7713: Braughing Iron Age Coin Moulds Post Excavation Assessment and Updated Project Design

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PLACE SERVICES

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1 Introduction

Braughing Late Iron Age and Roman settlement is in the parish of Braughing, Hertfordshire (TL3909024169) on the west bank of the River Rib, c.200m south of Ford Bridge. The site is Scheduled (SM75). In August 2016 Mark Landon and the Braughing Archaeology Group (BAG), with the professional oversight of Jonathan Hunn (Icknield Archaeology) carried out a rescue excavation of archaeological deposits that were being eroded out of the western riverbank. The total excavation area measured 4.5m². This work was funded by the HE Planning Group from their Regional HAR budget. A short section of bank to the north of this site had been previously investigated prior to remedial works in 2007.

The excavation was focused on a deposit Late Iron Age and Roman material containing large numbers of clay coin-moulds that had been exposed in the western riverbank, between the higher and lower water levels. A summary excavation report was prepared by Jonathan Hunn for the site (Hunn, 2017). The coin-mould assemblage is of national significance.

This post-excavation assessment covers the artefactual material (including a 10% sample of the coin-moulds) and the environmental material.

A project bid for the post-excavation assessment was prepared by Maria Medlycott, in conjunction with Mark Landon and Jonathan Hunn, and with the advice of Isobel Thompson, Debbie Priddy and Stewart Bryant and submitted to Historic England. This was submitted in December 2018 and formally agreed 23rd January 2019 (Project No. 7713).

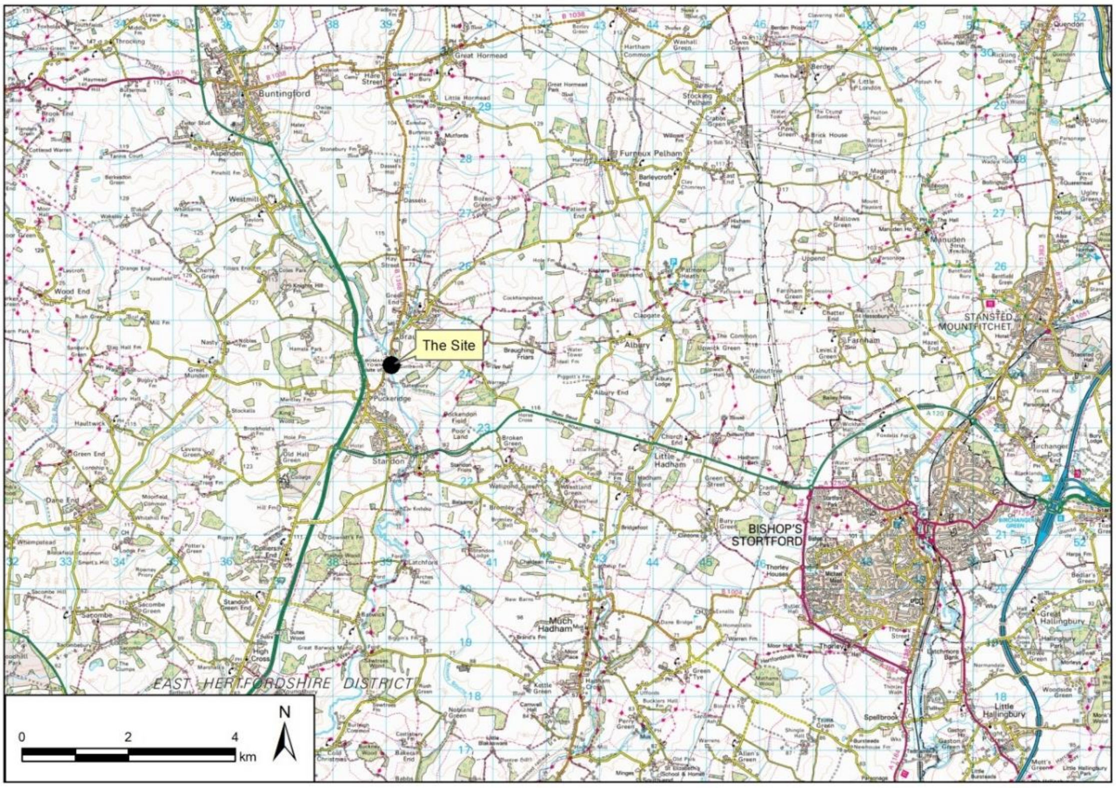

Figure 1 Location plan

2 Project Aims and Objectives

2.1 Aims

The aims of the project were to: -

A1 Establish the nature and date of the Braughing coin-mould deposit, including its associated contextual, artefactual and environmental evidence

A2 Contribute to a better understanding of the role of coinage in Late Iron Age society, both as an object in itself and as a catalyst for change, including a consideration of the wider nature and context of Late Iron Age coin-mould assemblages and monetary usage in Britain

A3 Contribute to a fuller understanding of the history and significance of Late Iron Age and Roman Braughing, both regionally and nationally.

A4 Ensure that the archive (both written and artefactual) is available to the public for further study

2.2 Objectives

O1 Establish dates for the river deposits and the coin-mould assemblage. A radio-carbon date will be sought for the organic river deposits that underly the coin-mould dump using material derived from the pollen sample. Analysis of the pottery component of the coin-mould assemblage will provide a time-bracket during which the coin-mould assemblage must have been deposited.

O2 Determine whether the clay fabric of the coin-moulds is single-source or from a range of sources, as suggested by previous studies, and consider whether this reflects the role of a scattered community bringing together raw materials in a structured way to create coinage.

O3 Establish what coin-mould forms are present, and how does this compare both to previous excavated examples from Braughing and from other coin-mould deposits

O4 Establish the chemical signature of the metal that remains in the coin moulds in order that comparisons can be made with existing metallurgical data for Iron Age coins and for other metalwork from Braughing

O5 Undertake SEM-EDF analysis of the moulds to cover a range of microscopic evidence relating to the manufacturing process, including the presence of prills, microscopic inclusions and signs of heating?

O6 Consider the nature of the coin-mould deposit: is it the result of a single deliberate dumping event perhaps to symbolically destroy the means of making coins, or is it more casual deposition perhaps after they have ceased to be of use, in order to raise or stabilise the river bank

O7 Assess the preservational condition of pollen, faunal and insect macrofossils in the organic sediments underlying the archaeological deposits and their research potential. These would be assessed once a date has been established for the deposits (see O1)

O9 The combined information from the coin-mould deposit (coin-moulds, pottery, animal bone and small finds) will help contribute to a fuller understanding of the material culture and diet of Late Iron Age/Roman Braughing and its trading links and relative status.

O8 To provide an overview of this assemblage to enable comparison with other Late iron Age coin-mould assemblages

O8 Ensure that the results are available to other researchers

3 Background

3.1 Summary description of Late Iron Age and Roman Braughing

This summary is based on the Braughing Extensive Urban Survey Project Assessment Report (Thompson 2002) and subsequent research by Isobel Thompson (Thompson pers. comm.). Isobel Thompson and Stewart Bryant are currently working on a separate project that is being prepared for submission for funding to the Heritage Lottery Fund. There are however clear synergies between the two projects, and it is intended that the results from this project will feed into the HLF project and vice versa.

Braughing Iron Age and Roman site is a Scheduled Monument (SM75). It lies in the narrow valley of the river Quin, which rises in Barkway and flows south into the river Rib a short distance to the southwest of Braughing. The subsoil is boulder clay capping higher ground over chalk. The Late Iron Age and Roman settlement is located to the south of the medieval and modern settlement, but it has kept the name. The highway later known as Ermine Street passed through Roman Braughing. This road, diverted slightly to the west, is the present A10.

The group of Late Iron Age coin-moulds and associated finds that this proposal is concerned was found eroding from the bank of the River Rib (TL3909724167), in the centre of Late Iron Age Braughing.

