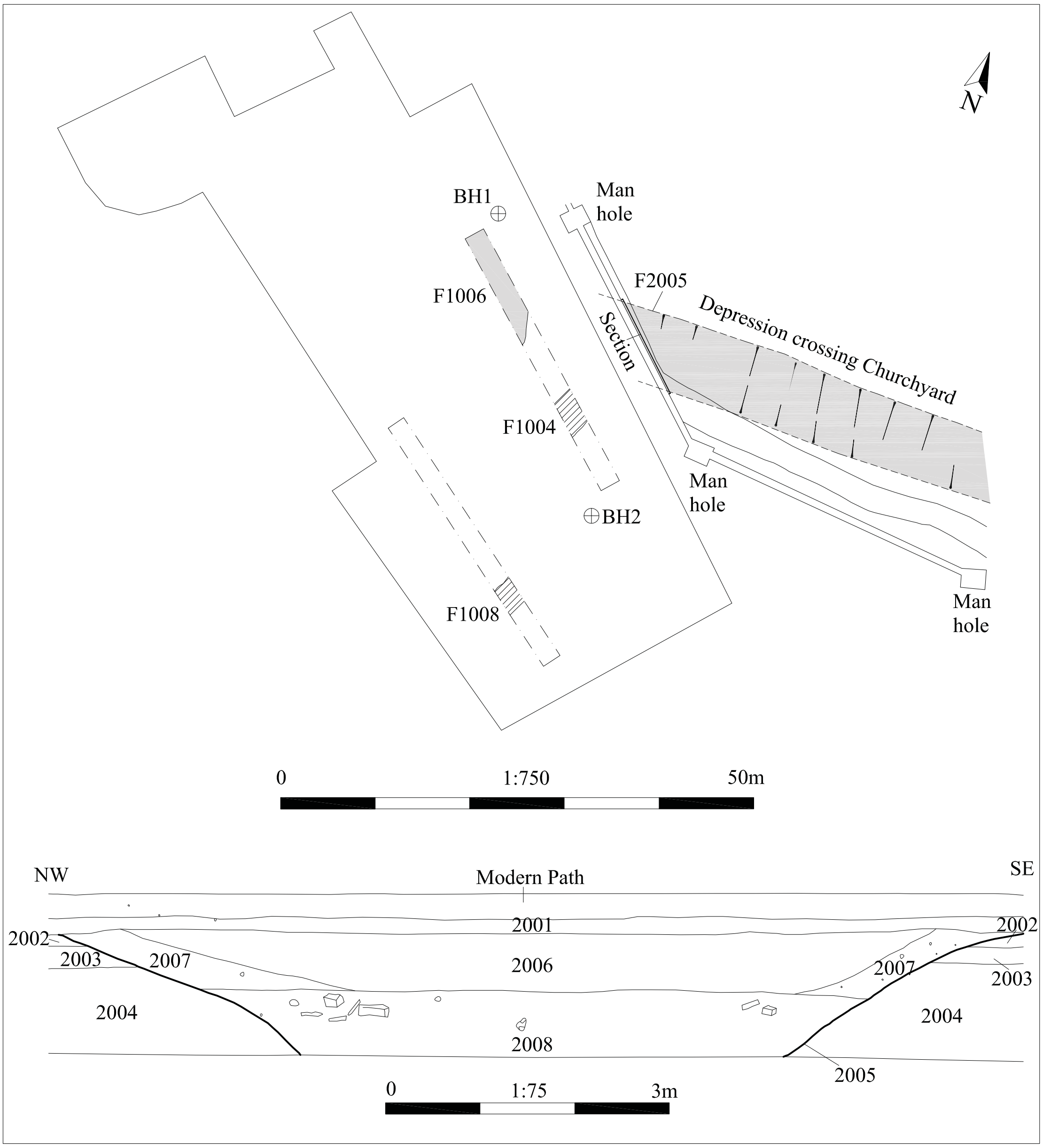

Fig. 3 Archaeological features

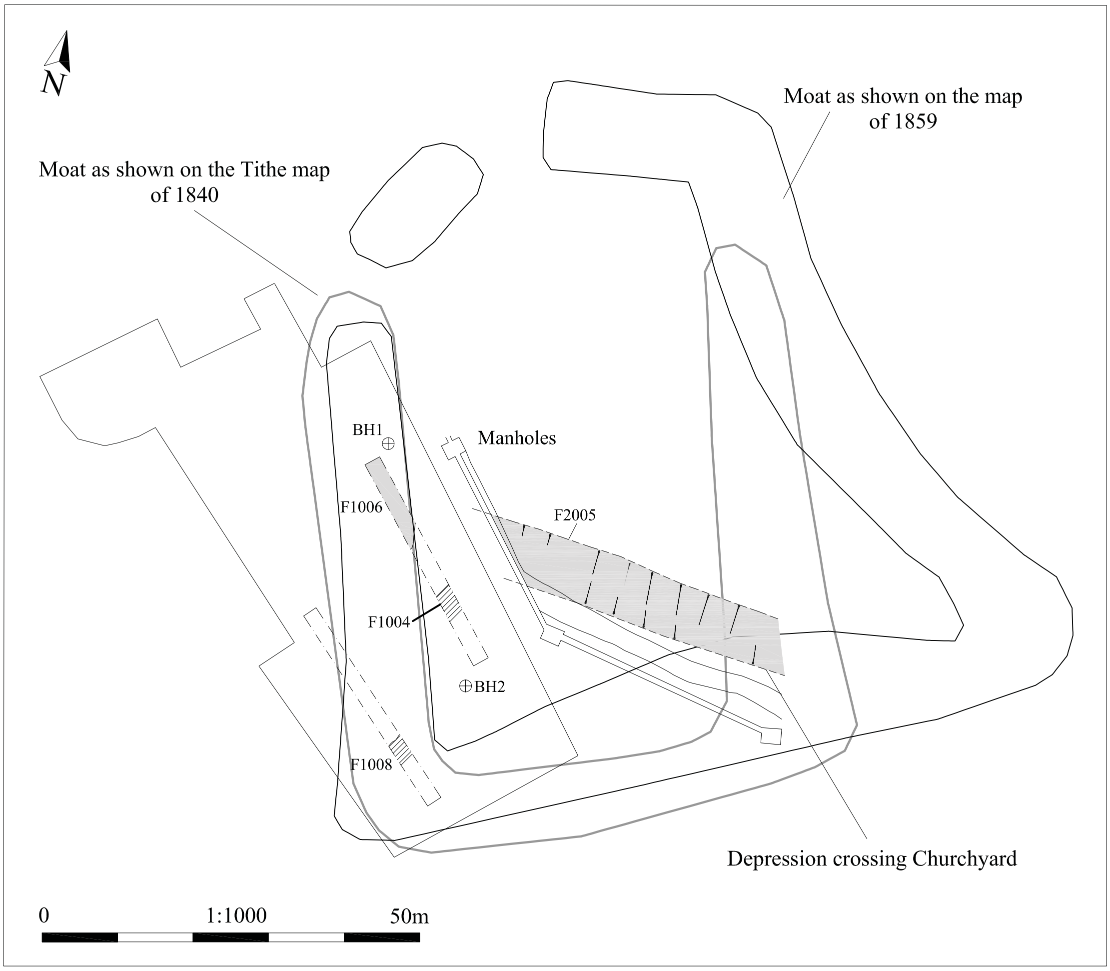

