# Soil micromorphology in medieval Odense

## *Analysis of the Guild House and the Old Road area (OBM 9776 II)*

*By Federica Sulas, Cristiano Nicosia, Sara Pescio & Søren M. Kristiansen*

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* Department of Geoscience, Aarhus University

$ Quaternaria, Pallanzeno (VB) - Italy

Editor: Mads Runge

Odense Bys Museer/ Odense City Museums

Overgade 48

DK-5000 Odense C

museum@odense.dk

www.odensebysmuseer.dk

www.odensebysmuseer.dk/forskning/forskningscentret-centrum

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# 1. Introduction

This report presents the results of soil micromorphological analysis applied to samples from archaeological deposits uncovered by excavations at the medieval Guild House and the Old Road area in central Odense (OBM 9776, - 13.01.2016) (Figs 1 and 2). The analyses aimed at elucidating site formation and post-depositional processes and at identifying markers of activities, use of space, and traffic. This report forms the basis for another report where bulk soil chemistry and magnetic susceptibility of the same samples are discusses, and wherein the findings of all the analyses are discussed in the broader environmental and cultural contexts of medieval Odense.

Information on the excavation contexts and sample locations was kindly provided by Mikael Manøe Bjerregaard (Odense Bys Museer) and is summarised here for reference. The work carried out by Aarhus University was based on a standard collaboration research contract with the museum.


Figure 1. Map collage showing the location of excavation trenches (OBM 9776) in Thomas B. Thriges Gade and I. Vilhelm Werners Plads (Map sources modified from HistoriskAtlas.dk).

*Contexts of the samples: Guild house*

In 2016, the Odense City Museums (OBM) undertook excavations around an area where remains of a brick house had been recorded (and partly removed) in the 1950s. The new excavation recovered the remains of outer walls, possibly inner walls, several cultural layers (floors) and a hearth, which would have been part of a basement. While an early use of this area is indicated by the presence of two human graves (Christensen & Bjerregaard 2017), radiocarbon dates from the house deposits range from the mid-13th century to the early 17th century. The house would have been destroyed in the mid-16th century as part of spatial re-organisation in this part of the old town. A total of 3 monolith samples and 5 Kubiena samples were taken from various locations within the western and eastern rooms of the house (Table 1).

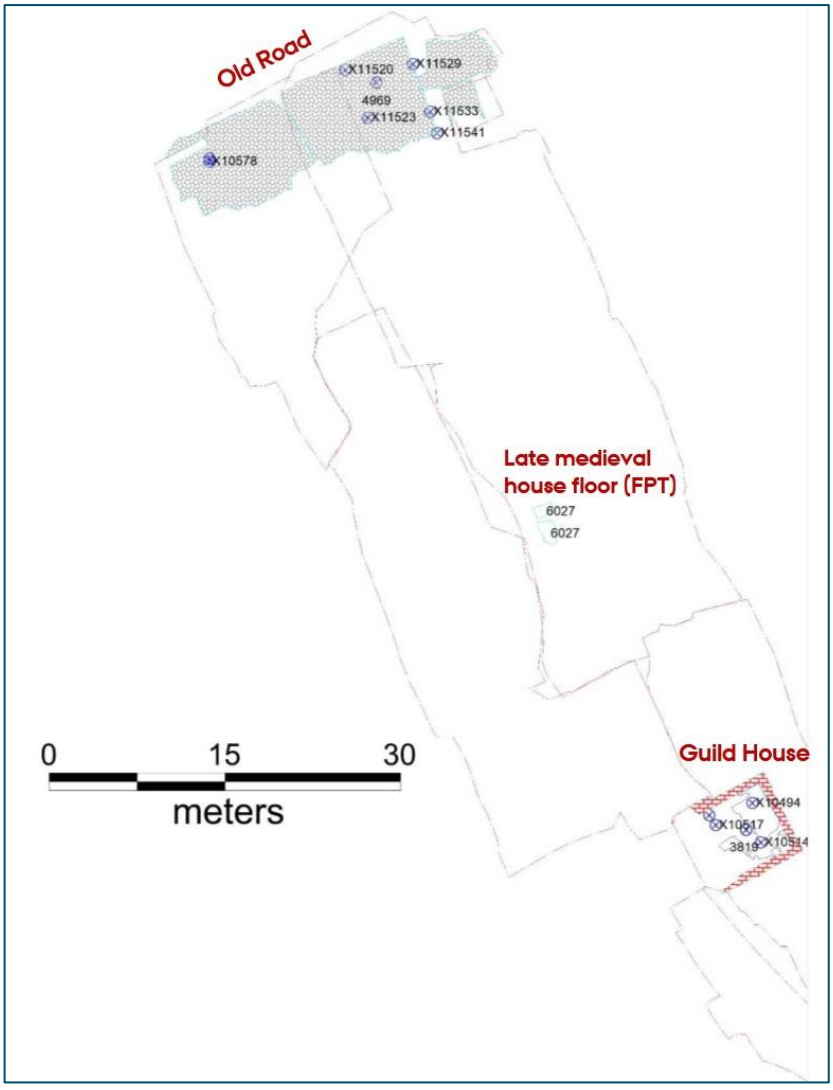


Figure 2. Map of the excavation trenches showing the location of micromorphology samples (map produced by M. M. Bjerregaard, OBM).

*Contexts of the samples: Old Road area*

An early pavement of the main street through medieval Odense was investigated over several excavation seasons in 2013–2016. The pavement (layers 4969 and 4484) appears to have been constructed directly on the subsoil, after removing topsoil and cultural layers associated with previous use. The pavement was built using small flint fragments and granite rock fragments (up to 10 cm). Variable concentrations of anthropic inclusions (twigs, wood, animal bone, antler) were embedded in this sandy matrix. The deposit appeared 'compressed' into a very compact surface. In some areas, wagon ruts were recorded during excavations. It is believed that the pavement was kept relatively clean and material found above was laid deliberately (rather than being the result of slow accumulation). In the late 12th or early 13th century, the area was raised (c. 0.5 m) by filling in organic-rich earthy material (layers 4941, 4942, 6040), possibly deriving from dunghills. On top of these layers, a series of small wooden market stalls were established, occupying the southern part of the street. The northern end of these market stalls was marked by a ditch (5809). A total of 2 monolith samples and 11 Kubiena samples were taken from various contexts.

*Contexts of the samples: Late medieval house floor*

A deposit associated with a late medieval house was recorded few meters north of the Guild House during modern construction work. The presence of two foundation ditches with large stones provided an indication that the house might have been 4 m wide. A monolith sample and 1 Kubiena sample were taken from the latest floor (layer 6027).

# 2. Materials and methods

Please note that this section contains technical descriptions that partly are re-used from previous reports. The private, Italian company QUATERNARIA Micromorphological Services (C. Nicosia and S. Pescio) described and interpreted the individual soil thin sections, while the overarching interpretations and combined conclusions were performed by the two AU-based authors (F. Sulas and S.M. Kristiansen).

*Soil micromorphology*

Soil micromorphology is the study of undisturbed samples of soil/sediment under a petrographic (polarizing) microscope. First developed within soil sciences, this method has been applied to archaeology since the 1950s. Today, soil micromorphology is applied to an increasingly wide range of contexts to characterise archaeological soils and sediments, and to acquire cultural and palaeoenvironmental information across different periods and environments (Nicosia and Stoops 2017: 1–5).

A total of 23 micromorphology samples were taken from key deposits by the excavation team and processed for micromorphological analysis (Table 1). These include 17 Kubiena samples and 6 monolith samples; the full list is provided in Appendix. Micromorphology samples were handed over for processing and analysis to S.M. Kristiansen. The samples were inspected for integrity and then processed into thin sections at the McBurney Laboratory for Geoarchaeology, University of Cambridge (full procedure is available at: https://www.arch.cam.ac.uk/research/laboratories/mcburney/cmb_docs/guide_soil_thin_sections). The procedure consists of a variably long process that turns the blocks into hard imprints on glass slides for study using optical microscopy. After collection, the samples are left to dry at room temperature or in a ventilated oven at low temperature. Once dried, the samples are impregnated using crystic polyester resin, mixed with acetone and a catalyst. The impregnated blocks are then put under vacuum to enhance the capillary penetration of the mixture into the material, so that each pore is filled and all the particles are fixed. The blocks are left to cure for a variable amount of time, depending on the nature of the material. Once fully hardened, the blocks are cut into thin slices, which are mounted onto glass slides and grinded down to reach a thickness of about 30 micrometer (1 µm= 1 x $10^{-3}$ millimeter). The glass slides (thin sections) are covered with a thin slip for protection and are ready for study using optical microscopy.

Thin sections are studied under a polarizing microscope equipped with two polarising filters (nichols) and objectives for different magnification views. The analysis is performed using three main types of light: plane polarized light (PPL), crossed polarized light (XPL), and oblique incident light (OIL). The description follows international standards for terminology and concepts (Stoops 2003). Identification and interpretation follow guidelines from reference textbooks (Stoops et al. 2010; Nicosia and Stoops 2017; Macphail and Goldberg 2018) and case studies relevant to the context under examination (see References). The thin sections from Odense were described and analysed by Sara Pescio, Cristiano Nicosia, and Federica Sulas.

Table 1. List of micromorphological samples and related contexts.

| Context | Samples* | Excavation layers | Key questions |
|---|---|---|---|
| **GUILD HOUSE** | | | |
| *Eastern area* | | | Function & activities |
| section FCB | OBM 1 (X10494-9776) | 3848 fill with brick rubble<br>5426 walkway<br>5381 sand floor, poss. bedding<br>5326 dirt layer over floor 5340<br>3819 limestone floor<br>3738 decomposed layer, brick rubble<br>3207 decomposed layer, brick rubble | |
| Walkway | | | Traffic |
| section FCH | OBM 2 (X10508-9776)<br>OBM 18 (X1057-9776 FCH)*? | 3848 fill with brick rubble<br>5426 walkway with humus<br>5381 sand floor, poss. bedding<br>5340 sandy floor<br>5326 dirt layer over floor 5340<br>3832 clay floor<br>3207 decomposed layer, brick rubble | |
| section FCK | OBM 3 (X10514-9776)<br>OBM 19 (X10513-9776 FCK) | 5588 humus<br>5380 brick floor<br>5412 soot<br>5340 sandy floor<br>5326 dirt layer over floor 5340<br>3819 limestone floor<br>3207 decomposed layer, brick rubble | Function & activities |
| *Western area* | | | Function & activities |
| section FCL | OBM 4 (X10517-9776) | 5585 gravel levelling<br>3848 fill with brick rubble<br>5425 humus<br>3829 clay floor<br>3207 decomposed layer, brick rubble | |
| *Entrance hall* | | | Traffic |
| Section FCM | OBM 5 (X10520-9776)<br>OBM 20 (X10519-9776 FCM)*? | 3848 fill with brick rubble<br>5425 humus<br>3829 clay floor<br>3830/3207 decomposed layer, brick rubble | |

Table 1 (Cont.). List of micromorphological samples and related context.

| | | | |
|---|---|---|---|
| **OLD ROAD** | | | |
| *Easter part* | | | Accumulation rate |
| section FCJ | OBM 6 (X10578-9776) | 4942 top of cultural layer | / |
| | OBM 7 (X10581-9776 LAG 4942) | 4942 fill of pavement | Dunghill? |
| | OBM 8 (X10584-9776 LAG 4941) | 4941 fill of pavement | Dunghill? |
| *Western part* | | | Accumulation rate & activities |
| section FQE | OBM 10 (X11520-9776 FRONT) | 4969 pavement and 6040 fill over it | |
| | OBM 11 (X11523-9776 FRONT) | Ditto | |
| section FLB/FQE/FQD | OBM 16 (X11561-9776 FRONT LAG 4969/6040) | Ditto | |
| | OBM 17 (X11571-9776 FRONT LAG 4969/6040) | Ditto | |
| section FLB | OBM 13 (X11529-9776 FRONT LAG 6040/6135) | / | Accumulation rate |
| | OBM 14 (X11533-9776 FRONT LAG 6040) | / | |
| | OBM 15 (X11541-9776 FRONT LAG 6040/5625) | 6040 fill of pavement<br>5625 | |
| | OBM 22 (X11593-9776 LAG 5625/6040)*? | | |
| | OBM 23 (X11594-9776 LAG 5625/6040)*? | | |
| section FQD | OBM 12 (X11526-9776 FRONT LAG 6040/5809 | 6040 fill of pavement<br>5809 ditch along market stalls | Accumulation rate |
| **LATE MEDIEVAL HOUSE FLOOR (FPT)** | | | |
| section FLB | OBM 9 (X11447-9776 FRONT) | 6025 white sand | Function of the floor |
| | OBM 21 (X11446-9776 LAG 6027) | 6026 paved stone floor<br>6027 clay floor | |

# 3. Results

*Characterising the micro-contexts*

The main aims of the analyses were to identify accumulation rates and activity markers within the deposits sampled. The analysis of the thin sections has identified 6 main categories of materials suggestive of different accumulation patterns, uses and post-depositional processes. In most thin sections, several sub-units were identified on the basis of differences in composition, and these are labelled using small case letter from bottom to top.

At sub-unit level, the following materials were recorded across the areas investigated: cess and latrine waste, anthropic waste from cleaning of hearths and/or cooking, mortar floor, calcareous fine matrix floor, beaten earth floor; and peat-like sediments (Table 2). The three types of floor deposits recorded are distinguished by differences in composition and micro-structure, as detailed in Table 2. Floor deposits made of mortar consist of generally coarse building material mixed with anthropogenic inclusions. Floors made of calcareous fine matrix are often found above mortar floors, resulting from a spread of calcareous material for re-flooring. In some instance, the same material is observed in different deposits, suggesting potential associations between different spaces of the areas investigated. In other cases, the same material is found deposited in different ways across different spaces.

In some cases, the properties of specific micromorphological features provide indication of the nature and pace of processes (Table 3). For example, horizontal orientation of components (e.g. sand, plant residues) can be the result of compaction and compression by trampling. Whether the trampling is by people or animals cannot be ascertained via soil micromorphology. However, in some cases, traces of animal excrements were detected alongside features deriving from trampling.

Table 2. Summary list of key materials identified in the thin sections from medieval Odense. Identification based on: Angelucci 2017: 223–230; Canti 2017: 141–142, 2017: 181–188; Milek 2012; Rentzel et al. 2017: 281–297; Stoops et al. 2017: 189–199.

| Materials | Key micromorphological characteristics | Context | Thin section and sub-unit |
|---|---|---|---|
| **Cess and latrine waste** | Plant-derived material at different stages of decomposition; occ. secondary phosphates (vivianite), fungal spores | **Guild House**<br>Eastern area, room fill<br>Western area, room fill<br>Western area, Entrance Hall<br><br>**Old Road, fills** | <br>OBM 1a, OBM 3a<br>OBM 4a,c<br>OBM 5a, OBM 20.3c<br><br>OBM 10 |
| **Waste from cleaning hearts/cooking** | Mix of burnt plant residues, large wood charcoal (hardwood and softwood), microcharcoal; burnt/unburnt shell and bone fragments; ceramic, brick, flint/chert inclusions. | **Guild House**<br>Eastern area, room fill<br>Eastern area, walkaway<br>Western area, Entrance Hall<br><br>**Late medieval house floor** | <br>OBM 1e,g; OBM 3b,d; OBM 19.1j,k; OBM 19.2g<br>OBM 2a,C; OBM 18.1a,d; OBM 18.2b<br>OBM 5d; OBM 20.1e,f<br><br>OBM 21.1c; OBM 21.2cOBM 21.3a |
| **Mortar floor** | Medium to very fine sandy loam, with variable content of silt; occ. microcharcoal and ash. Compression pedofeatures (trampling). | **Guild House**<br>Eastern area, Room fill | <br>OBM 1f,h; OBM 3c,f |
| **Calcareous fine matrix floor** | Fine to very fine sandy loam with calcitic groundmass. | **Guild House**<br>Western area, room fill<br>Western area, Entrance Hall<br><br>**Old Road**<br>Fills above/below pavement | <br>OBM 4b,d<br>OBM 5c, OBM 20.1g,e<br><br>OBM 16a; OBM 17a |
| **Beaten earth floor** | Medium to coarse sandy loam with rounded gains and non-calcareous fine mass; extremely compact and massive microstructure | **Late medieval house floor** | OBM 9; OBM 21.1a,d; OBM 21.2a,d |
| **Peat-like sediments** | Decayed plant residues | **Old Road**<br>Deposits beneath and fills above the pavement | <br>OBM 6, OBM 7, OBM 8, OBM 10, OBM 11, OBM 14, OBM 16, OBM 17, OBM 22.1-2, OBM 23.1-2 |

Table 3. Summary list of the areas where micromorphological indicators of accumulation rate, trampling and post-depositional processes were recorded. The units refers to the microstratigraphic units identified in thin section.

| *Area* | *in situ accumulation* | *dumping* | *trampling* |
|---|---|---|---|
| **GUILD HOUSE** | | | |
| Eastern area, room fill | Unit 2 | | Units 2 and 4 |
| Eastern area, walkway | | Units 1 and 3 | |
| Western area, room fill | | Unit 1 | Unit 1 |
| Western area, Entrance hall | Units 1 and 4 | | Units 1 and 4 |
| **OLD ROAD** | | | |
| Fills | | X | X |
| Beaten earth floor | Unit 2 | | X |
| Ditch | X | | X |
| **LM HOUSE FLOOR** | Unit 1 | | Unit 2 |

*Guild House*

Five main deposits were investigated in the Guild House. In general, the microstratigraphic units identified in these deposits appear largely consistent between the western and eastern areas.