There is evidence for extensive activity from around 30 BC covering some 300 acres across the Rib valley floor and around Wickham Hill. By the last quarter of the century, large quantities of imported goods were reaching Braughing; more Italian and Gaulish pottery of this date has been found here than anywhere else in either Hertfordshire or Essex' (Niblett 1995, 16). This sudden importance is thought to be due to the establishment here, at the confluence of the rivers Rib and Quin, of a trading depot. 'When the bed of the river [Rib] was examined some years ago, there was evidence to suggest that the river was much larger in prehistoric and Roman times' (Partridge 1975, 140). It is suggested that imported goods were brought via the Thames, Lea, and Rib to Braughing (Thompson 2002), and distributed from there to the settlements of Hertfordshire and perhaps beyond. This trade is the most visible element of the move towards 'romanisation' in the tribal society of post-Caesarean Britain, and Braughing was 'the most important trading settlement in southern England' (Partridge 1975, 55). The road system established after the Roman conquest is thought to reflect pre-existing routes.

Aspects of the material found at Braughing are compatible with this being a place of large-scale gatherings, probably seasonal, for social, judicial, and ritual functions combined with feasting and exchange (possibly also manufacture) of goods, and it is within this context that the presence of the coin-moulds should be understood. There need have been few permanent structures. In the late Iron Age imported finewares were disseminated outwards from such centres, generating variations in local coarsewares (Thompson 1982). This implies gift exchange between chieftain and retainers, but not free-for-all trade in expensive status symbols. The presence of foreigners at Braughing has supporting evidence, although trade was not necessarily their primary goal; gift exchange at elite level with Gaulish counterparts, and delivery of diplomatic gifts from Rome, may have been involved.

Comparisons can be made between coin usage at Braughing and Baldock (Niblett 1995, 20), which also shares similarities in the nature of the settlement. The known evidence largely consists of pottery and coins, and some structures. The Gatesbury earthwork suggests a large ditched enclosure rather than a fortification. Partridge (1981, 28-9) shows the ploughed-out corner and the earthwork's position in the landscape, with two seasonal streams forming natural dykes to the southeast. Close to the earthwork is an extensive complex of ditched enclosures, visible as cropmarks, that appear to be Late Iron Age in date based on their morphology (Partridge 1981, fig.3).The pottery excavated by a local farmer, G B Henderson, in 1936 from the area of the cropmarks west of the earthwork (Partridge 1981, 323-50; Henderson 1938) includes early imported continental vessels and amphorae. The Henderson Collection also has later wares which overlap the Roman conquest. It is notable for the richness of the imports, and for the many coin mould fragments. Rescue work in 1979, on the west bank of the river along the track to Gatesbury Mill, found pits and ditches containing material of a similar date, from *c.* 30 BC (or earlier) onwards and including imports and coin mould fragments (Partridge 1979, 97-130).

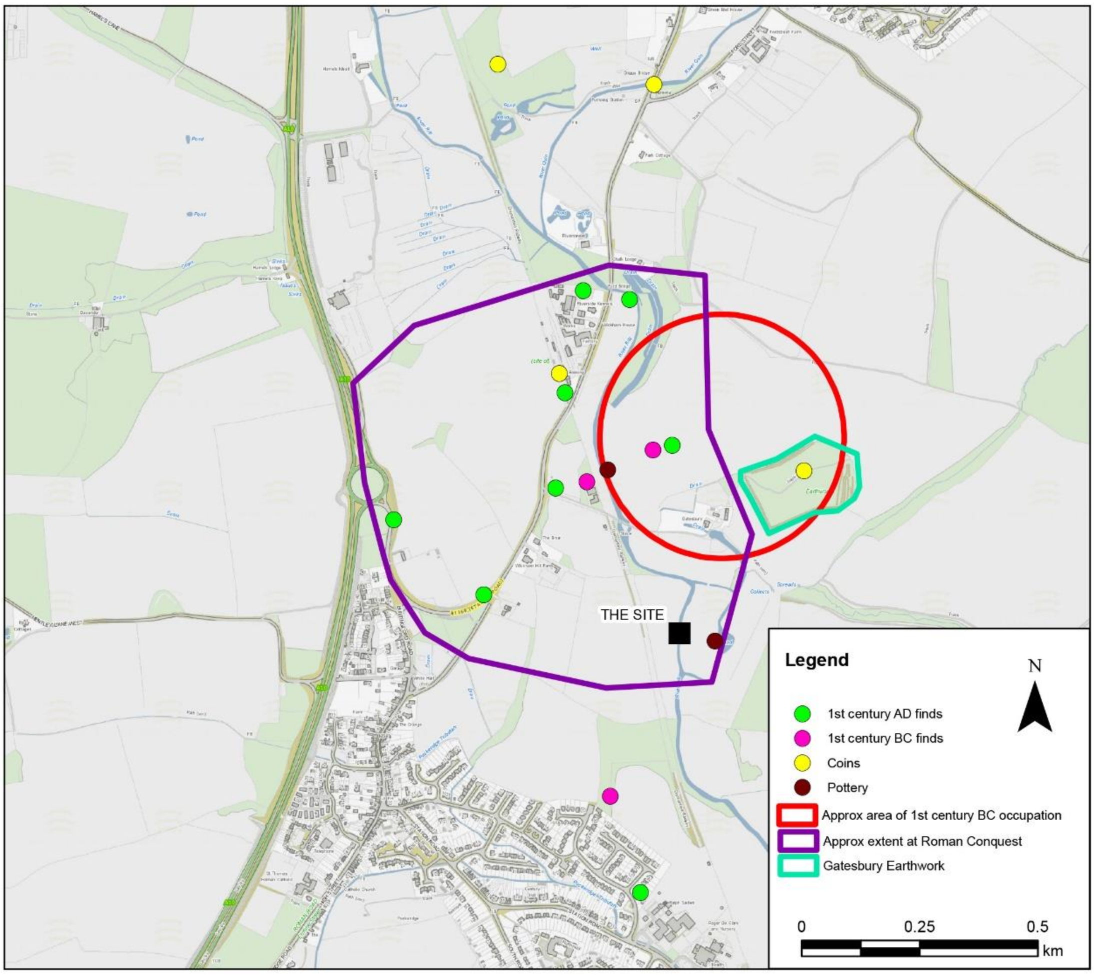

Figure 2 Late Iron Age Braughing

The rise of Verulamium to the south-west led to the gradual eclipse of Braughing in terms of the unique richness of its imports, but the settlement continued to spread. It appears to have formed a widespread, but patchy, development, with some of the areas being quite densely settled. Finds have been recovered from Wickham Hill and for some distance up and down the river. Late Iron Age pottery has been recovered from a considerable stretch of the river west and south of Gatesbury, but nothing has been noted to the east, and only coins have been recovered from north of the confluence with the Quin. To the south, the Station Road ditches (Partridge 1979) may represent the southern end of the settlement, or an outlying farmstead which lasted until *c*. AD 61. Pits, ditches and finds have come from the Wickham Hill and Ermine Street area. A sequence of timber buildings with some evidence of metalworking was recorded, with pottery from 15/10 BC until *c*. AD 65 on the western edge of the settlement and other buildings have been recorded by the river and at the station. Imported goods and coin mould fragments were still a feature of the settlement, showing that its loss of importance was relative. It is also noteworthy that several areas clearly continued in use beyond the conquest in AD 43 until about AD 65. Large quantities of pottery were then discarded and used to fill pits and ditches. Similar finds, of comparable date, on other sites in the region of Verulamium, suggest that these are termination deposits.

