Centre for Archaeology Report 3/2001

Soil Micromorphological Analysis of the Fills of Two Saxon Sunken-Featured Buildings at Sherbourne House, Lechlade, Gloucestershire

J L Heathcote

The Centre for Archaeology Reports Series incorporates the former Ancient Monuments Laboratory Report Series. Copies of Ancient Monuments Laboratory Reports will continue to be available from the Centre for Archaeology (see back of cover for contact details).

Centre for Archaeology Report 3/2001

Soil Micromorphological Analysis of the Fills of Two Saxon Sunken-Featured Buildings at Sherbourne House, Lechlade, Gloucestershire

J L Heathcote

Summary
Soil micromorphological analysis was carried out on the fills of two Saxon Sunken-Featured Buildings (SFBs) to examine the origin and mode of accumulation of the deposits, with specific reference to whether the primary fills had accumulated as a result of material falling between floorboards. Additionally, it was hoped that the analysis would provide information on the activities carried out within the structures during their occupation.

In both SFBs, clearly stratified fills were recorded from the field sections. However, when viewed in thin section, this clear stratification was lost and the samples appeared largely homogeneous with a high porosity and granular soil structure indicating the material had been subjected to a high level of biological activity. There was no evidence to suggest that the primary fills (observed in the field) resulted from *in situ* accumulation contemporary with occupation of the structures, whether by falling through floorboards or otherwise. As all of the fills (including the primary) appear to be redeposited soil material, the question of what kinds of activities may be signified by microrefuse of the deposits cannot be addressed. An observation by Hamerow in relation to some of the SFB fills at Mucking applies equally to the Lechlade fills in that '…at best, they may reflect activity which took place in the vicinity of the hut…' (Hamerow, 1993, 14).

Keywords

Author's address
English Heritage Centre for Archaeology, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD. Tel: 02392-856777. Email: jen.heathcote@english-heritage.org.uk

Centre for Archaeology Report 3/2001

Soil Micromorphological Analysis of the Fills of Two Saxon Sunken-Featured Buildings at Sherbourne House, Lechlade, Gloucestershire

J L Heathcote

The Centre for Archaeology Reports Series incorporates the former Ancient Monuments Laboratory Report Series. Copies of Ancient Monuments Laboratory Reports will continue to be available from the Centre for Archaeology (see back of cover for contact details).

Centre for Archaeology Report 3/2001

Soil Micromorphological Analysis of the Fills of Two Saxon Sunken-Featured Buildings at Sherbourne House, Lechlade, Gloucestershire

J L Heathcote

Summary
Soil micromorphological analysis was carried out on the fills of two Saxon Sunken-Featured Buildings (SFBs) to examine the origin and mode of accumulation of the deposits, with specific reference to whether the primary fills had accumulated as a result of material falling between floorboards. Additionally, it was hoped that the analysis would provide information on the activities carried out within the structures during their occupation.

In both SFBs, clearly stratified fills were recorded from the field sections. However, when viewed in thin section, this clear stratification was lost and the samples appeared largely homogeneous with a high porosity and granular soil structure indicating the material had been subjected to a high level of biological activity. There was no evidence to suggest that the primary fills (observed in the field) resulted from *in situ* accumulation contemporary with occupation of the structures, whether by falling through floorboards or otherwise. As all of the fills (including the primary) appear to be redeposited soil material, the question of what kinds of activities may be signified by microrefuse of the deposits cannot be addressed. An observation by Hamerow in relation to some of the SFB fills at Mucking applies equally to the Lechlade fills in that '…at best, they may reflect activity which took place in the vicinity of the hut…' (Hamerow, 1993, 14).

Keywords

Author's address
English Heritage Centre for Archaeology, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD. Tel: 02392-856777. Email: jen.heathcote@english-heritage.org.uk

Soil micromorphological analysis of the fills of two Saxon Sunken Featured Buildings at Sherbourne House, Lechlade, Gloucestershire.

J L Heathcote, English Heritage Research Fellow (Geoarchaeology), Department of Archaeology, University of Southampton, U.K.