### *Eastern area*

The thin sections from the eastern area show a sequence of anthropic waste and floors, represented by relatively thin and very thin micro-layers.

### *Room fills*

The room fills are represented by thin sections OBM 1, OBM 3 (Fig. 4) and OBM 19.1-3. From bottom to top, the following microstratigraphic units were identified:

[1] Cess and latrine waste deposit is represented in sub-unit **(a)** of OBM 1 and OBM 3 (Fig. 5). There is also evidence of re-flooring or spread of loamy material, presumably to sealing off the underlying cess waste, as indicated in at least two sub-units **(b)** and **(c)** of OBM 1.

[2] Anthropic waste originating from cleaning of hearth and/or cooking installations as observed in sub-unit **(e)** of OBM 1 and sub-unit **(b)** of OBM 3 (Fig. 6). This consists of highly organic sand with embedded decayed plant residues, charcoal, wood ash and ceramic material. The layer is likely to have accumulated *in situ*—at least in the case of OBM 1. In OBM 3, sub-unit **(b)** also shows indication of trampling.

[3] A very thin mortar floor consisting of medium sands and mineral temper is observed in sub-unit **(f)** of OBM 1 and sub-unit **(c)** of OBM 3.

[4] Anthropic waste very similar to the one recorded above [2], also showing indication of trampling in sub-units **(g)** of OBM 1; sub-unit **(d)** of OBM 3, and possibly sub-units **(j)** and **(k)** of OBM 19.1 and **(g)** of OBM 19.2.

[5] At the top of the sequence, a second, thin mortar floor is observed in sub-unit **(f)** of OBM 3 and possible sub-unit **(h)** in OBM 1.

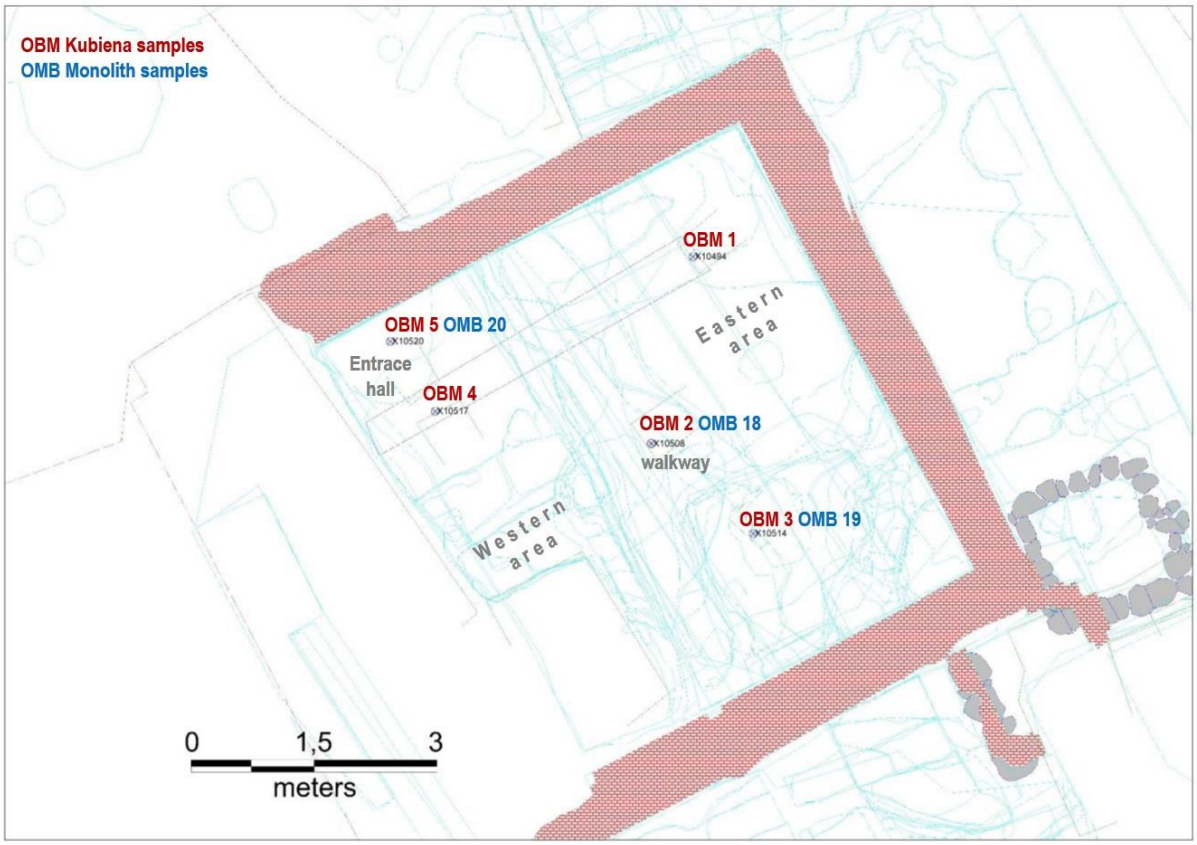


Figure 3. Plan of Guild House showing the location of the micromorphology samples (plan produced by M. M. Bjerregaard, OBM).

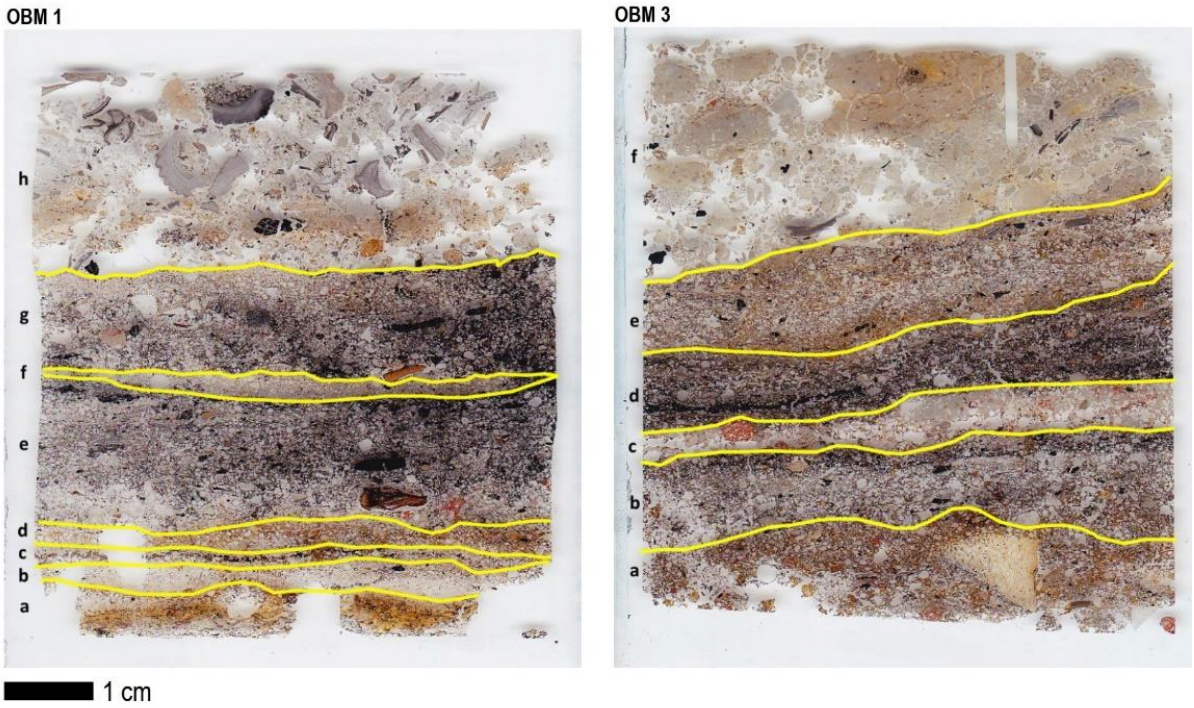


Figure 4. Thin sections of OBM 1 and OBM 3 with sub-unit divisions.

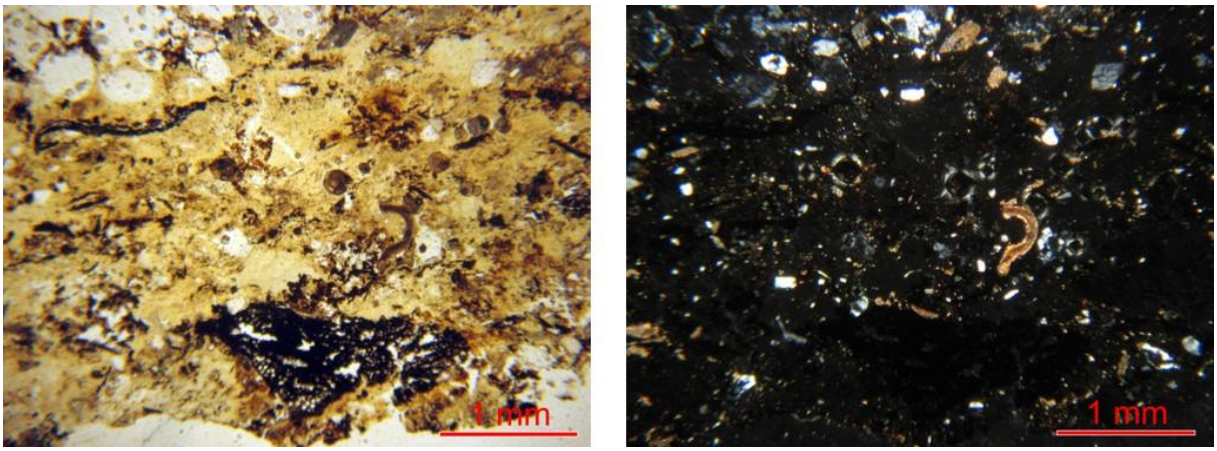


Figure 5. High phosphatic material rich in plant-derived organic fragments in sub-unit (a) of OBM 1, composed of latrine waste. PPL (right) and XPL (left). Scale bar (red): 1 mm.

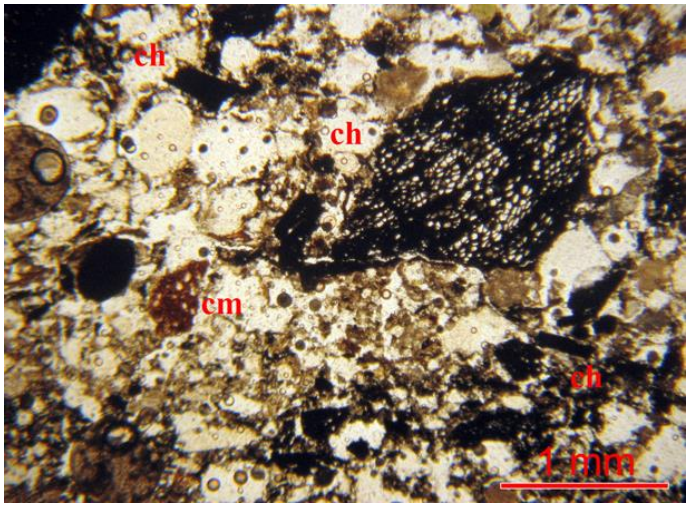


Figure 6. Sand with embedded charcoal (ch), wood ash and ceramic material (cm) in the anthropic waste layer from the cleaning of hearths and accumulated in situ. Sub-unit (e), OBM 1. PPL.

## Walkway

The walkway area represented by thin sections OBM 2 (Fig. 7) and OBM 18.1-2 revealed a slightly different sequence. From top to bottom, the following microstratigraphic units were recorded:

[1] Loose and rounded sand with limited anthropic inclusions (ceramic, bone, charcoal) is seen in sub-unit **(a)** of OBM 2 and OBM 18.1. The deposit is similar to sub-units **(e)** and **(g)** of OBM 1, but here mixing and texture suggest rapid accumulation (dumping).

[2] Very fine and fine sand with silt lamination is present in sub-unit **(b)** in OBM 2 (Fig. 8) and OBM 18.2, and sub-unit **(c)** in OBM 18.1. Loamy silt laminations indicate water runoff, which might result from this space being unroofed or water and sediments being washed down by strong rainfall. (or flooding of the room). This deposit might be associated with layer 5381 (sand floor with bedding).

[3] The top of the sequence is represented by anthropic waste from hearth/cooking installations observed in sub-units **(c)** of OBM 2 and OBM 18.2, sub-units **(b)** and **(d)** in OBM 18.1 (Fig. 9). These are similar to sub-units **(e)** and **(g)** of OBM 1, but here a higher degree of reworking, intermixing of latrine waste and open structure suggest that this waste has been dug up from elsewhere and dumped here as backfill.


Figure 7. Thin section OBM 2 with sub-unit divisions.

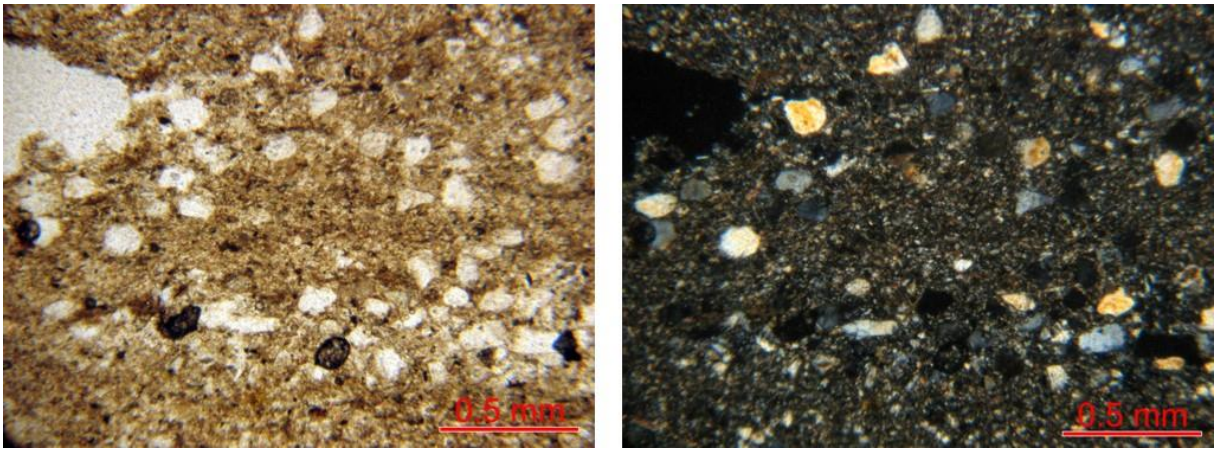


Figure 8. Fine laminations of very fine sand and silt in the top part of the sub-unit; such sedimentary features indicate water runoff on the surface of the walkway, sub-unit (b), OBM 2. PPL (right) and XPL (left).

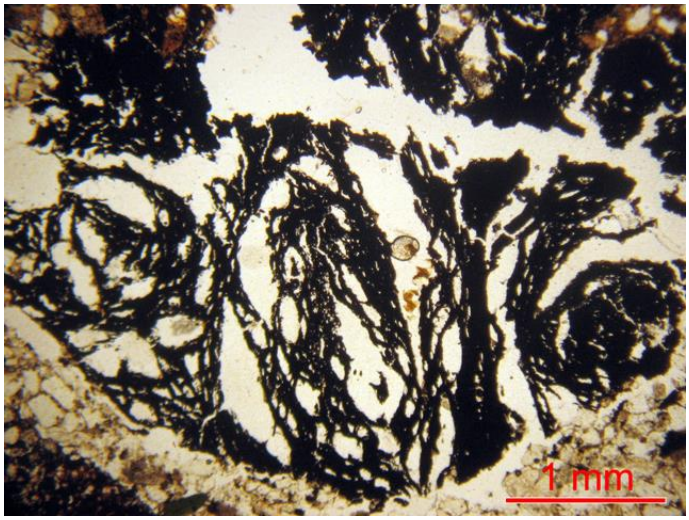


Figure 9. Charred cereal grain in the reworked anthropic waste layer, sub-unit (c), OBM 2. PPL.

### *Western area*

Two main deposits were sampled for micromorphological analysis: the main entrance hall and the house floor next to it. In both instances, the thin sections show alternating deposits of anthropic waste and calcareous floors.

#### Room fills

Floor sample OBM 4 shows two microstratigraphic units (Fig. 10), which have been recorded also elsewhere in the house, from bottom to top:

[1] Decomposed plant material, charcoal, large animal excrements and cess/latrine waste are seen in sub-units **(a)** and **(c)** (Fig. 11). They are similar to sub-units recorded in the eastern area, such as **(a)** in OBM 1 and OBM 3, but these are less compact and homogeneous, suggesting that they might derive from the cleaning and reworking of latrines (and not *in situ* accumulation).

[2] Calcareous, medium to fine loamy floors are seen in sub-units **(b)** and **(d)**. It is unclear whether these can be defined as 'mortar' or represent spread of unburnt sediments.


Figure 10 Thin section OBM 4 with sub-unit divisions.