A new town appears to have been laid out in the late 1st century, at about the same time that Roman Verulamium was also being planned. Very little has been excavated, but what is known suggests 'a level of Romanisation not seen in Hertfordshire away from Verulamium and the large villas' (Niblett 1995, 55). However, Braughing seems to have become no more than a small undefended roadside town. What is known in detail about the nature and history of the town in the Roman period is, however, very limited, and the impression given is possibly misleading. Its street plan is known only in part, largely from cropmarks (Partridge 1975, 146, fig.3), and may have changed over time. Extensive signs of settlement have been seen in excavation south of the known street plan. The 1969 trenches across Wickham Hill revealed 1st and 2nd century occupation on both sides of Ermine Street and across the hill, although on the east side of the hill the occupation was entirely 3rd century (Stead 1970; SMR 1099). Further south, however, along the line of the new road from the by-pass, occupation lasted right through the Roman period and included late 4th century coins (Potter & Trow 1988). The town also occupied the river valley to the east, north and south of the known street plan. 'It is clear that the whole ground round about the [Roman] crossroads and down to the river is filled with buildings', mostly of timber (Holmes 1954, 98). More substantial structures are represented by the 'Portico building' (possibly a temple), a 1st century bathhouse and parts of other masonry buildings. The meandering rivers have changed course over time, and the Rib is now invading part of the Roman settlement. Cemeteries have been identified to the north and west of the town (Partridge 1981, 245-321; Partridge 1977, 68-87 and 98-102).

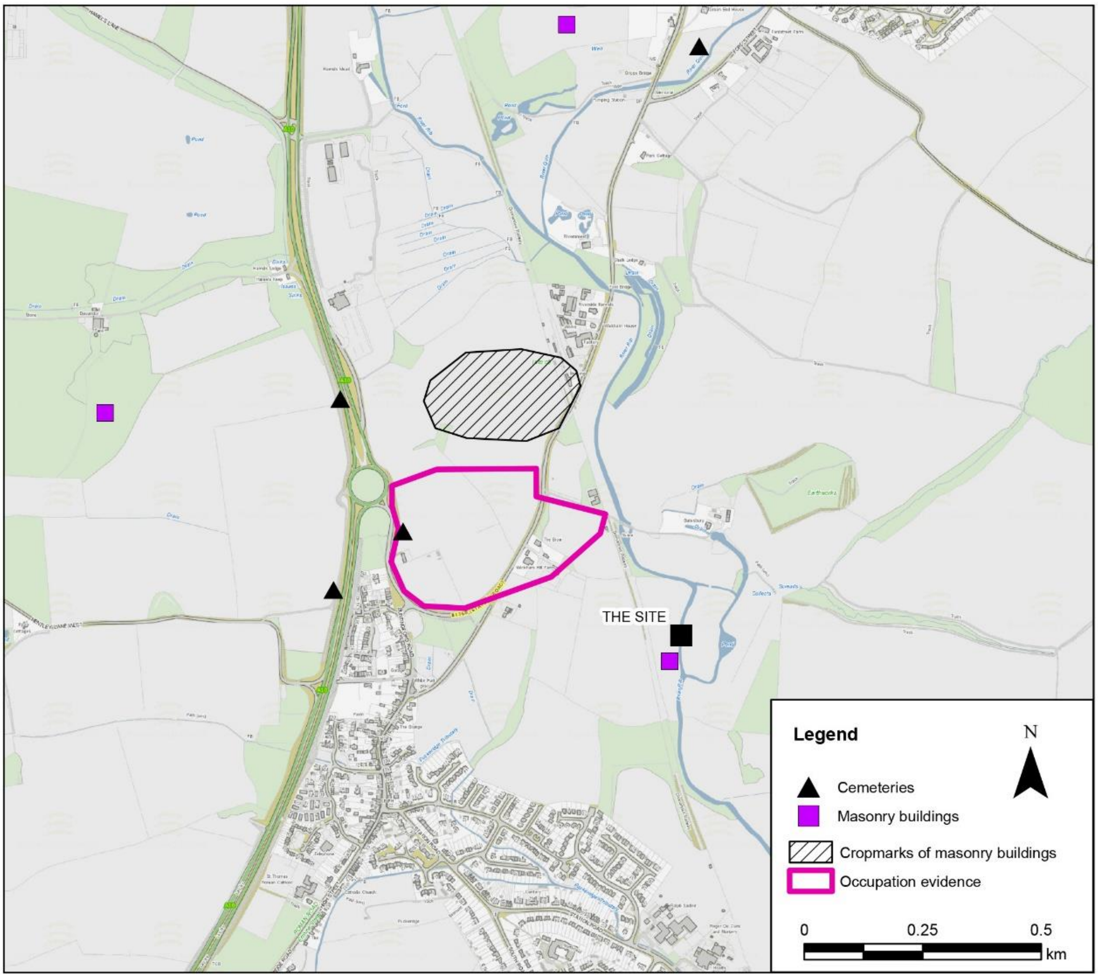

Figure 3 Roman Braughing (Thompson 2002, Fig. 3)

3.2 Summary introduction to Coin Pellet Moulds

By Mark Landon

Coin pellet moulds has been found across Europe north of the Roman Empire, from Štaštín near Bratislava in Slovakia to Scotch Corner in North Yorkshire, England. They can best be described as trays of clay in which holes have been made. The holes do not pierce the clay tray, so that a series of circular shallow cups are created, with the overall tray resembling a clay waffle. The holes range in diameter from 4mm to 20mm, and a tray will carry anywhere from 25 of the larger holes to 100 of the smaller. The current consensus is that unmelted metal fragments were placed in the holes: pre-mixed bronze, a much smaller fraction of silver, and occasionally an even smaller proportion of gold, so that alloying took place actually 'in the cup'. The tray was then heated to cherry-red on top of the furnace, and then, by means of a tuyère, the contents of each hole brought very swiftly to the temperature at which fusion would occur. Because the pellets are essentially base metal, and because the clay has a significantly lower melting point than the metal, and despite the fact that a steady jet of oxygen-rich air must be played directly over the hole, if reducing conditions are not rigorously maintained the oxides that form on the surface of the molten pellets fuse irretrievably with the glassy phase of the clay mould. It is a tribute to the consummate skill of the Iron Age smiths that fewer than 10 trapped pellets have ever been found. Although pellet moulds from different sites are superficially similar, close study reveals that variability is a salient characteristic. In fact, it is perhaps wise to think of the manufacture and use of pellet-mould as a family of closely-related techniques. This variability extends from the fabrics, through the methods used to make the trays to the way in which they were used.

It has been demonstrated very well by Haselgrove (1987) and others (Bland *et al* 2020) that European Late Iron Age coin had value over and above the purely monetary, so it is perhaps no surprise that the study found clear evidence that coin pellet mould also had significance on more than one level. The majority of deposits of coin mould in England are very small, ten fragments or fewer, and they are often accompanied by fragments of expensive pottery and the remains of feasting. This is mirrored by the undeniable fact that the larger assemblages show clear signs of the preferential removal of parts of trays. Although trays were often manufactured without a great deal of care, after use it would seem that they took on some of the *numen* of the coin they helped to produce. There is evidence that some, at least, of the larger assemblages were exposed to the elements for some time before finally being deposited in pits or ditches, raising the possibility that they may have been displayed in the open as symbols of wealth and prestige.

The Braughing/Puckeridge settlement complex has now yielded around 70kg. of coin pellet mould in total, and it is clear from stray surface finds that more assemblages remain to be uncovered in the vicinity. Braughing/Puckeridge is therefore one of the most significant sites of pellet-mould deposition in Europe.

4 Excavation Evidence by Dr Jonathan Hunn

In August 2016 Braughing Archaeology Group (BAG) carried out an archaeological excavation beside the River Rib at Ford Bridge, Braughing, Hertfordshire. The project was commissioned by Historic England and was carried out without a formal project design but in accordance with verbal instructions from Deborah Priddy (HE Inspector of Ancient Monuments) to salvage Iron Age coin mould that was eroding out of the western bank of the river. The fieldwork was overseen, and the report prepared by Jonathan Hunn MA PhD FSA MCIfA

4.1 The Site

The site is situated in the parish of Braughing, Hertfordshire (Figure 4). It is on the west bank of the river Rib *c.*200m south of Ford Bridge which is itself 0.8 km from the centre of Braughing. The site is *c.*60m to the east of the B1368 road which links the village with the A10 trunk road. To the west of the river the land is rough pasture while to the east the land is partly covered by immature deciduous trees.