Abstract
Soil micromorphological analysis was carried out on the fills of two Saxon Sunken-Featured Buildings (SFBs) to examine the origin and mode of accumulation of the deposits, with specific reference to whether the primary fills had accumulated as a result of material falling between floorboards. Additionally, it was hoped that the analysis would provide information on the activities carried out within the structures during their occupation.

In both SFBs, clearly stratified fills were recorded from the field sections. However, when viewed in thin section, this clear stratification was lost and the samples appeared largely homogeneous with a high porosity and granular soil structure indicating the material had been subjected to a high level of biological activity. There was no evidence to suggest that the primary fills (observed in the field) resulted from *in situ* accumulation contemporary with occupation of the structures, whether by falling through floorboards or otherwise. As all of the fills (including the primary) appear to be redeposited soil material, the question of what kinds of activities may be signified by microrefuse of the deposits cannot be addressed. An observation recorded by Hamerow in relation to some of the SFB fills at Mucking applies equally to the Lechlade fills in that, '...at best, they may reflect activity which took place in the vicinity of the hut...' (Hamerow 1993, 14).

Introduction

The following report presents the results of a soil micromorphological study of the fills of two Saxon Sunken Featured Buildings (SFB), SFB1 and SFB7 (Table 1), part of a group of six revealed during excavation of the multi-period site at Sherbourne House. The project brief presented the following objectives (defined by Cotswold Archaeological Trust) for the analysis:

Objective 1: to determine whether the primary fill of the SFB 'cuts' accumulated as a result of occupation material falling through floorboards (as has been suggested for other similar features).

Objective 2: if this is not the case, to determine the mode of origin of the primary fills of the SFBs.

Objective 3: to determine whether the secondary and tertiary fills of the SFBs are derived from occupation debris or from the surrounding soil.

Objective 4: to determine how the secondary and tertiary deposits formed.

Objective 5: to indicate how soon after abandonment the various infilling deposits began to accumulate.

Objective 6: to comment on what microscopic remains/features observable in the thin sections say about activities that were carried out in the SFBs.

The deposits

Table 1. The fill sequence sampled for micromorphological analysis. *NB. thickness, description and preliminary interpretations are all derived from the excavation record as the author was not able to visit the site during excavation.*

	context	*thin section number*	*thickness (cm)*	*description (including finds recovered)*	*preliminary interpretation (field)*
SFB1 (Saxon; phase 1 or 3)					
tertiary fill	(154)	<8^{A}>	*c*. 16	mid grey brown, fine silty clay, little compaction, small gravel (*c*.10%); pottery, bone and flint, bone needle (SF6), iron strip (SF7) recovered	final silting or deliberate backfill
secondary fill	(152)	<8^{A}> <8^{B}>	*c*. 22	mid grey to reddish brown silty clay, moderately compact, gravel (25%), well defined boundaries; pottery, bone, slag, burnt clay, flint recovered	
primary fill	(242)	<8^{B}>	2-4	mid to dark grey brown, fine silty clay, loose, small gravel (20%), 'comparatively humic'; bone, pottery, bone comb (SF8) recovered	possible initial silting event with fine deposits representing material washed in from the sides or material falling between floorboards over the sunken area; not thought to be remnant floor level
SFB7 (Saxon; phase 1 or 3)					
secondary fill	(985)	<20^{A}> <20^{B}>	up to 40	mid brown/red silty clay, compact, small gravel (25-30%); pottery, bone, chalk spindle whorl (SF32) recovered	-
primary fill	(986)	<20^{B}>	*c*. 2	grey brown, silt, fairly compact with occasional small gravel; pottery and bone recovered	silting layer in base of feature

Methods

In each of the SFBs analysed, an oriented column (20x5x3cm) of the contexts was removed from one of the internal baulks (the features having been excavated in quadrants) by the excavation staff. The samples were sealed in plastic and stored under cool conditions until delivered for analysis. The columns were then air-dried, impregnated with a polyester resin and four thin sections manufactured to provide a continuous sequence of the contexts, from the tertiary fill to the basal context (primary fill).