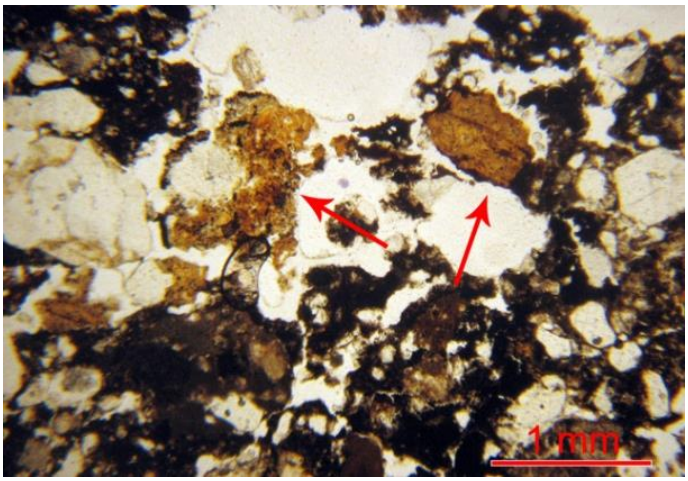


Figure 11. Carnivore-omnivore excrements and cess/latrine waste fragments (red arrows) in the organic layer deriving from cleaning or reworking of latrines, sub-unit (a), OBM 4. PPL

## Entrance Hall

The thin sections (OBM 5, OBM 20.1-3) from the Entrance Hall shows four main microstratigraphic units (Fig. 12), from the bottom:

[1] Deposit rich in decomposed plant material and animal excrements is observed in sub-unit **(a)** of OBM 5, and is very similar to sub-unit **(a)** in OBM 1 in the Eastern area. It also shows indication of compaction and compression. This can be interpreted as latrine waste or cess accumulated in situ.

[2] Medium to fine loose sand is seen in sub-units **(b)** of OBM 5, **(c)** and **(a)** of OBM 20.1, and **(d)** of OBM 20.2. This deposit might represent a sandy spread to seal off the cess waste below.

[3] Fine sand embedded in calcareous matrix is seen in sub-units **(c)** of OBM 5, **(e)** in OBM 20.1. This is very similar to the material observed in sub-unit **(b)** and **(d)** in OBM 4 and might also be considered a floor. This material might be associated with floor layer 3829 as recorded during excavation.

[4] At the top of the sequence, sub-units **(d)** in OBM5 and **(f)** in OBM 20.1 represent anthropic waste from cleaning and maintaining of hearths and cooking installations. Sand enriched with wood charcoal (Fig. 13), ash, brick and mortar fragments alongside bone, shell (burnt and unburnt) and reworked fragments of cess point to gradual build up. There is also some indication of compression by trampling. Based on contextual information available, it is likely that this deposit is associated with the decomposed layer 3830/3207 with brick rubble.

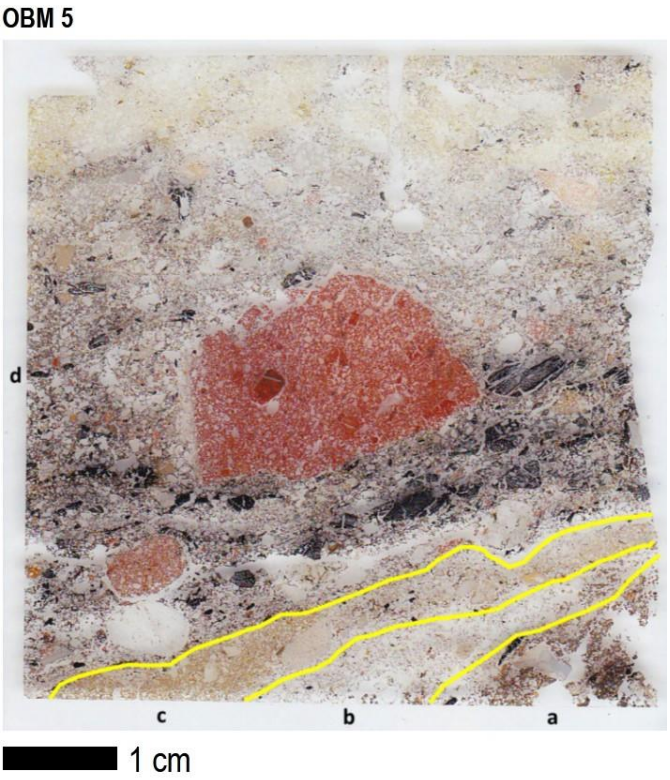


Figure 12 Thin section OBM 5 with sub-unit division.

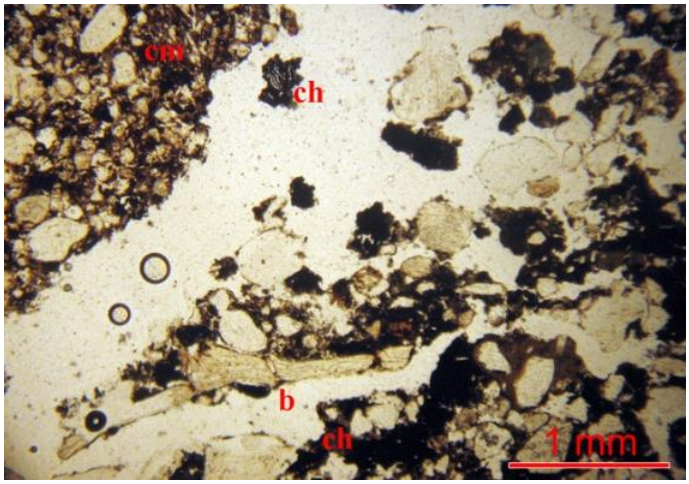

Figure 13. Sand enriched in charcoal (ch), ceramic material (cm) and bone fragments (b) in the anthropic waste layer from cleaning of hearths and accumulated in situ, sub-unit (d), OBM 5. PPL.

*Old road*

The old paved road was sampled for micromorphological analysis in the eastern and western sides to investigate the deposit beneath the pavement, the fills above it, later deposits and a ditch associated with market stalls subsequently established in the area (Fig. 14). A total of 14 thin sections were analysed from this area.

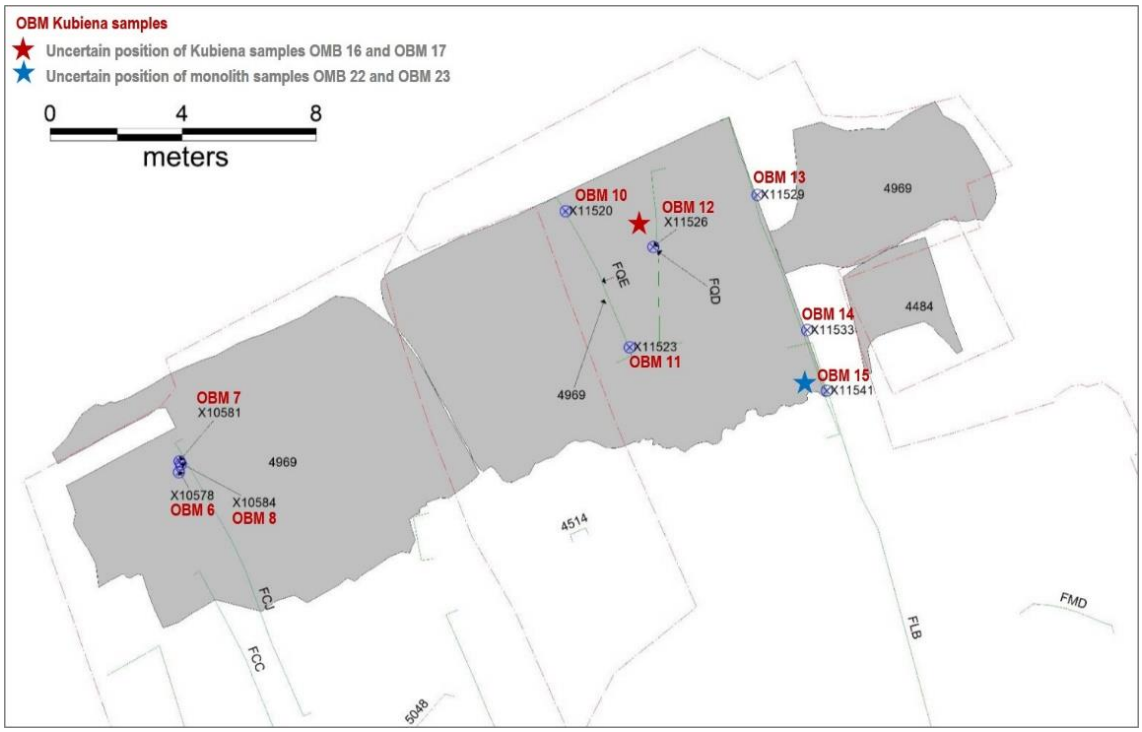

Figure 14 Plan of the Old Road area showing the location of the micromorphology samples (plan produced by M. M. Bjerregaard, OBM).

Most thin sections are remarkably similar and show a thick deposit of organic-rich anthropic waste mixed with peat-like sediments that has undergone waterlogging conditions. The greatest differences concern the depositional history of this deposit.

### *Deposits beneath the pavement and fills above it*

A relatively thick, organic-rich anthropic deposit embedded in peat-like sediments is observed in OBM 6, OBM 7, OBM 8, OBM 10, OBM 14, OBM 16, OBM 17, OBM 22.1-2 and OBM 23.1-2 (Fig. 15). In OBM 6 and 7, there is indication that this deposit formed as a result of rapid accumulation of anthropic waste, which might be linked to layer 4942. The organic inclusions are relatively well preserved, likely because of waterlogging condition after accumulation. Traces of trampling are only observed in OBM 8, which comes from layer 4941.

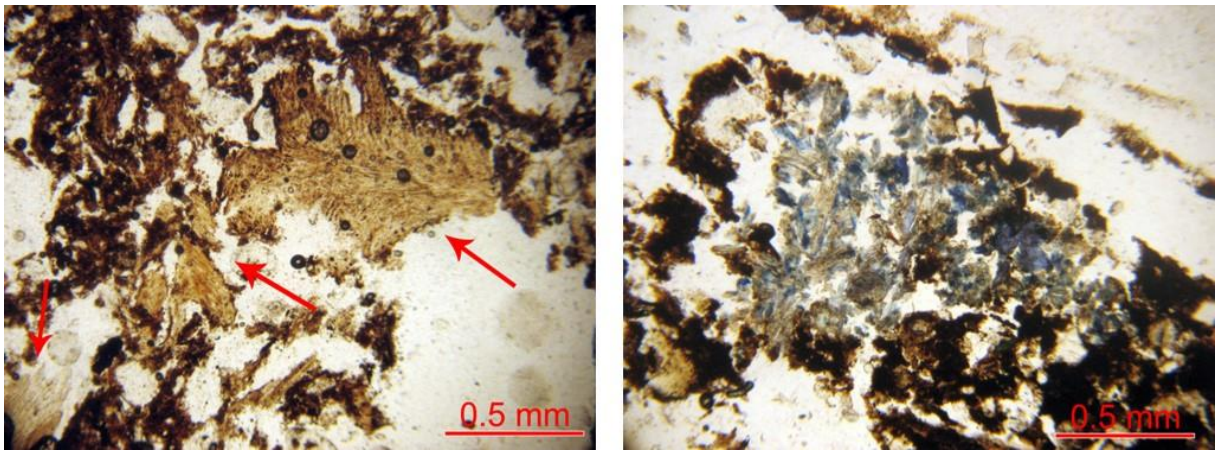


Figure 15. Peat-like material: right fragment of plant material (red arrows) in the peat or peat-like anthropic waste layer, thin section OBM 8; left Vivianite neo-formation indicates the weathering of organic matter under occasional reducing conditions in the peaty anthropic waste layer, thin section OBM 6. PPL

In OBM 10, this anthropic waste appears generally more decomposed and is covering a deposit of cess waste, similar to the one observed in the Guild House (sub-units **(a)** in OBM 3 and OBM 5). In addition, nutlets ('seeds' of berries, see Ismail Mayer 2017) (Fig. 16) and fishbones normally associated with excrements are also present. In the top part of the thin section, parallel horizontal bedding of plant fragments derives from compaction and compression by trampling (Rentzel et al. 2017). This would suggest a rapid accumulation of organic sediments, with trampling occurring after the sedimentation was complete. This tentative sequence might be consistent with field record of a fill (layer 6040) over the pavement (layer 4969).

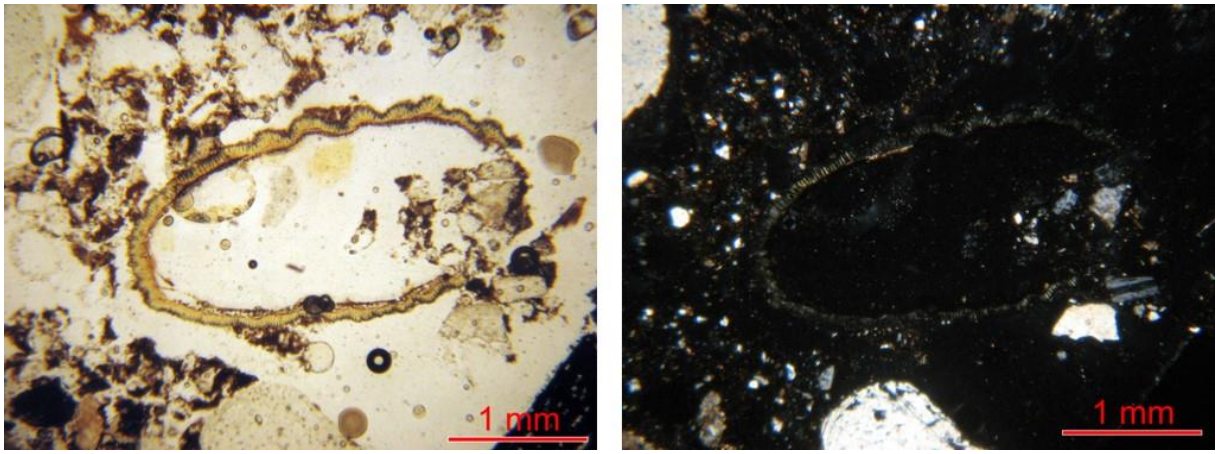


Figure 16 Nutlet ('seed' of berries) normally excreted with faeces in the cess or latrine waste layer. This is found in thelower zone of thin section OBM 10. PPL (right) and XPL (left).

OBM 11, 13, 14 and 15 also show a waste deposit, but this appears more a general waste that was dumped here. Waterlogging affected this deposit too after dumping. In some instances (OBM 13 and 14), traces of trampling are also observed.

### *Ditch*

One thin section was analysed from the ditch marking the northern border of the market stalls on the south side of the old pavement. OBM 12 is characterised by compressed plant residues, mostly deriving from herbaceous and sedge-like plants and very few from woody plants (Fig. 17). The bedding of these plant residues suggests gradual build-up and constant trampling. These could be associated with the presence of fodder for animals. However, the presence of dung cannot be firmly established in this deposit and, therefore, the precise formation processes remain unclear.

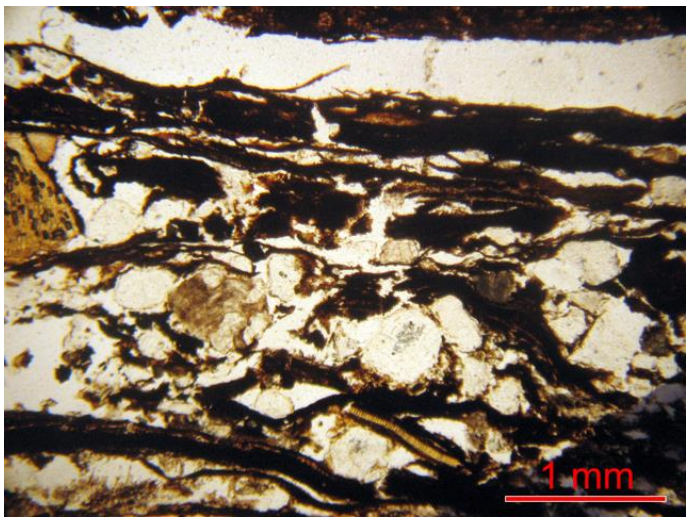


Figure 17. Compressed or trampled plant residues, thin section OBM 12. PPL

Thin sections OBM 16 and OBM 17 capture a mini-sequence of two micro-stratigraphic units (Figs. 18 and 19), from bottom up:

[1] At the bottom, sub-unit **(a)** represents a mineralogic floor, different from floors observed in Guild House (sub-units **(b)** and **(d)** in OBM 4, **(c)** in OBM 5). Here, the sand component is coarser (medium to coarse sand size) and distinctly rounded, and the fine mass is non-calcareous. In addition, this floor is extremely compact, producing a distinctive massive microstructure (Fig. 19). These characteristics might indicate that this is a 'beaten' earth floor, a surface that has been compacted as a result of substantial trampling.

[2] Organic-rich sub-unit **(b)** is composed of elongated plant fragments, charcoal, bone and secondary phosphates. These derived from an accumulation of anthropic waste on the beaten earth floor.

This sequence might be associated with the pavement (layer 4969) and fill over it (layer 6040) as recorded during excavation.