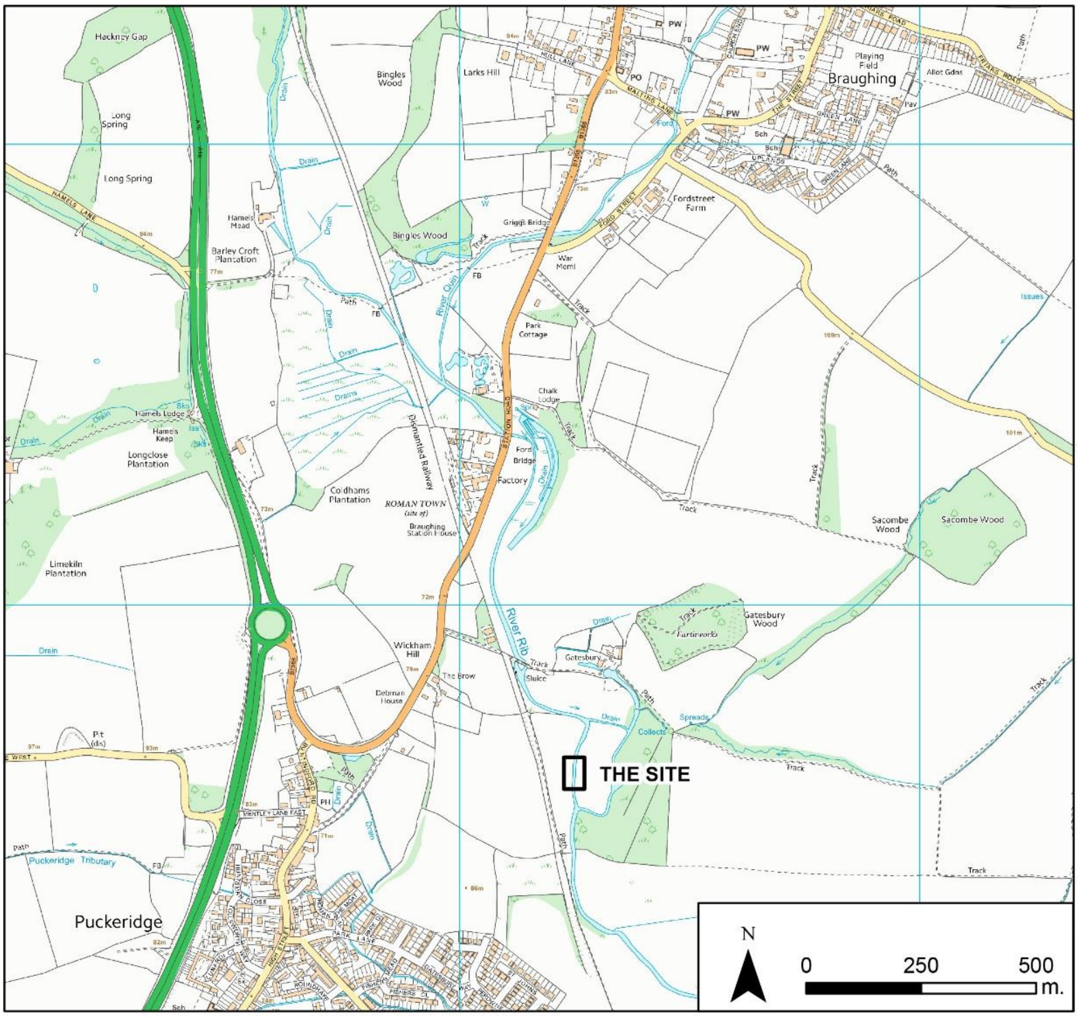

Figure 4 Location of the site

4.2 Geology & Topography

The terrain is essentially flat with the bank of the river dropping abruptly away about 1.5m to the water's edge. The circumstances of the find suggest that the stream has shifted its course over the years. This is due to human agency in the 19th century when the course of the stream was straightened out to assist water flow. The soils on the western side of the river Rib are derived from Chalky till belonging to the Melford Association (Soil Survey 1983). These are described as '*deep well drained fine loamy* *over clayey, coarse loamy over clayey and fine loamy soils, some with calcareous clayey subsoils'* (*ibid.*).

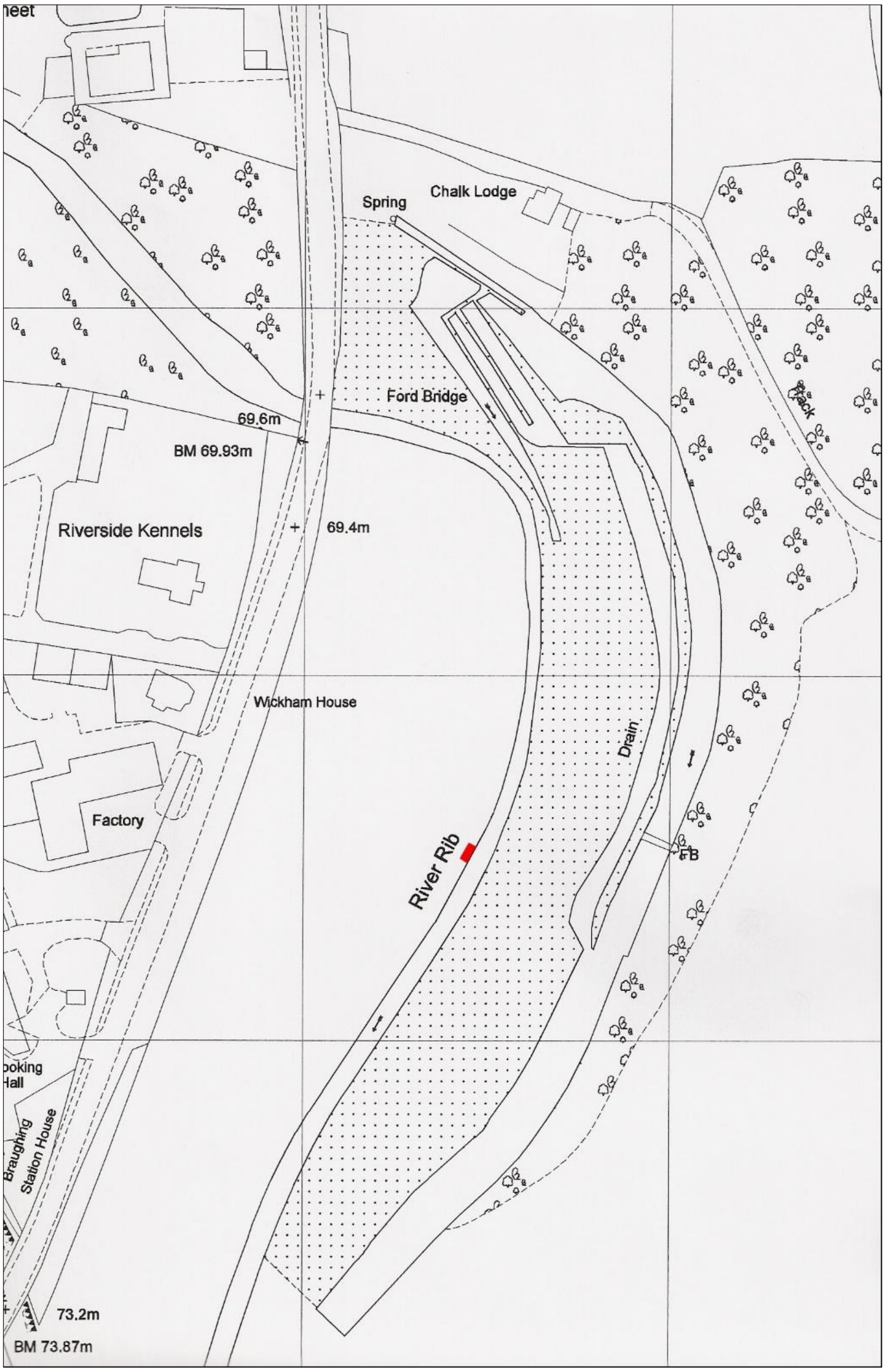

Figure 5 Site plan (on 100m grid-square)

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4.3 Methodology

By Jonathan Hunn

The site was excavated in accordance with standard archaeological field work practice. Though limited in scale it was commensurate with the overall objectives of the project. The great majority of contexts were either soil horizons or deposits; there were relatively few features or 'cuts' identified during the course of the excavation.