The thin sections were analysed in three stages to provide the following information:

- analysis over a light-box without magnification (scale 1:1) in order to recognise structural properties (the overall arrangement of void space, soil aggregates and stones) and the boundary characteristics between contexts.
- analysis of the slide at magnifications of between x5.8 and x400 to determine the nature and distribution of basic components (mineral and organic) of the soil fabric and the nature of any features indicating the type of soil processes active within the fills (Tables 2 and 3); these were semi-quantified by comparison with frequency charts (Bullock *et al*. 1985).
- finally, analysis at x100 magnification at 1cm intervals ('spits') to produce cumulative data for inclusions of material thought to be derived from human activity e.g. bone, charcoal fragments, pottery, heated/burnt stone (Table 3); the number of individuals in each category was counted.

SFB1

Description

Primary (context 242), secondary (context 152) and tertiary (context 154) fills were clearly distinguished in the field (see Table 1); however when viewed in thin section the whole sample appears homogeneous and the context boundaries are indistinguishable (Fig. 1). Overall, the sample exhibits a high porosity (c. 30-40%) and stone content of around 30%. The stones all comprise small, rounded pebbles of Inferior Oolitic limestone, presumably derived from the surrounding geology of the area (the underlying geology comprises Pleistocene gravels which overlie Inferior Oolitic limestone). The high porosity is imparted by loosely packed fine granular aggregates of soil lying between the stones. Granular soil structure is typically associated with high levels of bioturbation, particularly by earthworm activity, and has been shown to develop rapidly (within 2 months) under experimental conditions (Bergadà 1993). The biogenic calcite granules (Table 3, Fig. 3) present throughout the sample are thought to be produced by earthworms (Canti 1998), giving further evidence for their presence within the fills. Occasional roots are present in all but the lowest fill and show a range of decompositional stages from fresh to slightly degraded (FitzPatrick 1993). A few have been colonised by probable Oribatid mites (Babel 1975), the excrements of which are clearly visible within the decomposing tissues.

All of the contexts exhibit a fine texture (silty clay) and uniform mineral suite, except that the tertiary fill does not appear to contain vivianite (Table 2). The presence of vivianite in the primary and secondary fills was unexpected, as its occurrence within archaeological deposits is usually associated with a high organic content, high phosphorus content and, at least periodically, waterlogged (anoxic) conditions (FitzPatrick 1993), though detrital forms in geological (till) deposits have been recorded (Riezebos and

Rappol 1987). There is no indication that the sediments have been subjected to the degree of fluctuating groundwater that would be necessary to produce this mineral; under such conditions strong development of iron segregation (mottling) would also be expected. Furthermore, *in situ* development of vivianite tends to produce distinctive, acicular (needle-like) or dendritic (branching) intergrowths of crystals (Fig. 6d). Here, the mineral comprises discrete, rounded, fine sand-sized grains (Figs. 6a-c) that are randomly distributed throughout the soil fabric. The shape, size and distribution of the grains indicate that they do not represent *in situ* formation and suggests that the mineral has been subjected to some mechanical abrasion, possibly through reworking of the whole soil. However, without samples of the natural gravels, it is not possible to determine whether the grains are detrital or originate in association with anthropogenic activity.

The organic content comprises fine fragments of plant tissue (rarely larger than 50μm), and individual, or small groups of cells scattered throughout the soil fabric. The small size of the material indicates that efficient mechanical breakdown of the organic component by the soil faunal population has taken place. Homogeneous, brown pigmentation of the fabric imparted by fine (amorphous) organic material is also present throughout the sequence.

Rare zones of yellow silty clay (maximum dimension of *c.*750μm) are embedded within aggregates of the main soil fabric (Fig. 4). These have formed by internal reorganisation (slaking) of fine, calcareous soil material that has become redeposited within void spaces. Subsequent pedoturbation has acted to disrupt these pedofeatures from their initial site of formation and incorporate them into the body of the soil fabric. Their internal characteristics (colour, texture and b-fabric) and distribution are inconsistent with formation within the SFB hollow and it is therefore suggested that they represent an earlier stage of soil formation and have been inherited from the original soil material that forms the fills of the SFB. The fragments of calcareous soil (indicated by their colour and strong crystallitic b-fabric) that adhere to a very few of the stones suggest that this was the dominant soil type in which the yellow silty clay features formed. The fills may well have shown a more calcareous fabric when first deposited, but subsequent leaching has caused dissolution of much of the fine-grained calcite causing the soil to have only a weak crystallitic b-fabric.