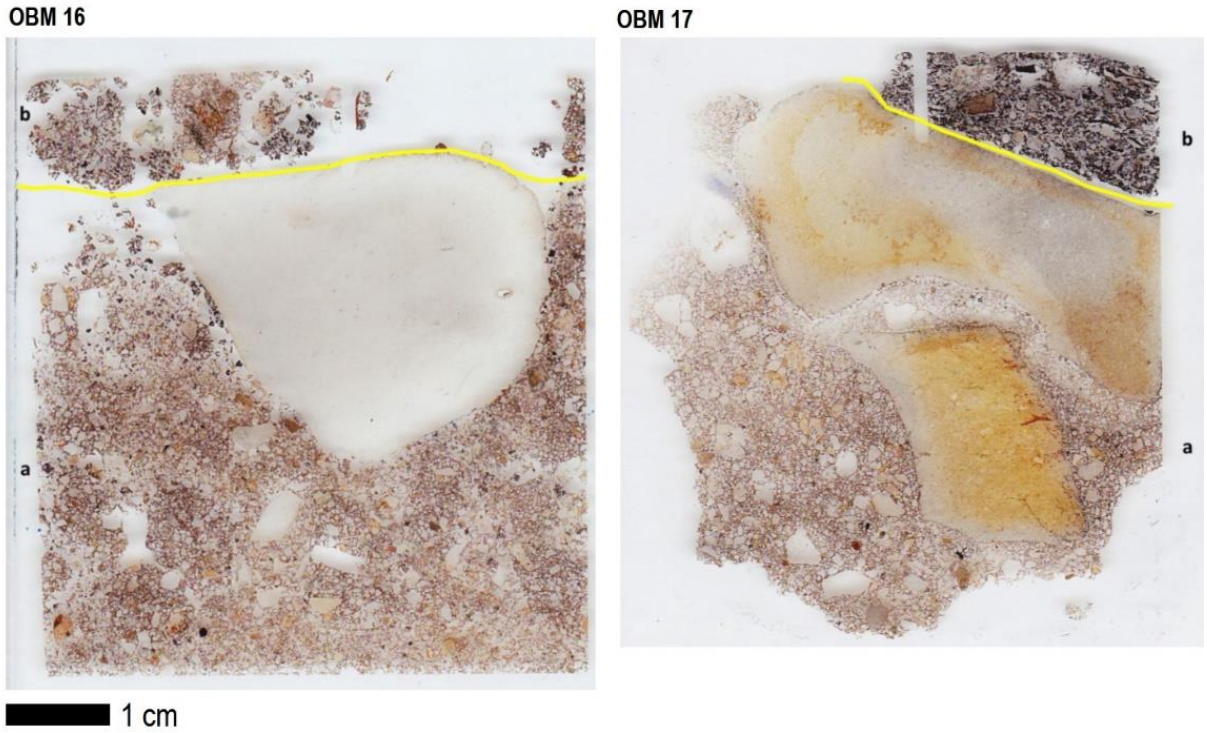


Figure 18. Thin sections OBM 17 and OBM 17 with sub-unit divisions.

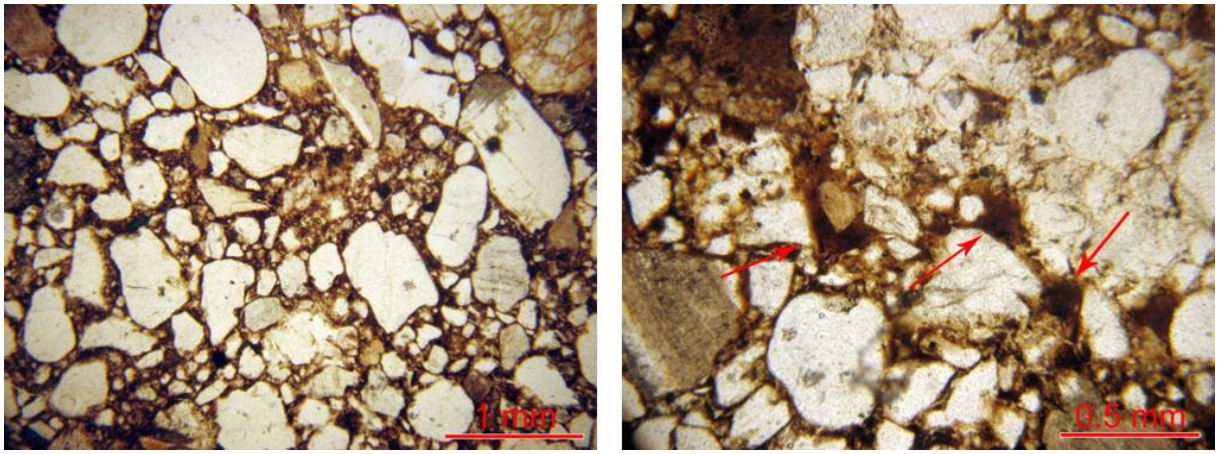


Figure 19. Minerogic floor of sub-unit (a): right apedal microstructure, suggesting that this floor was built with a 'beaten earth' technique in OBM 16; left clay illuviation (red arrows) in OBM 17. PPL

*Late medieval house floor*

A total of 4 thin sections where analysed from the late medieval house floor (FPT) recorded between the Guild House and the Old road: OBM 9 and OBM 21.1-3 (Fig. 20). The following sequence can be observed (from bottom up):

[1] Charcoal-rich waste is only seen in sub-unit **(a)** of OBM 21.3 (~ 5 cm thick). Embedded in a loamy coarse to fine sand silt matrix are abundant plant residues, variably charred, coarse wood charcoal and microcharcoal, fragments of burn bone, and rare fragments of shells (Fig. 21). In some cases, plant residues exhibit horizontal orientation, resulting from compression by trampling. This is likely associated with waste from a hearth, possibly accumulated *in situ*, which might correspond to layer 6028 as marked in the field.

[2] Fine loamy material with a calcareous matrix is observed in OBM 9 and sub-unit **(a)** in OBM 21.1 and OBM 21.2, and sub-unit **(b)** in OBM 21.3. The heterogeneous lithology (metamorphic, bioclastic, round limestone) might originate from quarrying of a glacigenic substrate. The (vughy) porosity and the presence of intercalations point to semi-wet conditions. In OBM 21.2, the horizontal orientation of plant fragments might result from trampling. The low content of anthropic inclusions, indications of semi-wet conditions, and the orientation of plant material suggest that this layer might represent material spread over a surface in semi-wet conditions or exposed to rainfall (unroofed?). In OBM 21.3, sub-unit **(b)** displays a similar deposit with enhanced degree of bioturbation and rarely fine fragments of bone. Fragments of silty clay crust and rare secondary phosphates (vivianite nodules) are also observed. It is possible that this deposit is associated with a layer of white sand (6025).

[3] Anthropic waste from a hearth or cooking installations is seen in sub-unit **(c)** in OBM 21.1 and OBM 21.2, and sub-unit **(b)** in OBM 21.2.

[4] At the top of the sequence, fine to very fine sand with calcareous matrix is observed in sub-unit **(d)** in OBM 21.1 and OBM 21.2 (Fig. 22). Anthropic inclusions include rare fragments of (burnt) bone and shell, charcoal and microcharcoal. No clear indication of trampling was observed, it is likely that this deposit is associated with a floor.

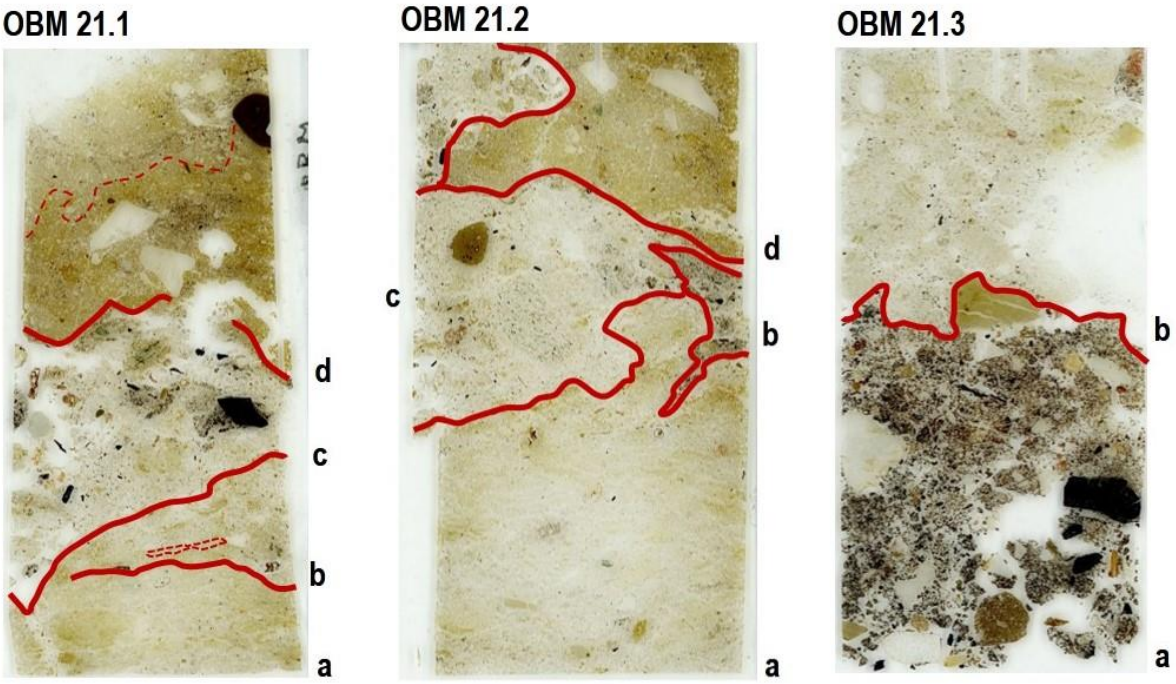


Figure 20. Thin sections OBM 21.1-3 with sub-unit divisions.

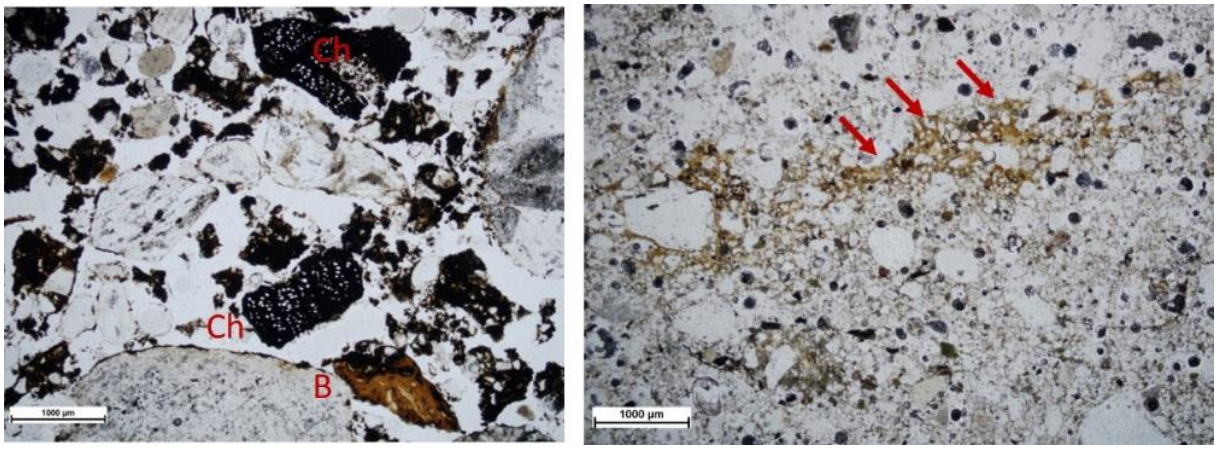


Figure 21. Hearth deposit: right charcoal (Ch) and burnt bone fragments (B); left silty clay intercalation; sub-unit (a), OBM 21.1. PPL.

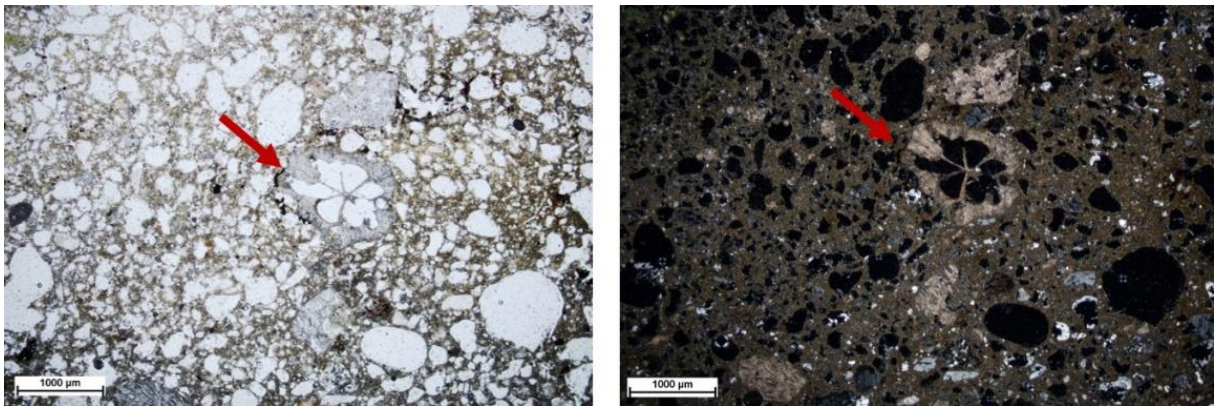

Figure 22. Fine sand embedded in calcareous matrix with shell fragments (red arrow), possibly associated with a floor surface; sub-unit (d), OBM 21.1. PPL (right) and XPL (left).

# 4. Discussion

*Previous micromorphological studies of samples from OBM 9776 I*

Soil micromorphological analysis had been conducted on 6 samples from excavations of an early medieval brick building in I. Vilhem Werners Plads (OBM 9776 I -16.05.201, just west of the Guild House and Old Road; Macphail et al. 2015). Before discussing the findings of the present study, the key results of this study are briefly mentioned here for reference.

Macphail et al. (2015) analysed thin sections from medieval urban contexts (~ 11th c. AD to later medieval periods) and their main findings can be summarised as follows (from bottom to the top):

- First activity was associated with ground raising using minerogenic turf of alluvial soil origin (T26);
- Intensive local occupation was characterised by the disposal of hearth/kitchen and construction debris, including common secondary phosphate features pointing to latrine waste (T26);
- Constructed floors were found associated with stabling (T67);
- Alluvial turf soil material used for ground raising was found in some places mixed with highly phosphatised material (T78);
- Indication of spread of middening and sealing by clean sands; in some cases, marine plant material was imported and used as floor covering (T146);
- A sandy clay loam was covered by a lime plaster surface.

*Guild House*

Three main deposits have been identified in the thin sections from the Guild House and recur in the eastern area, western room and entrance hall:

- At the bottom, a deposit of cess and latrine waste[1] appears to have accumulated *in situ* in the eastern area. Here, there is indication of re-flooring using loamy material to seal off the underlying waste. In the western area, the same waste appears to have been dumped. The presence of a cess waste has also been recorded in thin sections from TS26 (context A588) of OBM 9776 I (Macphail et al. 2015). Similarly to what reported by Machpail et al., the cess-rich sub-fabrics identified in this study are also characterised by common organic-rich, phosphatised material and the presence of secondary phosphates. Comparison with excavation data should clarify whether this cess and latrine waste accumulated in the Guild House or reflects a use of the area before the establishment of the brick house.
- Next, an anthropic waste from cleaning of a hearth and/or cooking installations is found accumulated *in situ* in the eastern area. A similar deposit was also recorded by Macphail et al. (2015).
- Different types of floors were then established. A mortar floor is recorded in the eastern room, whereas calcareous fine floors are found in the western room.

[1] Omnivore-carnivore excrements, sometimes mixed with ash, parasite eggs, reworked aggregates of underlying soil, seeds, iron-stained vegetal residues, phosphatic nodules, crystal intergrowths, crusts (see Nicosia et al. 2017: 337).


Figure 23. Guild House, view of X10514 Section FCK (walkway); left monolith sample and thin sections of OBM 18.


Figure 24. Guild House, view of X10507 Section FCK (eastern area); left monolith sample and thin sections of OBM 19.

Within this general sequence, specific conditions and patterns were also observed. In the eastern area, the walkaway yielded indication of material deposited due to water runoff, which might be explained with either this area being unroofed or alluvial deposition after heavy rains, or possibly flooding (Figs. 23 and 24).

In the western area, traces of a beaten earthen floor were recorded, including in the entrance hall (Fig. 25). This floor was not used for stabling of animals, either yielded any traces of latrine waste. A similar deposit has been recorded in the road and pavement contexts discussed below.


Figure 25. Guild House, view of X10520 Section FCM (Entrance Hall); left monolith sample and thin sections of OBM 20.

*Old road*

In the old road area, a thick deposit of peat-like materials with anthropic inclusions appears the result of rapid accumulation (Fig. 26). Organic matter is relatively well preserved compared to what can be observed elsewhere, likely as a result of postdepositional waterlogging. The presence of excremental matter, including secondary phosphates (Fig. 15), and traces of compression (Fig. 16) suggest that this deposit originated from the dumping of domestic waste, with trampling occurring after sedimentation was complete. It is unclear whether this anthropic, peat-like sediment is the same as the local turf of alluvial soil material identified by Macphail et al. (2015) and associated with ground-rising.

At the ditch, there is evidence of a beaten earthen floor, similar to the one observed in the entrance hall of the Guild House and the late medieval house. However, here the floor is made of coarser sands. This deposit might be representing a portion of the pavement layer 6040, possibly concomitant with the establishment of small market stalls.