4.4 Site Description

The excavation lay less than 0.5m from the edge of the river Rib (Figure 5, Plate 1), immediately to the south of the Ford Bridge 2007 site (BRR07) which also produced coin-moulds. It lies within a large pasture field beside Ford Bridge, Braughing (NGR TL 3909-2416). The trench extended into the bank some 3.5m and had a length of 4.6m (N-S). Of this area 16.1 sq. m. (*c.*10 sq. m. was excavated down to a gravel spread **(30)** and the top of alluvium **(31)**. The stratigraphic sequence (Figures 6-11, Plates 2-6) was as follows:

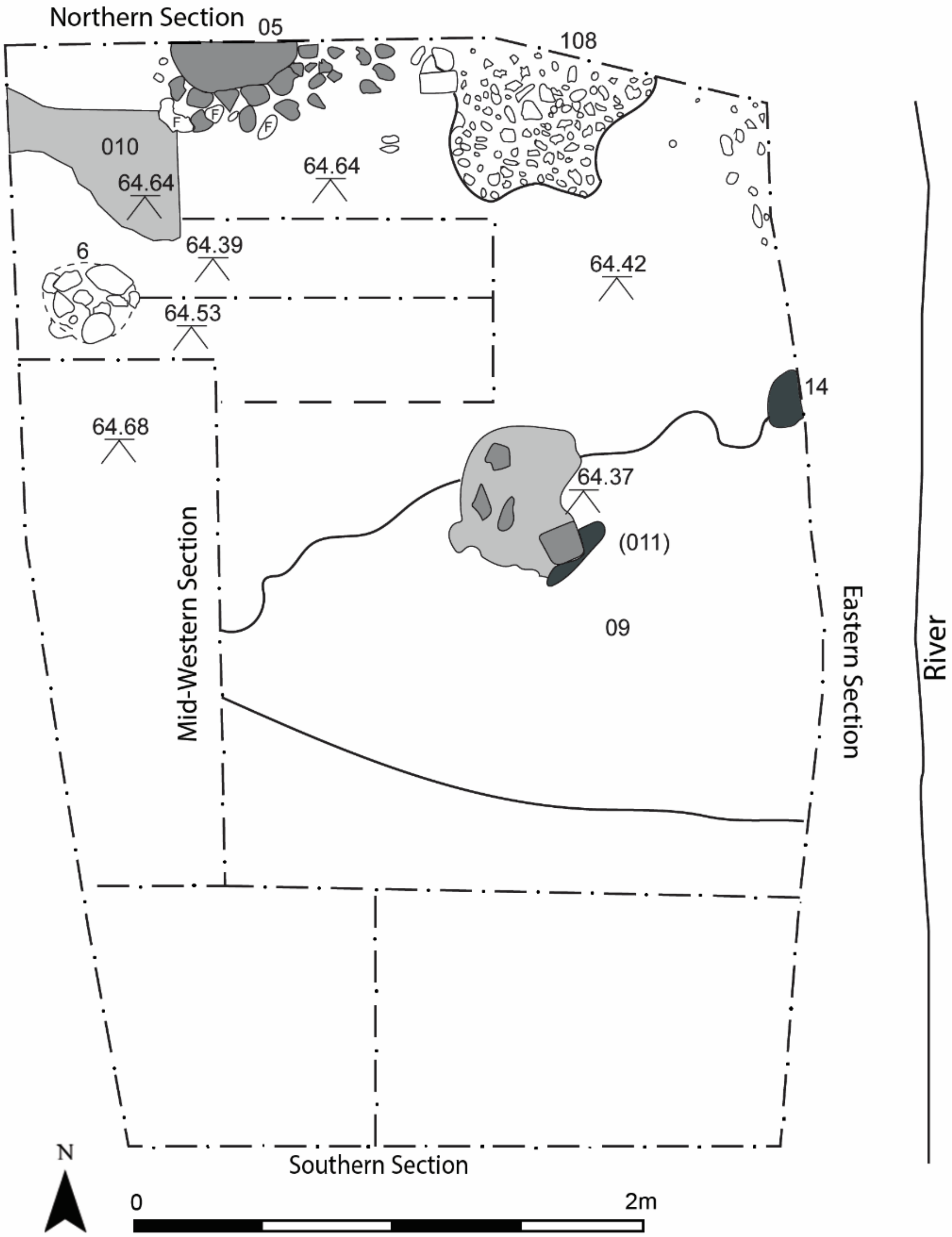


Figure 6 Pre-excavation plan of site (shaded areas = areas of chalk),

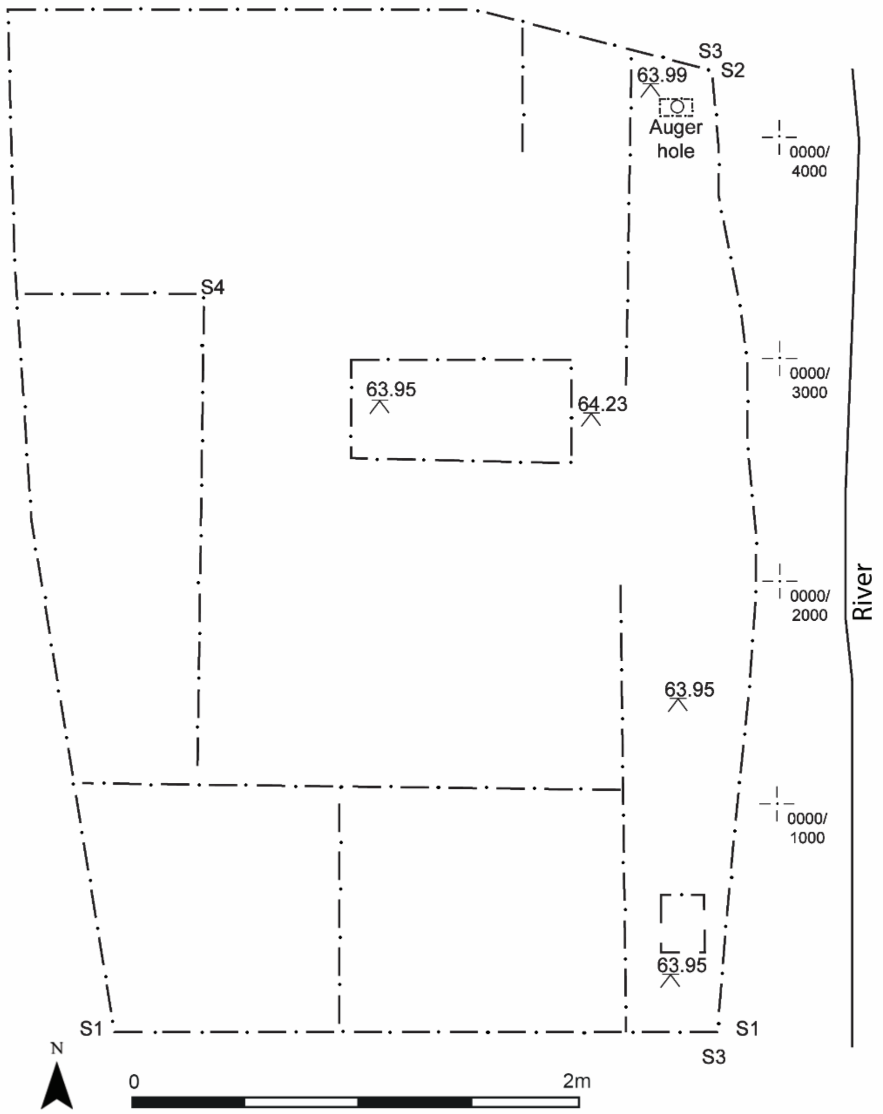


Figure 7 Post-excavation plan of the site

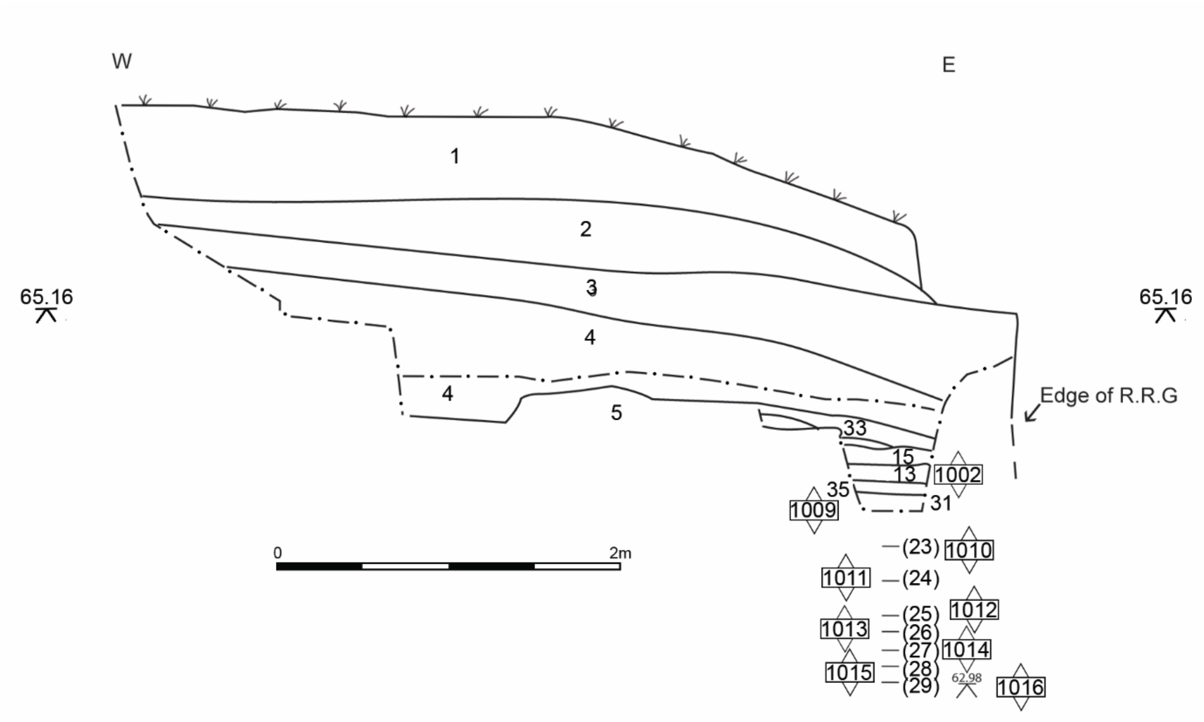


Figure 8 Northern E-W section (S2)

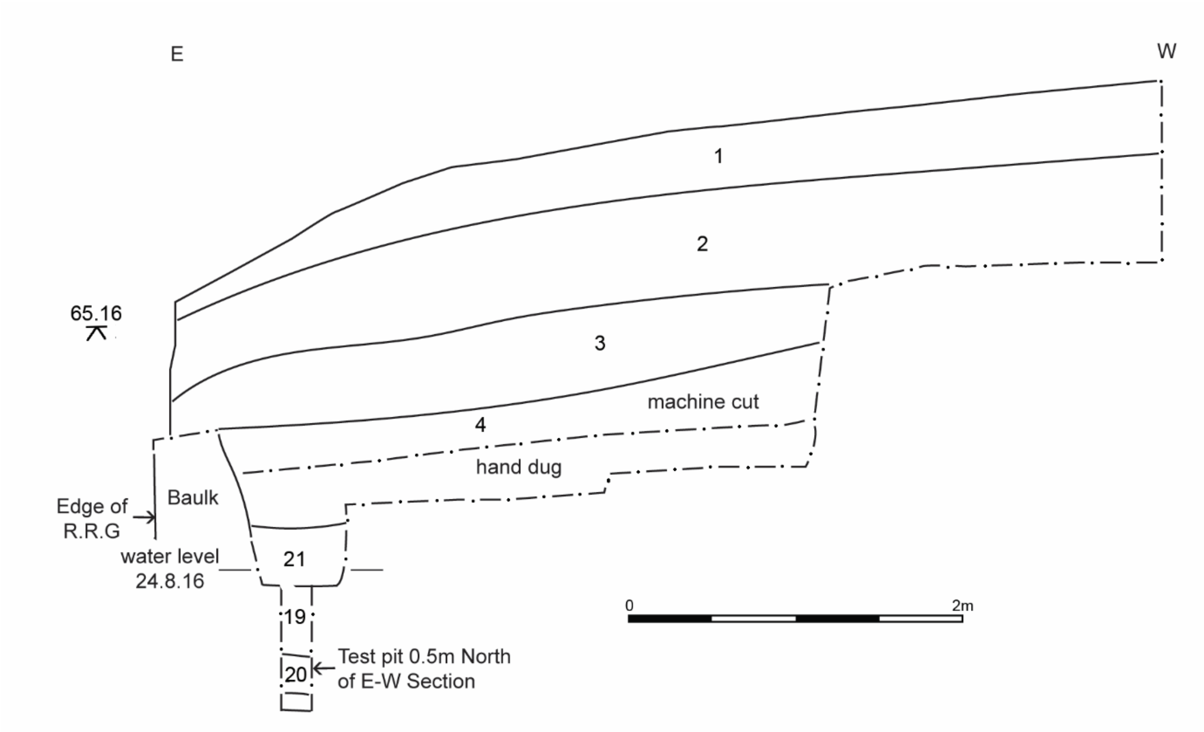


Figure 9 Southern E-W section (S1)

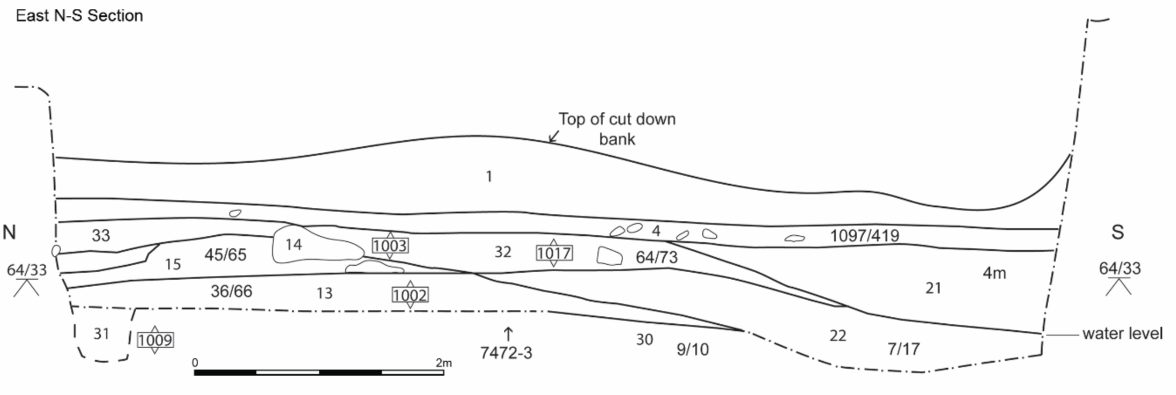


Figure 10 Eastern N-S section (S3)