Thin (30μm) coatings of dark brown silty clay on void walls are occasionally present in the upper fills (Fig. 5). The formation of these pedofeatures most likely occurred *in situ* as all coatings are present on existing void walls and none show disruption, fragmentation or incorporation into the body of the soil fabric. The presence of these features suggests that after deposition of the tertiary fill, the surface was unstable for some time leading to the redistribution of fine soil material further down the profile.

Material associated with anthropogenic activity is present in all of the fills; bone was consistent but low in quantity through the fill sequence and only two fragments of pottery and two of possible burnt stone were recorded (Table 3).

Interpretation

The fill contexts as observed in the thin sections suggest that they were deposited by deliberate backfilling of the hollow using soil material that was contaminated with a low concentration of anthropogenic material. This probably occurred soon after abandonment as there is no evidence for either slumping (from the section drawings), nor a primary fill comprising well sorted fine material as might be expected if an initial accumulation of sediment had occurred through weathering of the sides of the hollow. Subsequent to deposition of material in the hollow, colonisation by a range of soil fauna occurred, acting to disrupt the material and impart the granular structure seen. The degree of biological activity suggests that the material contained considerably more organic material than is currently observed in the sample (this having been lost through humification). The presence of anthropogenic material in the fills suggests that the backfill was derived from an area within the settlement though the low incidence of the fragmentary material does not suggest that it should be considered midden-type material and it was more likely to be topsoil or an upper subsoil.

SFB7

Description

As within SFB1, though clear primary (986) and secondary (985) contexts were recorded in the field (Table 1), these could not easily be distinguished in the thin sections. Context 986 was subdivided into two units (986.1 and 986.2) due to there being a change in the stone content and porosity in the upper 4cm (Fig. 2). The fills show comparable characteristics to those of SFB1.

Interpretation

The nature and deposition of the fills is comparable to those in SFB1; with the fills most likely representing redeposited material from elsewhere around the site after abandonment of the structure.

Discussion

Floors

One of the major objectives of this study was to determine whether the primary fill had accumulated as a result of material falling through floorboards. Before this question can be addressed, it is worth considering the alternative types of floor construction in SFBs. Evidence for trampled earthen floors i.e. where the occupation surface lies at the base of the sunken feature, has been recorded in SFBs as, for example, in some of the Mucking structures (Hamerow 1993, 11). The floors showed evidence of wear and trampling indicated by a lowering of the central area relative to a slight ledge around the edge and postholes, coupled with a concentration of occupation debris (Jones 1974, 198). It can be argued that the ledge represents the original floor level whilst the central area has been lowered by compaction of the sediment due to repeated trampling. A remnant of a clay floor was recorded in one of the Grubenhäuser at Mucking (Hamerow 1993, 11 and Fig. 75) indicating a greater degree of floor preparation than in the above examples. Finally, it has been suggested that some SFBs were constructed with suspended floorboards over the sunken area, as has been suggested for certain structures at West Stow (West 1969, 1985) and West Heslerton (Powlesland 1998).

If either of the first two flooring techniques were to be interpreted, analysis of samples across the contact boundary between the primary fill and the natural would be necessary. Useful information such as the relative degree of compaction, the nature and frequency of any embedded microartefacts resulting from trampling, particle size sorting, particle orientation and sediment staining can sometimes allow earthen floors/occupation surfaces and the deposits lying directly beneath them to be recognised (Courty *et al*. 1989; Macphail and Goldberg 1990; Goldberg and Whitbread 1993; Gé *et al*. 1993; Matthews 1995). In order to address this aspect of the research, samples taken across the boundary between the primary fill and the underlying 'natural' would have been required.

Fill mechanisms

'An understanding of the processes by which the huts were abandoned and the hollows filled up is ...[therefore]...crucial to the interpretation of their date, contained finds and function.' (Hamerow 1993, 14).