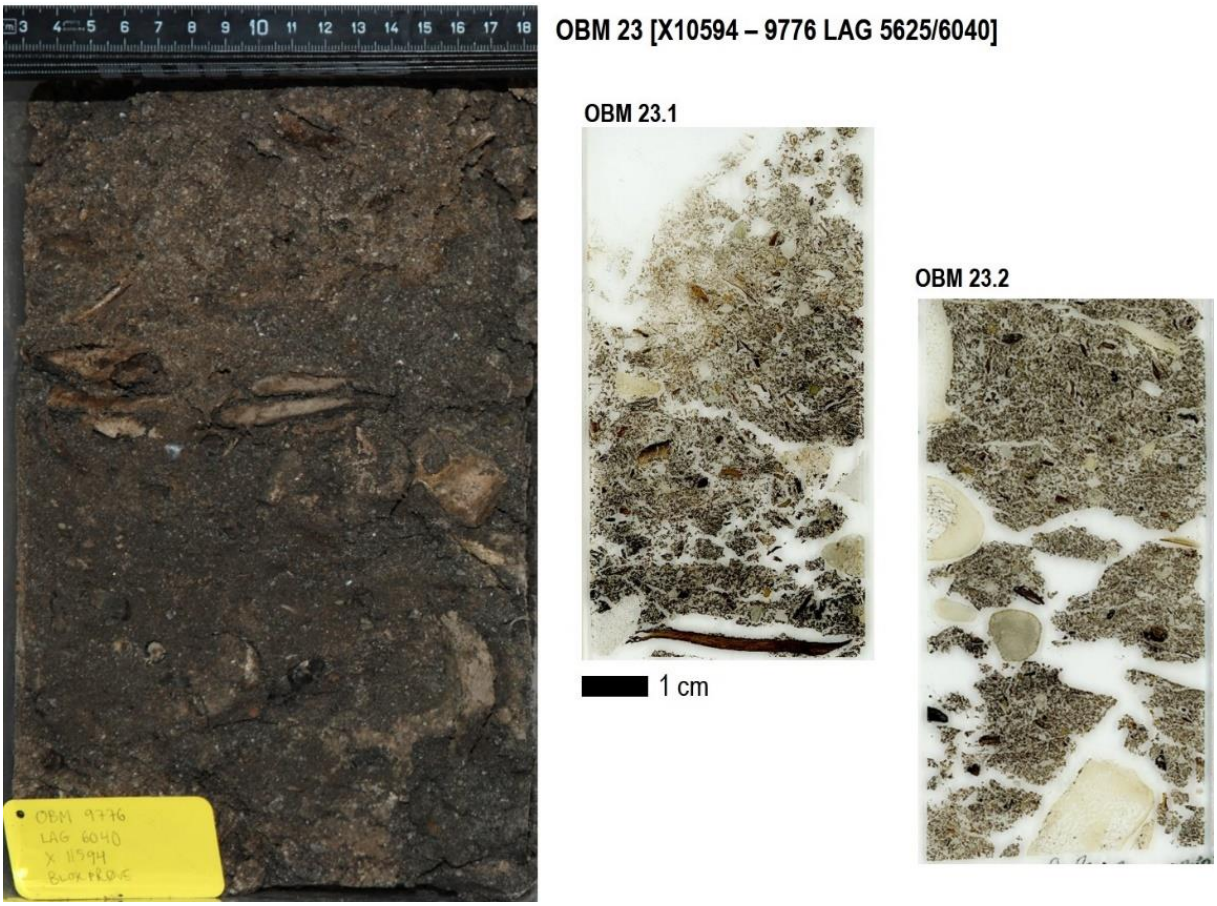


Figure 26. Monolith sample and thin sections of OBM 23.

*Late medieval house floor*

In this location, there is a sequence of alternating anthropic waste and different types of floors (Fig. 27).

At the bottom, a thick deposit of domestic waste accumulated *in situ*, and was later subject to trampling (similarly to what was observed in the Old Road fills discussed above).

Next, the presence of a calcareous, sandy matrix might be associated with the quarrying of earth material that was dumped here. Of note, previous studies of samples from T26 (contexts A1743 and A1338) recorded the presence of poorly sorted sands and gravels derived from podzols (Bs horizon material) that was used to raise the ground (Macphail et al. 2015). In our thin sections, low content of anthropic inclusions, indications of semi-wet conditions, and the orientation of plant material suggest that this layer might represent material spread over a surface in semi-wet conditions or exposed to rainfall (unroofed?). It is likely that this deposit is associated with a layer of white sand marked as 6025 in the field.

The top of the sequence is characterised by a deposit of hearth/kitchen waste overlain a fine calcareous floor.

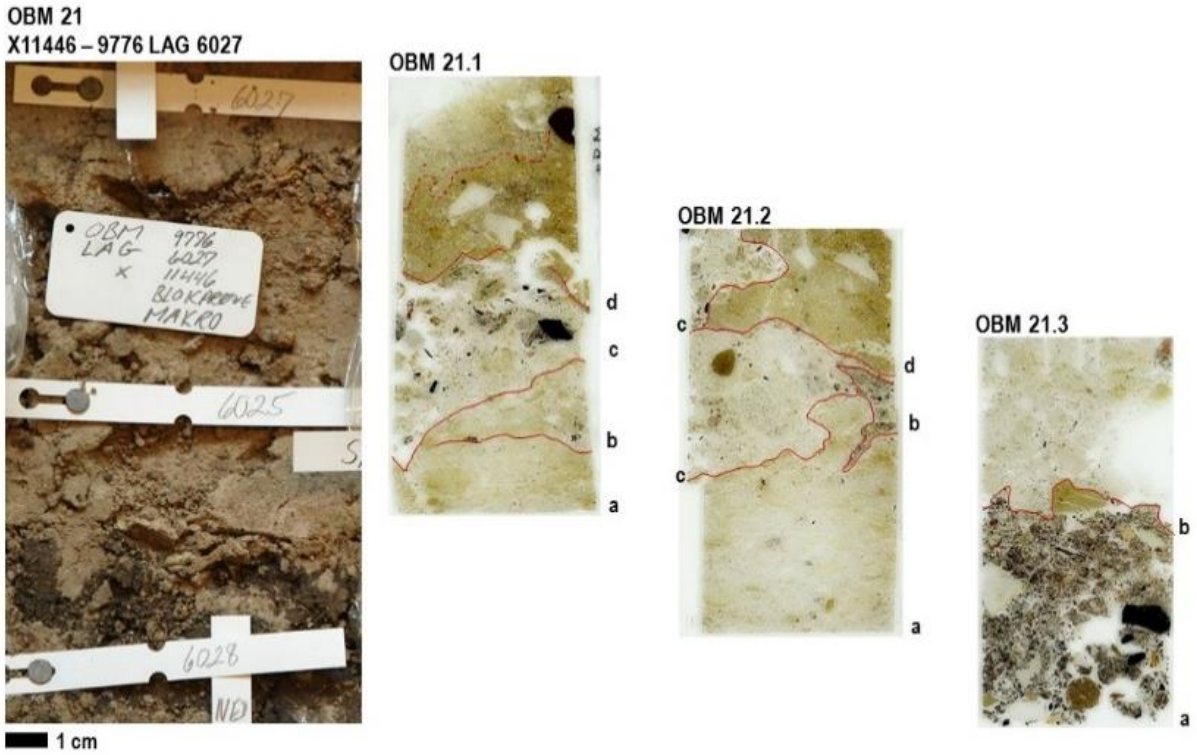


Figure 27 Monolith sample and thin sections of OBM 21.

# 5. Conclusions

The study of thin sections has identified different microstratigraphic units in the deposits sampled in the Guild House, Old Road area and the late medieval house floor. These suggests that use of space has changed over time. A tentative sequence might be proposed.

In the Guild House, the earliest phase is associated with the area being used for latrine (cess) waste, gradually built up *in situ* and occasionally sealed off. There is at least one instance where this waste was scooped and dumped in the western area. If this is correct, then the question remains as to whether the house was in fact used as a stable at this stage, or for human waste. Next, there is a sequence of material from hearths or cooking installations spread across the eastern area and covered by a mortar floor. This pattern can be observed across the house but not in traffic (passage) areas such as at centre of the eastern area. This sequence is associated with possibly cooking/consuming food.

In the Old Road area, there is evidence for a thick deposit of organic-rich, anthropic waste mixed in peat-like material, which appears relatively well preserved due to post-depositional waterlogging. There is also indication of cess waste in this deposit. However, it remains unclear whether this can be associated with the presence of dunghill or it might simply derive from more sporadic dumping of waste. It is interesting that this deposit also includes nutlets and fish bones (excreted as waste). In this respect, it is worth noting that latrine deposits dating to the late 15$^{th}$ c. in Odense (lag 991, lag 937) have yielded DNA evidence for the presence of parasites from pig excrements, harbour porpoise, and hop used for beer (Søe et al. 2018).

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# 7. Appendix: Thin section descriptions

## The Guild House

| Sample | | **OBM 1** (X10494-9776) – Eastern area | Similar to OBM 3 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 5 | **h** (0-2,5 cm) | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** sandy silt loam; silt and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, mica, plagioclase), subangular-subrounded grains; calcitic groundmass<br>**Organic components:** few organic matter microaggregates (20-50 µm); very few charcoal fragments (50-500 µm)<br>**Anthropogenic elements:** very few bone fragments (100-500 µm)<br>**Inorganic residues of biological origin:** frequent shell and eggshell fragments (200 µm-4 mm) variously burnt<br>**c/f10µm -ratio**: 98/2 **c/f related distribution**: close porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** / | Mortar floor (?) with common shells and shell fragments, variously burnt (Canti 2017). |
| 4 | **g** (2,5-3 cm) | **Voids:** /<br>**Microstructure:** massive<br>**Mineral constituents:** loamy sand; silt and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase, sedimentary and metamorphic<br>rocks), subangular-subrounded grains; calcitic groundmass<br>**Organic components:** frequent/dominant organic matter microaggregates (20-50 µm); frequent charcoal fragments (50 µm-2 mm); very few plant residues (100 µm-2 mm);<br>**Anthropogenic elements:** very few mortar fragments (200 µm-2 mm); very few bone fragments (100 µm-1 mm)<br>**Inorganic residues of biological origin:** very few (<2%) eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 80/20 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** crystallitic | Similar to sub-unit **(e)**, anthropic waste from cleaning of hearts/cooking installations. |

| Sample | | **OBM 1** (X10494-9776) – Eastern area | Similar to OBM 3 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Pedofeatures:** / | |
| 3 | **f** (3-3,3 cm) | Mortar micro-level with inclusions:<br>• frequent fine-medium sand, very few coarse sand and gravel (quartz, glauconite, mica, plagioclase, sedimentary and metamorphic rocks)<br>• very few charcoal fragments (20-500 µm)<br>• very few plant residues (20-200 µm) | Mortar floor(?), compact with medium sands as mineral temper. |
| 2 | **e** (3,3-5 cm) | **Voids:** /<br>**Microstructure:** massive<br>**Mineral constituents:** loamy sand; silt and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase, sedimentary and metamorphic rocks), subangular-subrounded grains; calcitic groundmass<br>**Organic components:** frequent/dominant organic matter microaggregates (20-50 µm); frequent charcoal fragments (50 µm-5 mm); very few plant residues (50 µm-1 cm);<br>**Anthropogenic elements:** very few ceramic material fragments (200 µm-3 mm)<br>**Inorganic residues of biological origin:** very few (<2%) eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 80/20 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** / | Anthropic waste originating from cleaning of hearths/cooking installations and accumulated *in situ*. Highly organic sub-unit composed of sand with embedded decayed plant residues, charcoal, wood ash and ceramic material. |
| | **d** (5-5,3 cm) | **Voids:** /<br>**Microstructure:** massive<br>**Mineral constituents:** loamy sand; silt and fine - medium sand (quartz, glauconite, chert, mica, plagioclase), subangular grains; phosphatic groundmass<br>**Organic components:** common organic matter microaggregates (20-50 µm); few charcoal fragments (50-300 µm)<br>**Anthropogenic elements:** very few bone fragments (100-500 µm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 70/30 **c/f related distribution**: close porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** common phosphatic infillings | Highly phosphatic cess and latrine waste, similar to sub-unit **(a)**. |

| Sample | | **OBM 1** (X10494-9776) – Eastern area | Similar to OBM 3 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| (1) | **c** (5-5,5 cm) | Silt and fine-medium sand level including frequent organic matter microaggregates | Sub-units **(c)** and **(b)** represent an episode of re-flooring of the surface that sealed off the underlying cess waste. |
| (1) | **b** (5,5-6 cm) | **Microstructure:** basic, chito-gefuric<br>**Mineral constituents:** loamy sand; fine - medium sand (quartz, glauconite, chert, mica, plagioclase, sedimentary and metamorphic rocks), subangular grains<br>**Organic components:** few organic matter microaggregates (20-50 µm); very few charcoal fragments (50-500 µm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 98/2 **c/f related distribution**: chito-gefuric<br>**B-fabric:** /<br>**Pedofeatures:** / | |
| 1 | **a** (6-6,5 cm) | **Voids:** channels (very few)<br>**Microstructure:** massive<br>**Mineral constituents:** silty clay loam; clay and silt, very few fine sand (quartz, glauconite, chert, mica, plagioclase), subangular grains; phosphatic groundmass<br>**Organic components:** few organic matter microaggregates (20-50 µm); common charcoal fragments (50 µm-1 mm); common plant residues (100 µm-1 mm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 20/80 **c/f related distribution**: open spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few (<2%) vivianite nodules (200-500 µm) | Sub-unit composed of cess and latrine waste, possibly of human or pig origin (see Macphail and Goldberg 2010). Highly phosphatic sub-unit rich in plant-derived material at different stages of decomposition. |

| **Sample** | | **OBM 2** (X10508-9776) – Eastern area, walkway | See also monolith sample **OBM 18** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 3 | **c** (0-2 cm) | **Voids**: channels (very few)<br>**Microstructure**: channel microstructure, weakly developed | Anthropic waste composed of material derived from cleaning of hearth/cooking, similar to sub- |

| **Sample** | | **OBM 2** (X10508-9776) – Eastern area, walkway | See also monolith sample **OBM 18** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Mineral constituents**: loamy sand; silt and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase), subangular-subrounded grains; calcitic groundmass<br>**Organic components**: few organic matter microaggregates (20-50 µm); common charcoal fragments (50 µm-3 mm); very few plant residues (20-50 µm); one charred cereal grain<br>**Anthropogenic elements**: very few ceramic material fragments (150 µm-3 mm); very few bone fragments (50-200 µm)<br>**Inorganic residues of biological origin**: very few eggshell fragments (100-150 µm) very few silica phytoliths<br>**c/f10µm -ratio**: 90/10 c/f related distribution: close porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**:<br>- very few phosphatic nodules (200-500 µm)<br>- very few vivianite nodules (200-300 µm)) | units **(e)** and **(g)** of OBM 1. Here, this material is intermixed with reworked cess and faecal waste. Open structure and reworking suggest that this waste has been dug up from elsewhere and dumped here as backfill. |
| 2 | **b** (2-4/5 cm) | **Voids**: channels<br>**Microstructure**: basic, chito-gefuric<br>**Mineral constituents**: loamy sand; very fine - fine sand and very few (<2%) gravel (quartz,glauconite, mica, plagioclase), subangular grains<br>**Organic components**: few organic matter microaggregates (20-100 µm)<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: /<br>**c/f10µm -ratio**: 98/2 c/f related distribution: close porphyric<br>**B-fabric**: /<br>**Pedofeatures**: very few phosphatic nodules (500 µm-1 mm) | Very fine and fine sand sub-unit with scarce anthropic components. In the top part, finely laminated very fine sand and silt features point to water runoff on surface, either because this was unroofed, or water and sediments were washed down from the doorway during strong rainfall events. Traces of trampling are also seen. |
| 1 | **a** (4/5-7 cm) | **Voids**: channels<br>**Microstructure**: basic, chito-gefuric | Loose medium sands with rounded edges and very scarce anthropic inclusions. |

| **Sample** | | **OBM 2** (X10508-9776) – Eastern area, walkway | See also monolith sample **OBM 18** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Mineral constituents**: loamy sand; very few silt and medium – coarse sand and very few<br>gravel (quartz, chert, mica, plagioclase, glauconite, sedimentary rocks), subrounded grains; calcitic groundmass<br>**Organic components**: few organic matter microaggregates (20-50 µm); few charcoal fragments (50 µm-1 mm)<br>**Anthropogenic elements**: very few bone fragments (50-500 µm); very few ceramic material fragments (50-500 µm)<br>**Inorganic residues of biological origin**: /<br>**c/f10µm -ratio**: 95/5 c/f related distribution: close porphyric<br>**B-fabric**: locally crystallitic<br>**Pedofeatures**:<br>- few vivianite nodules (200-300 µm)<br>- very few phosphatic nodules (200-500 µm) | |