Fig. 4 Correlation of archaeological and cartographic evidence

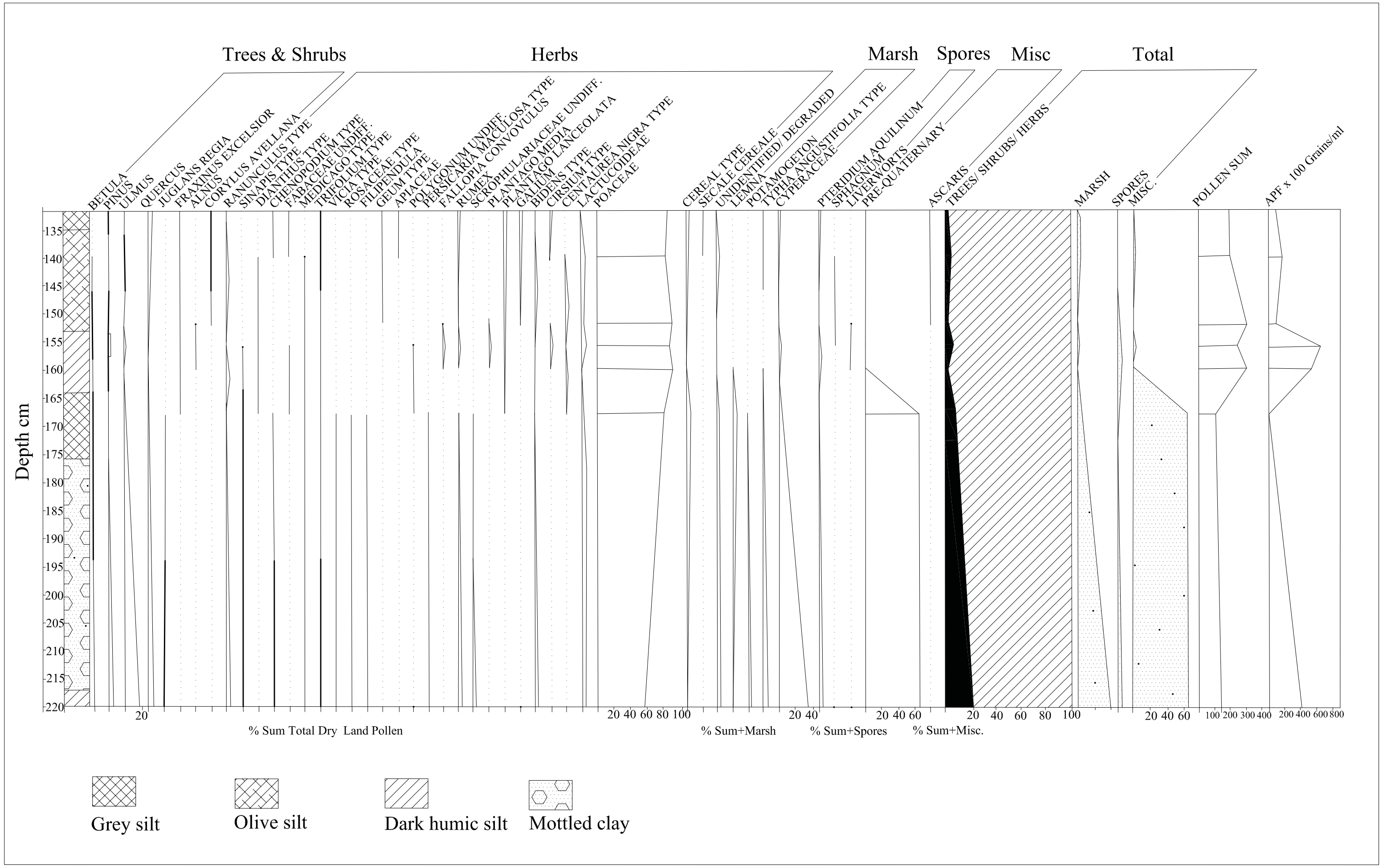

Fig. 5 Pollen diagram