Micromorphological analysis of SFB fills in order to understand their mode of formation has been conducted at a limited number of sites; the only other studies to date are from the Anglian settlement at West Heslerton, Yorkshire (Macphail 1998) and the Saxon site at Stratton, Bedfordshire (Macphail and Cruise 1998). The ways in which SFB hollows fill naturally (i.e. without rubbish deposition) and the type of macro and micromorphological sedimentary features that result are poorly understood. Research into the natural fill mechanisms of negative features has been restricted to deep (>0.8m) pits (Fasham 1987) and ditches in chalk (Bell 1990) and sand (Crabtree 1990). Though these produce clear weathering profiles and associated primary fills, the mechanisms are not directly transferrable to the situation presented by the SFB hollows at this site. This is due to differences in the inherent structural stability imparted by the different parent materials and by the way the features are constructed (primarily the ratio between depth and width of the cut). Experimental work to monitor the features exhibited by a naturally weathering SFB hollow is in progress at West Stow (Jess Tipper, *pers. comm.*), but the results of this research are not yet available for consultation.

Stratified fills were recorded in the field sections (three contexts for SFB1 and two for SFB7), however, when the material was manufactured into thin sections, no clear boundaries between the contexts could be observed when viewed without magnification (Figs. 1 and 2) and the position of the contexts could only be extrapolated from the section drawing. Each of the 20cm sequences showed evidence for the material being highly biologically reworked by soil fauna and the homogeneity was so marked that the samples were analysed in 1cm deep spits in order to see whether stratification could be recognised through microscopic analysis; even so, no clear differences could be detected.

It has been noted that stratified hut fills at Mucking were rare and very few of the SFBs contained anything that could be described as an 'occupation layer' (Hamerow 1993, 14); analysis of SFBs at other sites suggests that this is typical (Tipper 1998). A comparable situation is presented at Lechlade. Though anthropogenic material was recorded in the primary fills of the Lechlade SFBs, neither contained characteristics suggesting that they represented *in situ* accumulations of occupation debris. Neither the types, nor the quantities of inclusions resulting from anthropogenic activity (bone and charcoal in particular) were any higher than in the overlying layers (Tables 1 and 2). In conclusion, the fill material presents a comparable situation to that described at Mucking by Hamerow who states that ‘At best, they may reflect activity which took place in the vicinity of the hut...’ (1993, 14).

Conclusions: addressing the objectives

Objective 1: *to determine whether the primary fill of the SFB ‘cuts’ accumulated as a result of occupation material falling through floorboards (as has been suggested for other similar features).*

Given the similarity in texture, mineralogy, organic content, anthropogenic inclusions and suite of pedofeatures throughout the fill sequences, there is no evidence to suggest that the lower levels represent any form of *in situ* accumulation of material contemporary with occupation of the structures.

Objective 2: *if this is not the case, to determine the mode of origin of the primary fills of the SFBs. (also applicable to Objectives 3 & 4)*

The most likely mode of deposition is through backfilling of the hollow with soil from the surrounding area in which small amounts of anthropogenic material was present. Bone and pottery were recovered during excavation and observed in thin section in small quantities, together with charcoal.

Objective 5: *to indicate how soon after abandonment the various infilling deposits began to accumulate.*

Indications of weathering in the bottom of the pit could not be assessed as no suitable sample was available. Micromorphological features indicating silting could not be recognised in either SFB. Both structures had steeply sloping sides (noted in the preliminary excavation report) suggesting that long-term exposure to weathering had not occurred as this tends to create shallower slopes as material erodes in from the surface edges. Weathering attendant on a long period of exposure might be expected to produce slump features in the base of the SFB that are best recognised from the section in the field rather than in thin section.

Objective 6: *to comment on what microscopic remains/features observable in the thin sections say about activities that were carried out in the SFBs.*

As all of the fills (including the primary) appear to be redeposited material dumped into the hollows after abandonment this question cannot be addressed.

Acknowledgements

I should like to thank Jess Tipper (Department of Archaeology, University of Cambridge) for discussion regarding fill mechanisms and floors in sunken featured buildings; Karen Milek (as above) for permission to use her illustration of vivianite and comments on the report.

References

Babel, U 1975 Micromorphology of Soil Organic Matter. pp. 371-473. In: J E Gieseking (Ed.) *Soil Components Vol.1: Organic Components*. New York: Springer-Verlag.