## Monolith sample OBM 18(X1057-9776 FCH?) – Eastern area

| **Samples** | | **OBM 18.1** (13.2x5.8 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **f** (0-1,7 cm) | Organic-rich, fine loamy material. | Anthropic waste characterised by parallel orientation of charred and uncharred plant fragments. This might derive from compression by trampling. |
| | **e (1,7-3,7 cm)** | **Voids**: channel<br>**Microstructure**: massive to channel<br>**Mineral constituents**: fine to very sand silt; very rare medium sand (calcite?); calcitic groundmass | Fine to very fine loamy material with calcareous groundmass and scarce anthropic inclusions (charcoal, excrements). It might be |

| **Samples** | | **OBM 18.1** (13.2x5.8 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic component**s: rare charcoal fragments (20-50 μm), rare microcharcoal; rare uncharred plant tissue residue<br>**Anthropogenic elements**: /<br>I**norganic residues of biological origi**n: common phytoliths (trapeziform)<br>**c/f$_{10\mu m}$ ratio**: 40:60 **related distribution**: close porphyric<br>**B-fabric**: crystallitic to undifferentiated<br>**Pedofeatures**: phosphatised excremental matter | associated with an episode of re-flooring or spread of fine sands. |
| 3 | **d** (3,7-4,3 cm) | Similar to **(b)**, but with thin lenses of ashy waste and large charcoal fragments. | Finer sands, more compact and parallel orientation of charred remains point to trampling. Possibly, a spread of hearth waste to seal off the underlying cess waste. |
| 2 | **c** (4,3-8 cm) | Same as **(a)**, but increased coarse sands and pebbles, including large fragments of chert. | / |
| | **b** (8-13,2 cm) | **Voids**: channel, complex packing<br>**Microstructure**: crumb?<br>**Mineral constituent**s: loamy coarse to fine sand silt; tabular coarse sand and pebbles (>2 mm) (quartz, plagioclase, sedimentary rocks); calcitic domains<br>**Organic components**: common charcoal fragments (50 μm-> 2 mm) of different types of wood (ring-porous hardwood, diffuse-porous hardwood)<br>**Anthropogenic elements**: very fine bone fragments<br>**Inorganic residues of biological origin**: phytoliths (non-smooth, bulliform, articulated; non-heated)<br>**c/f$_{10\mu m}$ ratio**: 60:40 **related distribution**: open porphyric<br>**B-fabric**: undifferentiated to crystallitic<br>**Pedofeatures**: / | Anthropic waste composed of wood ash, plant residues (variously burnt), fragments of cess/latrine waste and possibly carnivore-omnivore excrements. In some instances, highly phosphatised organic matter deriving from cess/latrine waste is seen infilling charcoal vessels.<br>This is likely the same deposit of sub-unit **(c)** in OBM 2, representing a dump of anthropic waste as backfill. |

| **Samples** | | **OBM 18.1** (13.2x5.8 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 1 | **a** (10-13,2 cm) | **Voids**: channel, complex packing void<br>**Microstructur**e: crumb?<br>**Mineral constituents**: loamy medium to fine sand silt; tabular coarse sand and pebbles (>2 mm) (quartz, plagioclase, sedimentary rocks); calcitic micro-domains<br>**Organic components**: very rare amorphous organic matter; charcoal (10-500 μm)<br>**Anthropogenic elements**: rare burnt bone fragments and shell fragments (100-500 μm)<br>**Inorganic residues of biological origin**: fungal spores (mycorrhizal, ~ 20 μm); phytoliths (short cells)<br>**c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: open porphyric<br>**B-fabric**: undifferentiated, calcitic<br>**Pedofeatures**: calcite nodules (500 μm) | Loose medium sands with very scarce organic matter and anthropic inclusions, corresponding to **(a)** in OBM 2. |

| **Samples** | | **OBM 18.2** (13.2 x 5.8 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 3 | **d** & **c** (0-6,5 cm) | Similar to **(b)**, but including coarse potsherds, charcoal, brick/ceramic material, and cess waste. Plant residues variably charred. | Anthropic waste from cleaning and maintaining of hearths/cooking installations, and intermixed with general domestic waste material. |
| 2 | **b** (6,5-7,5 cm) | **Voids**: complex packing, channel<br>**Microstructure**: massive<br>**Mineral constituents**: loamy coarse to fine sand silt; tabular and sub-rounded pebbles (2 mm-3 cm) (quartz, plagioclase, sedimentary rocks; chert); calcitic groundmass<br>**Organic components**: amorphous organic matter; rare charcoal (50-0 μm); microcharcoal; rare burnt bone fragments (500 μm-5 mm)<br>**Anthropogenic elements**: very rare, round potsherds (200-500 μm)<br>**Inorganic residues of biological origin**: common ash; phytoliths<br>**c/f$_{10\mu m}$ ratio**: 70:30 r**elated distribution**: close porphyric | Similar to **(a)**, but far fewer anthropic inclusions, charcoal; fine organic matter. This material might represent a spread of ashy loamy earth to seal off the underlying waste. |

| **Samples** | | **OBM 18.2** (13.2 x 5.8 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **B-fabric**: crystallitic to undifferentiated<br>**Pedofeature**s: / | |
| | **a**<br>(7,5-13,2 cm) | **Voids**: complex packing, channel<br>**Microstructure**: massive<br>**Mineral constituents**: loamy coarse to medium sand silt; tabular and sub-rounded pebbles (2 mm-3 cm) (quartz, plagioclase, sedimentary rocks; chert); calcitic groundmass<br>**Organic component**s: common charcoal (500 µm-5 mm) (diffuse-porous and ring-porous hardwood), microcharcoal;<br>**Anthropogenic elements**: slag/coal fragment (1000 µm)?; brick fragments and sub-rounded ceramic material ; common ash; (burnt) bone fragments (200-500 µm)<br>**Inorganic residues of biological origin**: phytoliths (elongate and trapeziform cells)<br>**c/f$_{10\mu m}$ ratio**: 60:40 related distribution: open porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**:<br>- rare earthworm biospheroids (200-500 µm)<br>- illuvial clay coating | Anthropic waste, including reworked cess/latrine waste. The mixing and organisation of components point to rapid accumulation possibly associated with dumping. |

| **Sample** | | **OBM 3** OBM 3 (X10514-9776) – Eastern area | Similar to OBM 1; see also monolith sample OBM 19 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 5 | **f**<br>(0-3 cm) | Mortar level with very few inclusions:<br>- very few medium sand grains<br>- very few charcoal fragments (20 µm – 1 mm) | Mortar floor with dispersed shells fragments, similar to **(h)** in OBM 1. |
| | **e**<br>(3-3,5 cm) | **Voids**: channels (very few)<br>**Microstructure**: channel microstructure, weakly developed<br>**Mineral constituents**: sandy clay; clay and very fine-medium sand (quartz, chert, mica, plagioclase, glauconite), subangular grains; calcitic groundmass<br>**Organic components**: frequent organic matter microaggregates (20-50 µm); common charcoal fragments (50 µm-2 mm); very few plant residues (50-500 µm) | Ash-rich anthropic waste with burnt eggshells and charcoal fragments. Compaction and iso-orientation of elongated components point to trampling. |

| **Sample** | | **OBM 3** OBM 3 (X10514-9776) – Eastern area | Similar to OBM 1; see also monolith sample OBM 19 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: very few burnt eggshell fragments (200-500 µm)<br>**c/f10µm -ratio**: 60/40 c/f related distribution: single spaced porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**: very few phosphatic nodules (100-500 µm) | |
| 4 | **d**<br>(3,5-4 cm) | **Voids:** channels (very few)<br>**Microstructure:** channel microstructure, weakly developed<br>**Mineral constituents:** loamy sand; silt and very fine-medium sand, very few coarse sand (quartz, chert, mica, plagioclase, glauconite), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent charcoal fragments (50-700 µm); very few plant residues (50-500 µm)<br>**Anthropogenic elements:** very few bone fragments (100-500 µm); very few ceramic material fragments (200 µm-1 mm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 60/40 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few phosphatic nodules (100-300 µm) | Anthropic waste, similar to **(b)**, with charcoal, ceramic fragments, eggshell and bone fragments embedded in a matrix rich in ash and finely commuted charcoal. Parallel disposition of elongate components (shells, charcoal) indicates trampling. |
| | **c**<br>(0-3 cm) | Mortar level with inclusions:<br>- frequent very fine-medium sand grains<br>- very few charcoal fragments (20-700 µm)<br>- few ceramic material fragments (200 µm – 4 mm) | Mortar floor with mineral temper. |
| 2 | **b**<br>(4,5-5 cm) | **Voids:** channels (very few)<br>**Microstructure:** massive<br>**Mineral constituents:** loamy sand; loamy sand; silt and very fine-medium sand, very few coarse sand (quartz, chert, mica, plagioclase, glauconite), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent charcoal fragments (50 µm-1 mm); very few plant residues (50 µm-1 mm)<br>**Anthropogenic elements:** very few bone fragments (100-500 µm); very few (<2%) ceramic material fragments (100 µm-1 mm) | Anthropic waste from cleaning of hearths/cooking installations, similar to **(e)** and **(g)** in OBM 1.Here, traces of compaction in the upper part of the thin section indicate trampling and compression. |

| **Sample** | | **OBM 3** OBM 3 (X10514-9776) – Eastern area | Similar to OBM 1; see also monolith sample OBM 19 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Inorganic residues of biological origin:** very few eggshell fragments (50-300 µm)<br>**c/f10µm -ratio**: 70/30 **c/f related distribution**: close porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few phosphatic nodules (200-500 µm) | |
| 1 | **a**<br>(5-6 cm) | **Voids:** channels (very few)<br>**Microstructure:** channel microstructure, weakly developed<br>**Mineral constituents:** sandy clay loam; clay, silt and fine-coarse sand, very few coarse sand, very few gravel (quartz, chert, mica, plagioclase, glauconite), subangular grains; calcitic and phosphatic groundmass<br>**Organic components:** frequent organic matter microaggregates (20-50 µm); few charcoal fragments (50 µm-1 mm); common plant residues (100-200 µm)<br>**Anthropogenic elements:** few bone fragments (100 µm-1 cm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (300 µm-1 mm)<br>**c/f10µm -ratio**: 60/40 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** crystallitic and undifferentiated<br>**Pedofeatures:** very few phosphatic nodules (50 µm-1 mm) | Sub-unit composed of faecal material, rich in bone fragments that were probably digested and excreted. Plant material is abundant and less weathered than the one observed in **(a)** of OBM 1. This might indicate a more sheltered position (see Banerjea et al. 2015). |

## Monolith sample OBM 19 (X10513-9776 FCK) – Eastern area

| **Samples** | | **OBM 19.1** (10,5 x 5,8 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | **l** (0,5-1,1 cm) | As **(g)** | Very fine loamy material possibly associated with a thin re-flooring or sand spread. |
| | **i** (0-1,3 cm) | As **(f)** | Medium to fine mortar floor. |
| 4 | **k** (1,3-2,5 cm) | **Voids**: very few channel<br>**Microstructure**: massive<br>**Mineral constituents**: loamy medium to fine sand silt; rare subrounded sand (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: common charcoal (50-500 μm); microcharcoal;<br>**Anthropogenic elements**: burnt bone fragments (200-500 μm); rare shell fragments, variably heated (100 μm-2 mm); ash<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 60:50 **related distribution**: close porphyric<br>**B-fabric**: undifferentiatd<br>**Pedofeatures**: amorphous excremental matter | Anthropic waste from cleaning of hearth/cooking installation gradually accumulated in situ. Parallel orientation of charred plant residues and traces of snapping on bone fragments suggest trampling. This deposit might correspond to sub-unit **(e)** in OBM 1. |
| 4 | **j** (2,5-2,6 cm) | As **(g)** | Lenses of very fine loamy, calcareous material from a thin re-flooring or sand spread to seal off the underlying waste. |
| | **h** (2,6-5,3 cm) | As **(a)** rubble with large fragments of brick, ceramics, fine calcitic floor fragments, burnt shells, charcoal. | Anthropic waste intermixed with rubble material. This sub-unit might derived from general domestic waste. The chaotic organisation together with open structure point to rapid accumulation (dumping?). |
| | **g** (5,3-5,6 cm) | **Voids**: very few channel<br>**Microstructure**: massive | Very fine loamy material embedded in a calcitic groundmass. This might derive from a |

| **Samples** | | **OBM 19.1** (10,5 x 5,8 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Mineral constituents**: loamy fine to very fine sand silt; subrounded sand (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: few charcoal (50-100 μm); microcharcoal<br>**Anthropogenic elements**: rare fragments of ceramic material (100-500 μm)<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 50:50 **related distribution**: close porphyric<br>**B-fabric**: undifferentiatd<br>**Pedofeatures**: / | thin re-flooring or sand spread to seal off the underlying waste. |
| | **f** (5,6-6,3 cm) | Same as **(b)** and **(c)** | Medium to fine mortar floor. |
| | **e** (6,3-7 cm) | **Voids**: few channel and planar<br>**Microstructure**: massive<br>**Mineral constituents**: loamy medium to fine sand silt; subrounded sand (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: dominant amorphous organic matter; common charcoal (50-100 μm) and microcharcoal;<br>**Anthropogenic elements**: fragments of very fine calcitic floor (2-10 mm); rare (burnt) bone fragments (100-500 μm)<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 50:50 **related distribution**: close porphyric<br>**B-fabric**: undifferentiated<br>**Pedofeatures**: fragments of burnt fine sand silty material | Similar to **(b)** and **(c)**, this material includes phosphatised organic matter, common charcoal and ash. |
| | **d** (7-7,6 cm) | Same as **(c)** but higher amorphous organic matter and cess fragments. | Mortar floor with calcitic groundmass |
| | **c** (7,6-8 cm) | Same as **(b)** but more compact, finer texture, less organic matter. | Horizontal orientation of rare plant fragments points to compression, likely by trampling. |
| | **b** (8-8,5 cm) | **Voids**: few channel<br>**Microstructure**: massive | Composition very similar to **(a)**, but more compact and with a massive microstructure. |

| **Samples** | | **OBM 19.1** (10,5 x 5,8 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Mineral constituents**: loamy medium to fine sand silt; subrounded sand (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: common amorphous organic matter; few charcoal (50-100 μm); microcharcoal;<br>**Anthropogenic elements**: ceramic material (300 μm -1 mm);<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 60:40 related distribution: close porphyric<br>**B-fabric**: crystallitic to undifferentiated<br>**Pedofeatures**:<br>- phosphatised cess waste<br>- ash | This also includes ash and fragments highly phosphatised organic matter (cess/latrine waste). Although traces of trampling have not been observed, this sub-unit might represent the bottom of a loamy (mortar) floor captured in sub-units **(c)** and (**d)** |
| | **a** (8,5-10,5 cm) | **Voids**: compound packing<br>**Microstructure**: granular to crump<br>**Mineral constituents**: loamy coarse to medium sand silt; tabular and subrounded pebbles (1-2 mm) (quartz, plagioclase, sedimentary rocks; flint); calcitic groundmass<br>**Organic component**s: few charcoal (100-500 μm); microcharcoal;<br>**Anthropogenic elements**: ceramic material (1-3 mm); brick fragments; flint/cert flake (?) (1-6 mm); rare burnt (fish) bone fragments (500 μm-1 mm)<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 40:60 **related distribution**: close porphyric<br>**B-fabric**: crystallitic to undifferentiatd<br>**Pedofeatures**: / | Rubble composed of fragments of fine loamy, calcareous floor, ceramic and brick. This material might be interpreted as general domestic waste. The chaotic orientation of components is indicative of rapid accumulation, likely as a result of dumping. |

| **Samples** | | **OBM 19.2** (10,5 x 5,9 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **g** 0-1,5 cm) | Same as **(k)** in OBM 19.1 | Anthropic waste from cleaning of hearth/cooking installation gradually accumulated *in situ* and with traces of trampling. This deposit might correspond to sub-unit **(e)** in OBM 1. |

| **Samples** | | **OBM 19.2** (10,5 x 5,9 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **f** (4,7-1,5 cm) | Same as **(h)** in OBM 19.1 | General domestic waste deriving from rapid accumulation (dumping?). |
| | **e** (1,3-4,7 cm) | Same as **(g)** in OBM 19.1 | Sub-unit associated with thin re-flooring or sand spread over the underlying mortar floor. |
| | **d** (4,7-6 cm) | Same as **(b)** in this thin section, and **(f)** in OBM 19.1 | Medium to fine mortar floor. |
| | **c** (6-6,5 cm) | Same as **(a)** in this thin section, and **(e)** in OBM 19.1 | Anthropic waste from cleaning of hearths/cooking installations. Moore compact than **(a)**, possibly as a result of *in situ* accumulation. |
| | **b** (6,5-7 cm) | Same as **(d)** in OBM 19.1 | Medium to fine sand mortar floor (same as **(c)** in OBM 3?) |
| | **a** (7-11,5 cm) | **Voids**: compound packing<br>**Microstructure**: granular to crumb (bottom)<br>**Mineral constituents**: loamy coarse to medium sand silt; tabular and sub-rounded pebbles (2-3 cm) (quartz, plagioclase, sedimentary rocks; flint); calcitic groundmass<br>**Organic component**s: dominant amorphous organic matter; charcoal (100 μm-1 mm); microcharcoal;<br>**Anthropogenic elements**: fragments of ceramic/brick material (1-2 cm); fragments of burnt/heated sediment and very fine calcitic (floor?) material; burnt shell fragments (100-500 μm); rare burnt bone fragments (100 μm-1 mm), 1 heated fragment (1,5 cm-3 mm);<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 40:60 **related distribution**: close porphyric<br>**B-fabric**: crystallitic to undifferentiated<br>**Pedofeatures**: / | General domestic waste intermixed with waste from cleaning of hearths/cooking installations. Open and porous microstructure together with chaotic orientation of components suggest rapid accumulation (dumping?). |