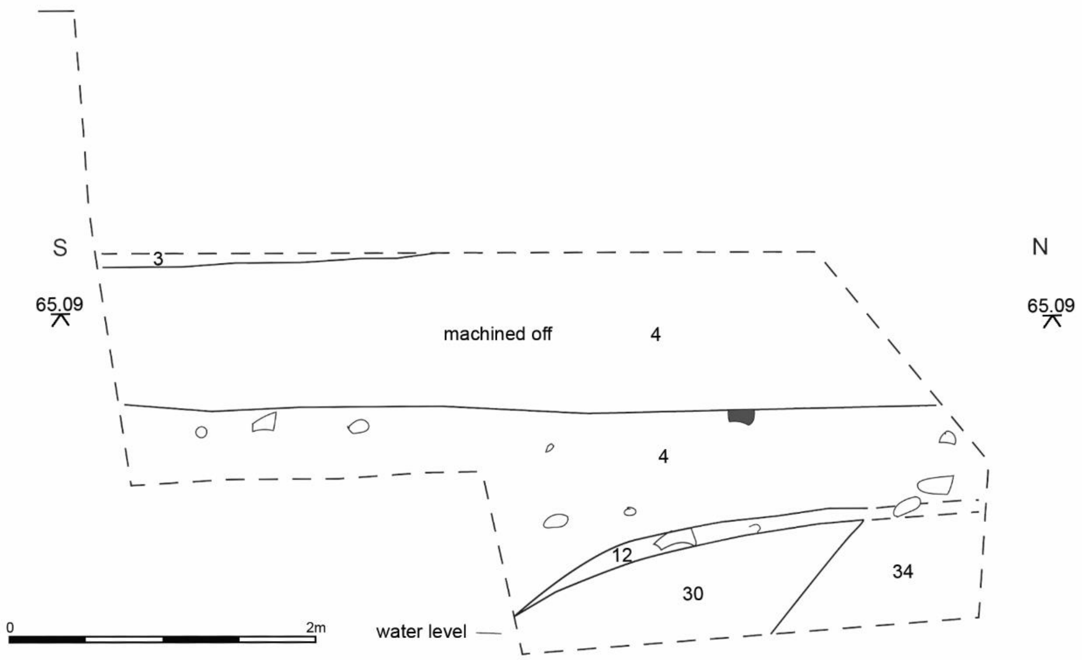


Figure 11 Mid-western N-S section (S4)

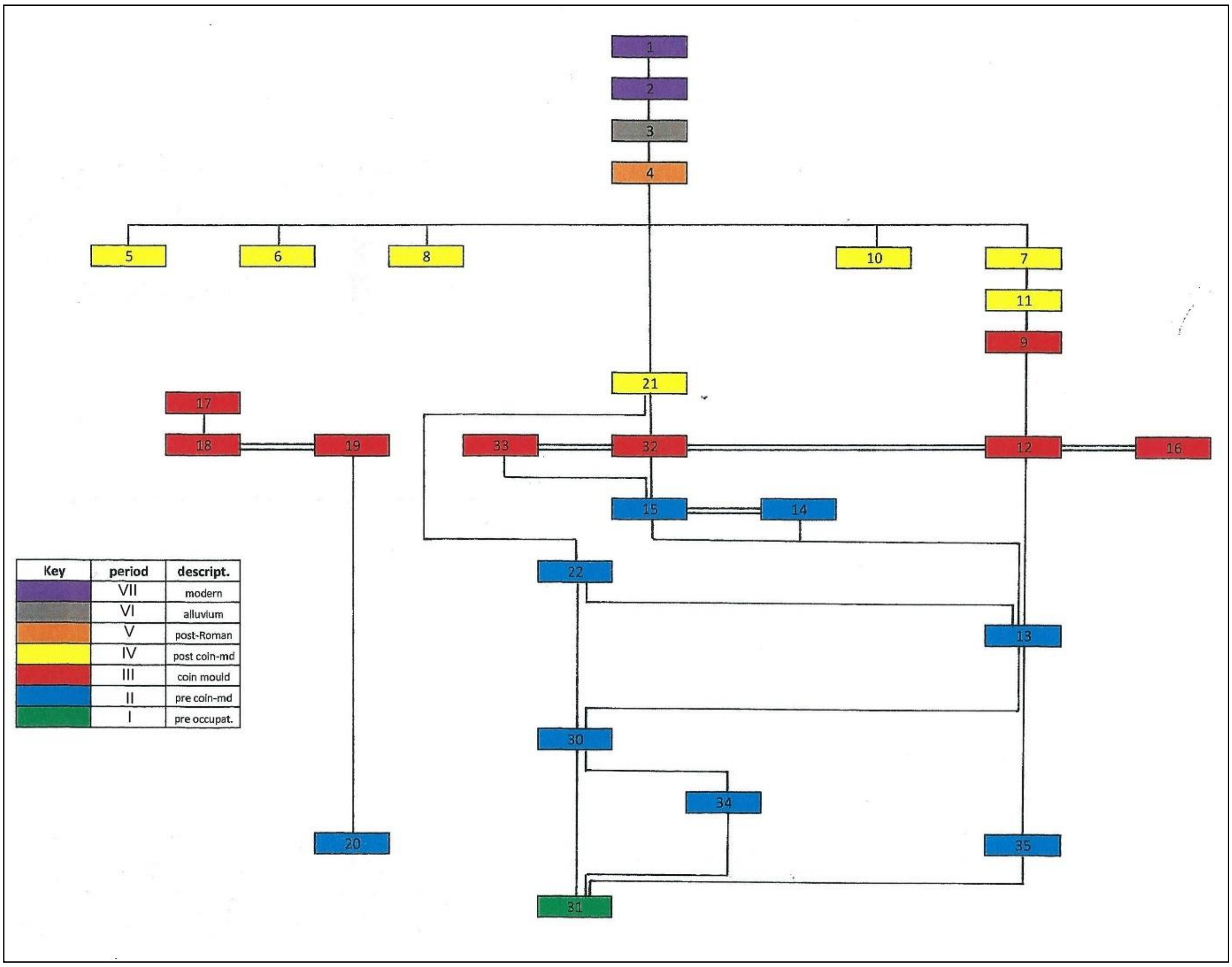


Figure 12 Phased matrix of excavation

Period I Pre-occupation horizon

The primary horizon **(31)** consisted of a smooth, dark grey alluvium (Mun 10 YR 5/1). This was at least 1.3m thick and was sub-divided into eight discrete 'levels' for the purposes of obtaining pollen samples (contexts 23-29). These were as follows: 31) 35g at a depth of 100mm <1009>; 23) 46g at a depth of 200mm below base of (31) <1010>; 24) 50g at a depth of 400mm below base of (31) <1011>; 25) 70g at 600mm below base of (31) <1012>; 26) 68g at a depth of 700mm below base of (31) <1013>; 27) 48g at a depth of 800mm below base of (31) <1014>; 28) 48g at a depth of 900mm below base of (31) <1015>; 29) 32g at a depth of 1000mm below base of (31) <1016>.