Bell, M 1990 Sedimentation rates in the primary fills of chalk-cut features. pp. 237-248. In D E Robinson (Ed.) *Experimentation and Reconstruction in Environmental Archaeology: Symposia of the Association for Environmental Archaeology No.9 Roskilde, Denmark, 1988*. Oxford: Oxbow Books.

Bergadà, M 1993 Aproximación experimental a la actividad postdeposicional de los lumbricidos sobre los niveles arqueológicos. *Procesos Postdeposicionales, Arqueologia Espacial*, 16/17: 363-370.

Bullock, P, Fedoroff, N, Jongerius, A, Stoops, G, Tursina, T and Babel, U 1985 *Handbook for Soil Thin Section Description*. Wolverhampton: Waine Research Publications.

Canti, M 1998 Origin of calcium carbonate granules in buried soils and Quaternary deposits. *Boreas* 27: 275-288.

Courty, M A, Goldberg, P and Macphail, R I 1989 *Soil Micromorphology and Archaeology*. Cambridge: Cambridge University Press.

Crabtree, K 1990 Experimental earthworks in the United Kingdom. pp. 225-236. In D E Robinson (Ed.) *Experimentation and Reconstruction in Environmental Archaeology: Symposia of the Association for Environmental Archaeology No.9 Roskilde, Denmark, 1988*. Oxford: Oxbow Books.

Gé, T, Courty, M A, Matthews, W and Wattez, J 1993 Sedimentary formation processes of occupation surfaces. pp. 149-164. In P Goldberg, D T Nash and M D Petraglia (Eds.) *Formation Processes in Archaeological Context*. Madison: Prehistory Press.

Goldberg, P and Whitbread, I 1993 Micromorphological study of a Bedouin tent floor. pp. 165-188. In P Goldberg, D T Nash and M D Petraglia (eds.) *Formation Processes in Archaeological Context*. Madison: Prehistory Press.

Fasham, P J 1987 *A Banjo Enclosure in Micheldever Wood, Hampshire*. Hampshire Field Club and Archaeological Society, Monograph 5.

FitzPatrick, E A 1993 *Soil Microscopy and Micromorphology*. Chichester: John Wiley & Sons Ltd.

Hamerow, H 1993 *Excavations at Mucking Volume 2: the Anglo-Saxon settlement*. London: English Heritage.

Jones, M U 1974 Excavations at Mucking, Essex: a second interim report. *Antiquaries Journal*, 54: 183-99.

Macphail, R I and Goldberg, P 1990 Soil micromorphology in archaeology. *Endeavor*, 14(4): 163-171.

Macphail, R I 1998 Assessment of the soils. In D Powlesland (Ed.) The West Heslerton Assessment. *Internet Archaeology*, 5 (http://intarch.ac.uk/journal/issue5/westhes/4-4.htm).

Macphail, R I and Cruise, G M 1998 *Report on the soil micromorphology and chemistry of the Saxon Grubenhäuser and Late Medieval dovecote at Stratton, Bedfordshire*. Unpublished report to Bedfordshire County Archaeology Service.

Matthews, W 1995 Micromorphological characterisation and interpretation of occupation deposits and microstratigraphic sequences at Abu Salabikh, Southern Iraq. pp. 41-74. In A J Barham and R I Macphail (Eds.) *Archaeological Sediments and Soils: Analysis, Interpretation and Management*. London: Institute of Archaeology.

Powlesland, D (Ed.) 1998 The West Heslerton Assessment. *Internet Archaeology*, 5 (http://intarch.ac.uk/journal/issue5/westhes/4-4.htm).

Riezebos, P A and Rappol, M 1987 Gravel-sized and sand-sized vivianite components in a Saalian till layer near Borne (The Netherlands). *Geologie en Mijnbouw*, 66(1): 21-34.

Tipper, J 1998 *Interpreting Anglo-Saxon settlement-space: Grubenhäuser and their secondary refuse deposits*. Transcript of unpublished paper presented at Theoretical Archaeology Group (TAG), Birmingham, 1998.

West, S 1969 The Anglo-Saxon Village at West Stow: an interim report of the excavations 1965-8. *Medieval Archaeology*, 13: 1-20.

West, S 1985 *West Stow; The Anglo-Saxon Village* East Anglian Archaeology Report No. 24. Ipswich: Suffolk County Planning Department.