| **Samples** | | **OBM 19.3 (**10,5 x 5,9 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **e** (0-1,6 cm) | Same as **(a)** in OBM 19.1 | General domestic waste deriving from dumping. |
| | **d** (1,6-2,2 cm) | **Voids**: very few channel and planar<br>**Microstructure**: massive<br>**Mineral constituents**: loamy fine to very fine sand silt; few subrounded medium sand grains (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: rare amorphous organic matter; few charcoal (50-100 μm ), microcharcoal<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: rare (heated?) shell fragments (100-500 μm)<br>**c/f$_{10\mu m}$ ratio**: 60:40 **related distribution**: close porphyric<br>**B-fabric**: undifferentiated<br>**Pedofeatures**:<br>- rare extremental matter<br>- silty intercalation | Lenses of fine, minerogenic floor with scarce anthropic inclusions. |
| | **c** (2,2-3,2 cm) | **Voids**: compound packing<br>**Microstructure**: crumb<br>**Mineral constituents**: loamy medium to very fine sand silt; few subrounded coarse sand grains (quartz, plagioclase, sedimentary rocks; flint); calcitic groundmass<br>**Organic component**s: few charcoal (100 μm-3 mm) from different types of wood; amorphous organic matter<br>**Anthropogenic elements**:<br>**Inorganic residues of biological origin**: ash<br>**c/f$_{10\mu m}$ ratio**: 60:40 **related distribution**: open porphyric<br>**B-fabric**: calcitic to undifferentiated<br>**Pedofeatures**: / | Reworked anthropic waste from hearths/cooking, including fragments of cess. |

| **Samples** | | **OBM 19.3 (**10,5 x 5,9 cm); (X10513-9776 FCK) – Eastern area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **b** (3,2-4,7 cm) | **Voids**: few channel and planar<br>**Microstructure**: weakly developed sub-angular blocky<br>**Mineral constituents**: loamy fine to very fine sand silt; sub-rounded coarse sand (quartz, plagioclase, sedimentary rocks); calcitic groundmass<br>**Organic component**s: rare charcoal (50-100 μm)<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 40:60 **related distribution**: close porphyric<br>**B-fabric**: calcitic<br>**Pedofeatures**: silty clay intercalations/infillings in the top | Very fine loamy, calcareous material; possibly associated with a spread to seal off the underlying waste. |
| | **a** (4,7-13 cm) | **Voids**: compound packing<br>**Microstructure**: granular to crumb (bottom)<br>**Mineral constituents**: loamy coarse to medium sand silt; tabular and sub-rounded pebbles (2-3 cm) (quartz, plagioclase, sedimentary rocks; flint); calcitic groundmass<br>**Organic component**s: dominant charcoal (50 μm-6 mm) from different types of wood; microcharcoal; amorphous organic matter<br>**Anthropogenic elements**: rare burnt (fish) bone fragments (300 μm-1 mm); coarse fragments of brick/ceramic materials<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: open porphyric<br>**B-fabric**: undifferentiatd<br>**Pedofeatures**: / | Anthropic waste from hearth, with embedded brick/ceramic rubble, including ash and fragments of cess. This is likely the result of rapid accumulation and dumping. |

| **Sample** | | **OBM 4** (X10517-9776) – Western area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 2 | **d** & **b** (0-3/4 and 3/4-5 cm) | **Voids:** channels<br>**Microstructure:** channel microstructure, locally platy microstructure<br>**Mineral constituents:** sandy clay; clay and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase), subangular-subrounded grains; calcitic groundmass | Floors made of calcareous fine matrix with embedded fine and medium sands. Compaction is reflected in the platy microstructure (see Rentzel et al. 2017). It is unclear whether these sub-units can be defined as |

| **Sample** | | **OBM 4** (X10517-9776) – Western area | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic components:** very few organic matter microaggregates (20-50 µm); very few charcoal fragments (50 µm-2 mm); very few plant residues (20-300 µm)<br>**Anthropogenic elements:** very few ceramic material fragments (200 µm-5 mm); very few bone fragments (100-500 µm)<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 50/50 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** very few phosphatic nodules (200-500 µm) | 'mortar' or simply a spread of unburnt calcareous sediments. Secondary iron-phosphates seen along some cracks derive from the leaching of sub-units rich in faecal material above and below. |
| 1 | **a** & **c** (3/4-5 and 5-6 cm) | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** sandy clay; silt and very fine - medium sand, very few coarse sand (quartz, glauconite, chert, mica, plagioclase, sedimentary and metamorphic rocks), subangular grains<br>**Organic components:** few organic matter microaggregates (20-50 µm); common charcoal fragments (50 µm-1 mm); few plant residues (50 µm-3 mm)<br>**Anthropogenic elements:** few carnivore-omnivore coprolites (50 µm-1 mm); very few bone fragments (100-500 µm)<br>**Inorganic residues of biological origin:** very few (<2%) eggshell fragments (200-300 µm)<br>**c/f10µm -ratio**: 60/40 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** striated<br>**Pedofeatures:** few phosphatic nodules (50 µm-1 mm) | Sub-units made of decomposed plant material, charcoal and abundant carnivore-omnivore excrements, and cess/latrine waste fragments. These appear less compact and homogeneous than similar material observed in sub-unit **(a)** of OBM 1 and OBM 3. It is possible that these sub-units derived from the cleaning and reworking of latrine (rather than in situ accumulation). |

| **Sample** | | **OBM 5** (X10520-9776) – Western area, Entrance Hall | See also monolith sample **OBM 20.** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 4 | **d** (0-4,5 cm) | **Voids:** channels (very few)<br>**Microstructure:** channel microstructure, weakly developed<br>**Mineral constituents:** sandy silt loam; silt and fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase, metamorphic rocks), subangular grains; calcitic groundmass | Anthropic waste from cleaning and maintaining of hearth and cooking installations. In addition to common wood charcoal, ash, brick and mortar fragments, and bone, it also includes some seeds (leguminous *testa*?). |

| **Sample** | | **OBM 5** (X10520-9776) – Western area, Entrance Hall | See also monolith sample **OBM 20.** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic components:** frequent organic matter microaggregates (20-50 µm); frequent charcoal fragments (50 µm-3 mm); very few plant residues (200-400 µm)<br>**Anthropogenic elements:** few ceramic material fragments (200 µm-2 cm); very few mortar fragments (200 µm-3 mm); very few bone fragments (300-500 µm)<br>**Inorganic residues of biological origin:** 1 eggshell fragment (500 µm)<br>**c/f10µm -ratio**: 90/10 **c/f related distribution**: close porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** very few phosphatic nodules (200-700 µm) | This material shows traces of gradual build-up and compression by trampling. |
| 3 | **c** (4,5-5 cm) | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** sandy clay; clay and very fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase), subangular-subrounded grains; calcitic groundmass<br>**Organic components:** very few organic matter microaggregates (20-50 µm); very few charcoal fragments (50 µm-2 mm); very few plant residues (20-300 µm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 50/50 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** very few phosphatic nodules (200-300 µm) | Floor (?) composed of fine sand embedded in calcareous earth, similar to **(b)** and **(d)** in OBM 4. |
| 2 | **b** (5-6 cm) | **Voids:** complex packing voids<br>**Microstructure:** basic, chito-gefuric<br>**Mineral constituents:** loamy sand; fine and medium sand, very few coarse sand (quartz, mica, plagioclase), subangular grains<br>**Organic components:** few organic matter microaggregates (20-50 µm); very few charcoal fragments (50-500 µm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 98/2 **c/f related distribution**: chito-gefuric<br>**B-fabric:** /<br>**Pedofeatures:** very few (<2%) phosphatic nodules (150-500 µm) | Fine to medium loose sand, with scarce faecal material, possibly a spread of sand to seal off the underlying cess accumulation. |

| **Sample** | | **OBM 5** (X10520-9776) – Western area, Entrance Hall | See also monolith sample **OBM 20.** |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 1 | **a** (5-6 cm) | **Voids:** channels (very few)<br>**Microstructure:** massive microstructure<br>**Mineral constituents:** sandy loam; silt and fine - medium sand, very few coarse sand and gravel (quartz, glauconite, chert, mica, plagioclase, sedimenatry rocks), subangular grains; phosphatic, locally calcitic groundmass<br>**Organic components:** frequent organic matter microaggregates (20-50 µm); few charcoal fragments (50-500 µm); common plant residues (50-500 µm)<br>**Anthropogenic elements:** very few bone fragments (100-300 µm)<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 70/30 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** undifferentiated, locally crystallitic<br>**Pedofeatures:** few phosphatic nodules (200-500 µm) | Sub-unit rich in decomposed plant fragments and carnivore-omnivore excrements, similar to **(a)** in OBM 3. Material might be interpreted as latrine waste or cess accumulated *in situ*, and with traced of compaction and compression. |

## Monolith sample OBM 20 (X10519-9776 FCM?) – Western area, Entrance Hall

| **Samples** | | **OBM 20.1 and 20.2** (13,1 x 6 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 4 | **f** (6-13,1 cm) | Same as **(c)**. | These sub-units are all part of a relatively thick deposit of anthropic waste from cleaning and maintaining of hearth/cooking installations. The same deposit is observed in **(d)** OBM 5. |
| 3 | **e** (5,5-6 cm) | Sub-unit of charcoal-rich waste from hearth with traces of micro-layering, likely as a result of gradual build-up and possibly trampling. | |
| 2 | **c** & **d** (5,5-11 cm) | Anthropic waste from cleaning of earth/cooking; **(d)** shows coarser texture and common fragments of ceramic/brick material | |
| | **b** (7,5-11,5 cm) | **Voids**: channel and vugh<br>**Microstructure**: weakly developed sub-angular blocky<br>**Mineral constituents**: loamy very fine clayey sand; silt, medium and coarse sand, sub-rounded grains; (quartz, feldspars) | Very fine loamy clay-rich material possibly deriving from soil (B(t) horizon?) quarried and used here to seal off the underlying |

| **Samples** | | **OBM 20.1 and 20.2** (13,1 x 6 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic components**: rare amorphous organic matter; very few charcoal (50-100 μm)<br>**Anthropogenic element**s: /<br>**Inorganic residues of biological origin**: phytoliths (short- and elongate cells)<br>**c/f$_{10\mu m}$ ratio**: 40:60 **related distribution**: closed porphyric<br>**B-fabric**: crystallitic to stipple-speckled<br>**Pedofeatures**: dusty clay infillings | waste. Porosity and dusty clay infilling suggest that this material was laid in wet conditions (cf. OBM 9). This might correspond to **(c)** / **(b)** in OBM 5. |
| 2 | **a** (11,5-13 cm) | **Voids**: compound packing<br>**Microstructure**: crumb<br>**Mineral constituents**: loamy fine to very find sand; rare coarse sand, subrounded grains; (quartz, feldspars, limestone, metamorphic rocks)<br>**Organic components**: common charcoal of different wood types (50 μm-1 mm), microcharcoal; few plant residues (organ, tissue) (300-500 μm); amorphous organic matter<br>**Anthropogenic element**s: rare rounded ceramic fragments (100-500 μm)<br>**Inorganic residues of biological origin**: /<br>**c/f$_{10\mu m}$ ratio**: 60:40 **related distribution**: single space porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**: abundant phosphatised organic matter | Sub-unit very similar to **(a)** in OMB 5 and consisting of organic-rich anthropic waste. Abundant charcoal, plant residues and excrements are found in fine to very fine loamy matrix enriched with ash and minute organic matter. Orientation of components points to gradual built-up and possibly trampling. |

## Old Road area

| **Sample** | | **OBM 6** (X10578-9776) – Eastern side | Same as OBM 7 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and very fine - medium sand, very few coarse sand and gravel (quartz, chert, mica, plagioclase, sedimentary rocks), subangular-subrounded grains<br>**Organic components:** dominant organic matter microaggregates (20-50 μm); frequent plant residues (seeds, wood, grasses and leaves fragments, 20-300 μm) very few charcoal fragments (250 μm-1 mm); | Anthropic waste dominated by peat or peat-like sediments with c. 30% of interspersed sand. Wood fragments (possibly also bark?), grasses (vesicular bundles) and possibly some leaves (see Ismail-Mayer 2017) are present. |

| **Sample** | | **OBM 6** (X10578-9776) – Eastern side | Same as OBM 7 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Anthropogenic elements:** very few bone fragments (100 µm-3 mm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-300 µm)<br>**c/f10µm -ratio**: 30/60 **c/f related distribution**: single spaced enaulic<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few vivianite nodules and crystal intergrowths (50-500 µm) | Seeds and seed coats are abundant. Fragments of burnt bone and eggshell are dispersed throughout the thin section.<br>This material is likely to result from rapid accumulation. |

| **Sample** | | **OBM 7** (X10581-9776 LAG 4942) – Eastern side | Same as OBM 6 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and very fine - medium sand, very few coarse sand and gravel (quartz, chert, mica, plagioclase, sedimentary and metamorphic rocks), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (seeds, wood, grasses and leaves fragments, 50 µm-1 cm); very few charcoal fragments (50 µm – 1 mm);<br>**Anthropogenic elements:** very few bone fragments (200-500 µm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-300 µm)<br>**c/f10µm -ratio**: 30/60 **c/f related distribution**: single spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few vivianite nodules and crystal intergrowths (50-300 µm) | Anthropic waste dominated by peat or peat-like sediments as seen in OBM 7. |

| **Sample** | | **OBM 8** (X10584-9776 LAG 4941) – Eastern side | Similar to OBM 6 and OBM 7 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and very fine - fine sand, very few medium and coarse sand (quartz, chert, mica, sedimentary rocks), subangular grains | The thin section has the same composition of OBM 6 and OBM 7, but it has less sand and finer texture (fine/very fine sand and silt). An additional, important difference is that here traces of compaction and trampling are |

| **Sample** | | **OBM 8** (X10584-9776 LAG 4941) – Eastern side | Similar to OBM 6 and OBM 7 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (seeds, grasses and tissue fragments, 50 µm-1 cm); few charcoal fragments (50 µm-2 mm);<br>**Anthropogenic elements:** very few bone fragments (200 µm-1 cm)<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** / | also observed. These consists of horizontal parallel bedding of coarser plant fragments, and the 'crushing' (or snapping) of burnt bone fragments, which result from trampling (see Miller et al. 2010). This anthropic waste, then, underwent trampling and compaction, and waterlogging hampered the decay of organic matter. |

| **Sample** | | **OBM 10** (X11520-9776 FRONT) – Western side | Similar to OBM 6, 7 and 8, see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and fine - coarse sand very few gravel (quartz, chert, mica, glauconite, plagioclase,), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (seeds and tissue fragments, 50 µm-2 mm); very few charcoal fragments (50 µm-1 mm);<br>**Anthropogenic elements:** very few bone fragments (100-300 µm)<br>**Inorganic residues of biological origin:** very few shell and eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** few phosphatic nodules (100-500 µm) in the lower part | Peat or peat-like sediments with anthropic material (bone, charcoal, eggshell), similar to OBM 6, 7 and 8. Here, a higher degree of decomposition, and hence a lesser degree of preservation, of the plant material are observed. In the lower part, common carnivore-omnivore excremental matter mixed with plant residues indicates the accumulation of cess or latrine waste. This is also suggested by the presence of nutlets (seeds of berries, see Ismail-Mayer 2017) and fishbones that are normally excreted in the faeces. This lower part is similar to sub-unit **(a)** in OBM 5 and OBM 3. The top part shows signs of compaction and compression, with horizontal bedding of plant fragments. This would suggest a rather rapid accumulation |

| **Sample** | | **OBM 10** (X11520-9776 FRONT) – Western side | Similar to OBM 6, 7 and 8, see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | | of organic sediments, with trampling occurring after the sedimentation was complete. |

| **Sample** | | **OBM 11 -** (X11523-9776 FRONT) – Western side | Similar to OBM 6 and 7, see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** subangular blocky microstructure (?)<br>**Mineral constituents:** loamy sand; silt and fine - medium sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (50 µm-1 cm); very few charcoal fragments (50 µm-2 mm);<br>**Anthropogenic elements:** very few bone fragments (100 µm-3 cm)<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-300 µm)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few vivianite nodules (100-400 µm) | Peaty material with dispersed medium sands, as observed in OBM 6 and 7. No clear indication of trampling. Anthropic inclusions consist of scarce wood charcoal, eggshell and bone fragments. This deposit can be interpreted as general waste rich in plant material, dumped and then subjected to waterlogging conditions, which prevented the oxidation of the organic matter. |

| **Sample** | | **OBM 12** (X11526-9776 FRONT LAG 6040/5809 – Western side (ditch) | Similar to OBM 6 and 7; see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and fine - coarse sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subangular grains<br>**Organic components:** frequent organic matter microaggregates (20-50 µm); dominant plant residues (50 µm-2 cm); few charcoal fragments (50 µm-2 mm);<br>**Anthropogenic elements:** very few bone fragments (100 µm-2 mm) | Deposit composed of compressed/trampled plant residues, primarily from herbaceous and sedge-like vegetation, with minor amounts of wood tissue. Compression is indicated by the bedding of this material that might derive from gradual build-up together with trampling. The plant material might |

| **Sample** | | **OBM 12** (X11526-9776 FRONT LAG 6040/5809 – Western side (ditch) | Similar to OBM 6 and 7; see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Inorganic residues of biological origin:** very few eggshell fragments (100 µm-1 mm)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few (<2%) vivianite nodules (200 µm-1 mm) | have accumulated as 'fodder' or 'bedding' for animals in a stable. However, here there is no trace of dung (faecal materials and secondary phosphates observed in other thin sections). At present, the function of this deposit remains unclear (stabling? dung? storage of plant material?). |

| **Samples** | | **OBM 13** (X11529-9776 FRONT LAG 6040/6135) **and OBM 14** (X11533-9776 FRONT LAG 6040) (both 6x5.8 cm) – Western side | Similar to OBM11 and 12, see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** channel<br>**Mineral constituents:** loamy medium to fine sand silt; coarse sand, very few gravel (quartz, chert, mica, plagioclase), subangular and subrounded grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); common plant residues (seeds, charred grains, plant tissues, 50 µm-3 mm); few charcoal fragments (50 µm-2 mm);<br>**Anthropogenic elements:** few bone fragments (100 µm-2 mm), some burnt<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-500 µm); nut shells (1-3 mm)?; articulated phytoliths (dendritic elongates from cereal husk?)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures: /** | Peaty material with dispersed medium and coarse sands with anthropic material.This deposit can be interpreted as general waste rich in plant material, dumped and then subjected to waterlogging conditions that prevented the oxidation of the organic matter. Here traces of compression are seen in the top and bottom, suggesting trampling. |

| **Samples** | | **OBM 15** (X11541-9776 FRONT LAG 6040/5625) – Western side | Similar to OBM 12, see also OBM 22 and 23 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| / | / | **Voids:** channels<br>**Microstructure:** basic, single spaced enaulic/ subangular blocky (low zone)<br>**Mineral constituents:** loamy sand; silt and fine - coarse sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subangular grains<br>**Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (seeds, charred grains, plant tissues, 50 µm-3 mm); few charcoal fragments (50 µm-2 mm);<br>**Anthropogenic elements:** few bone fragments (100 µm-2 mm); very few fish bone fragments<br>**Inorganic residues of biological origin:** very few eggshell fragments (100-500 µm)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: porphyric single spaced<br>**B-fabric:** undifferentiated<br>**Pedofeatures:**<br>**-** very few phosphatic nodules (200 µm-2 mm)<br>- very few (<2%) vivianite nodules and crystal intergrowths (10-30 µm) | Composition similar to OBM 12, but with no traces of compression or trampling. The material is instead chaotically dispersed with seeds, 1 charred grain, carnivore-omnivore excrements, charcoal, bone and fishbone. As in the case of OBM 11, this material can be interpreted as general domestic waste that underwent waterlogging after being dumped. |

## Monolith sample OBM 22 (X11593-9776 LAG 5625/6040?)

| **Sample** | | **OBM 22.1**(13 x 5,9 cm) and OBM 22.2 (12,7 x 6 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | / | **Voids**: channel, compound packing<br>**Microstructure:** crumb<br>**Mineral constituents:** loamy sand; silt and fine - coarse sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subangular grains<br>**Organic components:** common organic matter microaggregates (20-50 µm); common plant residues (seeds, charred grains, plant tissues, 50 µm – 3 mm); few charcoal fragments (50 µm – 2 mm);<br>**Anthropogenic elements:** few bone fragments (100 µm – 2 mm); 1 large bone fragment (4-1 cm); few bone fragments<br>**Inorganic residues of biological origin**: phytoliths (non-smooth elongate cells, husk?)<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: open porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures: /** | Peat or peat-like deposit with anthropic inclusions, very similar to material observed in OBM 14, OBM 15 and OBM 12. Here, at the bottom, bedded plant residues point to compression by trampling and gradual build up. Similarly to what observed in OBM 12, the plant material might have been accumulated as fodder or bedding for animals. However, as in OBM 12, animal excrements have not been observed and, hence, other uses cannot be ruled out (e.g. storing of plant material). In this respect, elongate phytoliths, in particular non-smooth morphotypes found here, derive from grass inflorescences (see Harvey and Fuller 2015). |

## Monolith sample OBM 23 (X11594-9776 LAG 5625/6040?)

| **Samples** | | **OBM 23.1**(12 x 6 cm) and **OBM 23.2** (13,2 x 6 cm) |
|---|---|---|
| *Unit* | *Sub-unit* | *Interpretation* |
| | / | These samples capture the same material seen in OBM 22.1.<br>In OBM 23.2, the upper 6 cm shows more compact plant fragments and traces of bedding, again indicating gradual build up. |

| **Samples** | | **OBM 16 -** (X11561-9776 FRONT LAG 4969/6040) – Western side | Same as OBM 17 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 2 | **b** | **Voids:** channels (upper zone)<br>**Microstructure:** channel microstructure (upper zone)/ massive (lower zone) | Organic deposit composed of elongated plant fragments, charcoal, bone and secondary |

| **Samples** | | **OBM 16 -** (X11561-9776 FRONT LAG 4969/6040) – Western side | Same as OBM 17 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | (0-2 cm) | **Mineral constituents:** sandy clay loam; clay and fine - coarse sand, very few gravel (> 4 cm) (quartz, chert, mica, glauconite, plagioclase), subangular grains<br>**Organic components:** frequent organic matter microaggregates (20-50 µm); few plant residues (root and tissue fragments, 200-500 µm); very few charcoal fragments (50-500 µm)<br>**Anthropogenic elements:** very few (<2%) bone fragments (100-300 µm)<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 85/15 **c/f related distribution**: close and single spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few phosphatic nodules (200-500 µm) | phosphates. This material derives from an accumulation of anthropic waste on the floors. |
| 1 | **a** (2-6 cm) | **Voids:** channels (very few)<br>**Microstructure:** massive<br>**Mineral constituents:** sandy clay loam; clay and fine - coarse sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subrounded grains<br>**Organic components:** common organic matter microaggregates (20-100 µm); few plant residues (root and tissue fragments, 200-300 µm); very few (<2%) charcoal fragments (100-300 µm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 85/15 **c/f related distribution**: close and single spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** / | Minerogenic floor with a non-calcareous fine mass and medium to coarse sands (and thus different from floors observed in **(c)** OBM 5 and **(b)** and **(b)** in OBM 4. Traces of clay illuviation suggest that this material was quarried from soil material that underwent decalcification and secondary clay accumulation. The sand grains have distinctively round morphologies. This characteristic together with a massive microstructure could indicate that this is in fact a 'beaten' earth floor. |

| **Samples** | | **OBM 17** (X11571-9776 FRONT LAG 4969/6040) – Western side | Same as OBM 17 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 2 | **b** (0-1 cm) | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy sand; silt and fine - coarse sand, very few gravel (quartz, chert, mica, glauconite, plagioclase), subangular grains | Accumulation of anthropic, organic-rich waste on the floor, as **(b)** in OBM 16. |

| **Samples** | | **OBM 17** (X11571-9776 FRONT LAG 4969/6040) – Western side | Same as OBM 17 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Organic components:** dominant organic matter microaggregates (20-50 µm); frequent plant residues (root and tissue fragments, 50 µm-2 mm)<br>**Anthropogenic elements:** very few bone fragments (200-500 µm)<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 40/60 **c/f related distribution**: close and single spaced porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few vivianite nodules and crystal intergrowths (10-100 µm) | |
| 1 | **a**<br>(2-6 cm) | **Voids:** /<br>**Microstructure:** massive<br>**Mineral constituents:** sandy clay loam; clay and very fine - coarse sand, few gravel (>5 cm) (quartz, chert, mica, glauconite, plagioclase), subrounded grains<br>**Organic components:** very few organic matter microaggregates (20-500 µm)<br>**Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** /<br>**c/f10µm -ratio**: 85/15 **c/f related distribution**: close porphyric<br>**B-fabric:** undifferentiated<br>**Pedofeatures:** very few clay coatings | The same minerogenic floor found in **(a)** of OBM 16, possibly a 'beaten' earth floor. |

## Late medieval house floor

| **Sample** | | **OBM 9** (X11447-9776 FRONT) | See also monolith sample OBM 21 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| (2) | / | **Voids:** channels<br>**Microstructure:** channel microstructure<br>**Mineral constituents:** loamy; clay and very fine - medium sand, few coarse sand and very few gravel (quartz, chert, metamorphic and sedimentary rocks), subrounded grains; calcitic groundmass<br>**Organic components:** very few organic matter microaggregates (20-50 µm); very few plant residues (root and tissue fragments, 50 µm-2 mm); very few charcoal fragments (50 µm-3 mm); | This is composed of the same earth material observed in the floors represented by sub-units **(c)** in OBM 5, and **(b)** and **(d)** in OBM 4. This material has a loamy texture and a calcareous matrix with embedded sand and fine gravel. The heterogenous gravel lithology (metamorphic and plutonic rock fragments, bioclastic rounded limestone fragments) |

| **Sample** | | **OBM 9** (X11447-9776 FRONT) | See also monolith sample OBM 21 |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Anthropogenic elements:** /<br>**Inorganic residues of biological origin:** very few phytolithes<br>**c/f10µm -ratio**: 50/50 **c/f related distribution**: close porphyric<br>**B-fabric:** crystallitic<br>**Pedofeatures:** silty intercalations | might suggest that material from a glacigenic substrate was quarried to build these floors. The presence of silty lenses (intercalations) might indicate that the material was laid down in a semi-wet state, a process known as 'pugging.' Given the lack of secondary phosphate, it is highly unlikely that the floor was used for stabling of animals or the accumulation of cess and latrine waste. |

## Monolith sample OBM 21 (X11446-9776 LAG 6027?)

| **Sample** | | **OBM 21.1** (13 x 5,7 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 4 | **d**<br>(0-7,5 cm) | **Voids**: planar, common vughs<br>**Microstructure**: massive to sub-angular blocky<br>**Mineral constituents**: loamy fine to very find sand; common medium sand, rare pebbles (>2 mm); (quartz, feldspars, limestone, metamorphic rocks); rare tabular flint (>2 mm); calcitic micromass<br>**Organic components**: rare amorphous organic matter; rare fine charcoal (100-50 µm), microcharcoal;<br>**Anthropogenic element**s: rare bone (burnt) fragments (100-300 µm)<br>**Inorganic residues of biological origin**: shell fragments (100-1000 µm)<br>**c/f$_{10µm}$ ratio**: 40:60 **related distribution**: single space porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**: / | Mortar floor composed of fine to very find sand in a calcareous matrix. |
| 3 | **c**<br>(7,5-9 cm) | **Voids**: channel, complex packing<br>**Microstructure**: crumb to channel | Anthropic waste from cleaning of hearth/cooking installation, characterised by abundant charcoal, charred plant residues, ash and few shell fragments. |

| **Sample** | | **OBM 21.1** (13 x 5,7 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **Mineral constituents**: loamy coarse to fine sand; common sub-round pebbled (>2mm); (quartz; feldspars, sedimentary and metamorphic rocks); domains of calcitic micromass<br>**Organic components**: common coarse charcoal (2-1 mm + large fragment 1 cm); rare uncharred plant residues (tissue; 100-500 μm)<br>**Anthropogenic elements**: rare potsherds<br>**Inorganic residues of biological origin**: rare (burnt) shell fragments (100 μm-1 mm); rare phytoliths (elongate)<br>**c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: open porphyric<br>**B-fabric**: crystallitic to undifferentiated<br>**Pedofeatures**: rare excrements (herbivore?) | |
| | **b** (9-11,5 cm) | **Voids**: channel, compound packing<br>**Microstructure**: channel microstructure<br>**Mineral constituents**: loamy medium to fine sand; few coarse grains (quartz; feldspars, chert, sedimentary and metamorphic rocks); subrounded grains, tabular chert fragments; calcitic micromass<br>**Organic components**: few large plant residues (tissue, root; > 2 mm); charcoal fragments (10-500 μm), rare microcharcoal<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: very rare shell fragments (50-300 μm)<br>**c/f$_{10\mu m}$ ratio**: 60:30 **related distribution**: open porphyric<br>**B-fabric**: crystallitic<br>**Pedofeatures**: dusty clay intercalations; horizontal lenses of fine loamy, calcitic matter. | This is similar to sub-unit **(a)** but displays a coarser and heterogeneous sands, higher organic content and ash. Parallel orientation of fine, loamy calcitic material might be indicative of compression by trampling. This deposit might be interpreted as the top part of mortar floor seen in **(a)**. |
| 2 | **a** (11,5-13 cm) | **Voids**: planar and voughs (very few)<br>**Microstructure**: massive to sub-angular blocky<br>**Mineral constituents**: loamy fine to very find sand; rare silt and medium to coarse sand (quartz, plagioclase, sedimentary rocks); subrounded grains;<br>**Organic components**: rare amorphous organic matter; rare charcoal (10-200 μm)<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: rare phytoliths (tracheid, short cells) | Mortar floor with traces of compaction and scarce anthropic inclusions. At the bottom, the presence of intercalations (pugging?) is it indicative of wet conditions. |

| **Sample** | | **OBM 21.1** (13 x 5,7 cm) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: close porphyric<br>**B-fabric**: undifferentiated<br>**Pedofeatures**: rare silty clay crust fragments and intercalations bottom; | |

| **Sample** | | **OBM 21.2** (10,5 x 5,8 cm); (X11446-9776 LAG 6027?) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| 4 | **d**<br>(0-4 cm) | Same as (d) in OBM 21.1 with higher content of pebble-size rock fragments | Mortar floor. |
| 3 | **c**<br>(4-8,5 cm) | Same as (c) in OBM 21.1, but lower content of charcoal fragments. | Sub-units **(c)** and **(b)** represent a deposit of anthropic waste from cleaning of hearth/cooking installations, already seen in **(c)** of OBM 21.1. |
| 3 | **b**<br>(~ 2 cm thick) | **Voids**: channel, complex packing<br>**Microstructure**: crumb to channel<br>**Mineral constituents**: loamy coarse to fine sand; common sub-round pebbled (>2mm); (quartz; feldspars, sedimentary and metamorphic rocks); domains of calcitic micromass<br>**Organic components**: common coarse charcoal (2-1 mm);<br>**Anthropogenic elements**: /<br>**Inorganic residues of biological origin**: rare (burnt) shell fragments (100 μm-1 mm<br>**c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: open porphyric<br>**B-fabric:** crystallitic to undifferentiated<br>**Pedofeatures**: loamy silty clay intercalations | |
| | **a**<br>(8,5-10,5 cm) | **Voids**: planar and vough (very few)<br>**Microstructure**: massive to sub-angular blocky<br>**Mineral constituent**s: loamy fine to very find sand; rare silt and medium to coarse sand (quartz, plagioclase, sedimentary rocks); rare tabular coarse chert fragments; sub-rounded grains;<br>**Organic components**: rare amorphous organic matter; rare charcoal (10-200 μm)<br>**Anthropogenic elements**: rare round, fragments of calcitic floor (= (**d)** in OBM 21.1)<br>**Inorganic residues of biological origin**: / | Mortar floor as seen in **(a)** of OBM 21.1. Horizontal orientation of plant residues at the top points to trampling. |

| **Sample** | | **OBM 21.2** (10,5 x 5,8 cm); (X11446-9776 LAG 6027?) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | | **c/f$_{10\mu m}$ ratio**: 70:30 **related distribution**: close porphyric<br>**B-fabric**: undifferentiated<br>**Pedofeatures**: rare (orthic) iron nodules (10 μm-1 mm) | |

| **Sample** | | **OBM 21.3**(12 x 5,8 cm); (X11446-9776 LAG 6027?) | |
|---|---|---|---|
| *Unit* | *Sub-unit* | *Description* | *Interpretation* |
| | **b** (0-5,4 cm) | **Voids**: planar<br>**Anthropogenic elements**: rare fine bone fragments (100-200 μm)<br>**Pedofeatures**:<br>- vivianite nodule (200 μm)<br>- silty clay crust fragments | This is very similar to **(a)** in OBM 21.1 and represents a mortar floor with traces of compaction. Here, a higher degree of bioturbation and the presence large silty clay crust are observed. |
| 1 | **a** (5,4-12 cm) | **Voids:** channel, complex packing void<br>**Microstructure**: crumb (bioturbated)<br>**Mineral constituents**: loamy coarse to fine sand silt; (quartz, plagioclase, sedimentary rocks); rare tabular coarse flint; sub-rounded grains<br>**Organic components**: very common amorphous organic matter and plant residues, variably charred (tissue, root 100 μm – 1 mm); common coarse to fine charcoal, microcharcoal;<br>**Anthropogenic elements**: common coarse (1 mm) burnt bone fragments; rare burnt shell fragments (100-300 μm)<br>**Inorganic residues of biological origin**: see bone and shell above<br>**c/f$_{10\mu m}$ ratio**: 70:30 - **related distribution**: close porphyric<br>**B-fabric**: undifferentiated<br>**Pedofeatures:** / | Anthropic waste from hearth, characterised by abundant charcoal, charred plant residues and coarse fragments of burnt bone and shell. Parallel organisation of plant fragments might derived from gradual, *in situ* accumulation. |