Period II Pre-coin-mould horizons

Above the alluvium was a thin, dark grey olive silt **(35)** which was only apparent in the northern E-W section (Figure 8) was sealed by context **(13).** There were no finds from this context. Above the primary horizon was a pale grey silty clay **(34)** which initially was believed to be layer **(21)** but is now interpreted as a distinct deposit in its own right (see Fig. 4d). The finds are included in context **(22)** (see below). It is not certain if this layer was the result of fluvial dynamics or human agency. The earliest deposit that can be ascribed to human agency was a spread of yellowish brown gravel lying in the centre of the trench and orientated east/west **(30)**. Only a small transect was excavated with an undetermined width and a thickness of c. 2m. It yielded 9 sherds of pottery (163g) and 10 fragments of bone (163g). Above the gravel layer **(30)** was context **(13)** which was a sticky, dark grey, silty pebbly clay (Mun 10YR 4/1) which extended across much of the site. 36 sherds of pottery (974g), 66 fragments (796g) of animal bone, 2 flint flakes (23g) and 162 (1535g) fragments of coin mould were retrieved from this layer. A bulk sample (30 litres) was taken from this context, <1002>.

Layer **(13)** was partially overlain by a pale grey silty clay (Mun 10YR 5/1) context **(22)** which lay just above the water level. It contained 7 sherds (106g) of pottery, 17 fragments (222g) of animal bone and 9 fragments of coin mould (330g). See Figure 10. Also sealing **(13)** were two contemporary deposits (14 & 15) which are probably the result of a single episode of activity. **(14)** was a charcoal deposit 250mm x 200mm by *c.*100mm thick (Mun 10 YR 2/1); a 2 litre sample was taken <1003>. Context **(15)** comprised a mix of cobb, chalk and clay and was some 180mm thick; it contained 48 sherds (957g) of pottery, 65 (906g) fragments of animal bone, 1 flint (12g) and 5 fragments (40g) of ceramic building material/tile.

In the southern E-W section context **(20)** might pre-date the coin mould horizon, though this is not certain. It was a dark grey, almost black peat deposit at least 0.3m thick. It contained 18 sherds (385g) of pottery and 28 fragments of animal bone (780g). There were no coin mould debris present. A pollen sample was retrieved <1007> and a 1.36 kg soil sample <1008>.

Period III ***Coin mould horizon*** (Plate 4-5)
Sealing the above contexts was the coin mould horizon which was sub-divided into four contexts (**12**, **16**, **32** & **33**). **(12)** was the principal context with (**16**) being those coin mould fragments that were retrieved during water washing/sieving process and (**32** & **33**) were those finds retrieved from the 'baulk' that separated the excavation (*c*.0.4m wide) and the modern course of the River. Rib**.**

Context **(12)** was a very dark grey clay deposit that lay in the middle of the excavation trench. The excavated portion was 2.8m E-W by 1.6m wide N-S with a maximum thickness of 180mm that tailed off on its southern side (see Figure 10).

The context contained 281 sherds (8191g) of pottery (+ 5 sherds or 220g of amphora), 173 (2264g) of animal bone, 3 flints (58g), 1 cbm/tile fragment (10g), small lumps of charcoal (4g) and 4 lumps of daub (124g), an Fe Neuheim brooch and 1415 (23,212g) fragments of coin mould. From the water-washing process **(16)** a further 9 sherds of pottery (172g) and 11 fragments of animal bone (816g) were recovered, though the coin mould was classified as u/s (unstratified).

The N-S section just inside the excavated trench and parallel with the River Rib (Figure 10) shows context **(32)** dipping down on its south side below **(21).** This portion of **(12)** was 1.7m long by 0.4m wide and contained 64 sherds (2129g) of pottery, 73 (1636g) of animal bone,1 flint (22g) (SF 507), 1 fragment of furnace debris (63g), 223 (3812g) fragments of coin mould and 1 cu alloy pellet (SF 534). A 30 litre bulk sample was taken <1017>. Contemporary with **(32)** was **(33)** which was an olive brown, friable deposit (Mun 2.5 Y 4/3). This was identified during the recording process and the finds were amalgamated with **(32).** The combined quantity of cbm from contexts (**12** & **32**) was 1638 fragments or 27,024g excluding any material contained within bulk sample <1017>. A further quantity of material could be added from the 'cleaning horizon' context **(9)** (see below).

During the course of defining the coin mould deposit a 'cleaning horizon' context number **(9)** was assigned. This was essentially to reduce the possibility of data contamination from post-depositional activity. This cleaning horizon yielded 302 sherds (3594g) of pottery, 213 fragments (1997g) of animal bone, 2 burnt bone (6g), 5 flints

(55g), 3 fragments of cbm/tile (68g), 10 lumps of daub (114g) and 791 fragments (4787g) of coin mould debris. If combined with **(12)** and **(32)** the total number coin mould fragments would be 2429 (31,811g). From the cleaning horizon came the following small finds: Cu alloy pellets (SF 500 & SF 502); cu alloy fragments (SF 503); five iron objects (SF 510); one shell (SF 511); 3 possible fragments of painted plaster (SF 519) and furnace debris (ST 524).

Possible association with coin mould horizon
In the southern E-W section (Figure 9) context **(19)** was a dark grey, waterlogged organic layer 0.35m thick that contained the following finds: 31 sherds (685g) of pottery, 30 (526g) fragments of animal bone, 1 flint (3g), 1 fragment of amphora (237g) and 17 fragments of coin mould (409g). A 300g soil sample was retrieved <1005> and a pollen sample <1006>. It was initially thought that **(19)** was a fill of a possible ditch or pit **(18)** but this is not certain. Layer **(17)** was initially thought to be an upper fill of (**18**) but this looks like it was part of **(19)**; it contained an iron nail (SF 535), 43 sherds (1561g) of pottery, 105 fragments of animal bone (708g), 1 flint (44g), 2 fragments (53g) of cbm/tile and 121 fragments of coin mould (620g).

Period IV Post-coin mould horizons
The earliest post-coin mould horizon **(21)** is shown in Figure 10 overlying the tail end of **(32)** and in Figure 8. This was a dark olive clay with occasional pebbles some 0.3m thick lying just above the water level in the western N-S section (Figure 10) and partially submerged in the southern E-W section (Figure 8). This suggests that it is dipping down in a southerly direction. It is one the later Romano-British deposits, though there were no finds associated with this context. It overlay context **(19)** in the southern E-W section (Fig. 4a) and clearly post-dates contexts (**17**, **18** & **20**).

Contexts that lay directly on the coin mould were numbers **(7)** and **(11)** which were both relatively small and isolated deposits. Context **(11)** was a patch of charcoal 300mm x 100mm no more than 40mm thick <1004>. This lay beneath **(7)** which was a patch of clay 400mm x 55mm and c.100mm thick <1001> (Fig. 3a). From this context came 20 sherds of pottery (874g) and 6 fragments (194g) of animal bone, 2 pieces of daub (26g) and 1 (1401g) fragment of oven or furnace debris (SF 521); also associated, were a charcoal (SF 522) and a burnt flint (SF 523). Both **(7)** and **(11)** were below layer **(4)**.

On the northern side of the site were several features **(5**, **6**, **8** and **10)** whose association with the coin mould horizon could not be established. **(5)** was a half exposed oven/kiln whose northern half lay beneath the northern edge of the site. It was between 0.7 and 1.2m long and possibly 0.7m wide and composed of clay edged with mainly chalk but also some flint. It was exposed, but its remains were left *in situ*. During its excavation the following material was retrieved: 28 sherds (258g) of pottery, 5 fragments of animal bone (45g), 1 flint (5g), 1 cbm/tile fragment (50g), 3 pieces of daub (48g), 2 items of iron (15g) (SF 509), 2 shells (17g) and a small sheet of lead (SF 528).

To the west of this feature a small localised spread of chalk was exposed **(10).** This was only partially revealed. To the east of the kiln/oven **(5)** a small area (0.8m x 0.7m) of 'cobbles' was exposed **(8)**. Finally, towards the north west corner of the excavation a cluster of flints was exposed in a diameter of 04m **(6)**. This is interpreted as a post-hole, though it was not excavated.

Period V Post-Roman horizon
Overlying all the features was **(4)** which was a very dark grey loamy clay some 0.5m thick. The top half was mechanically removed, while the remainder was manually excavated. The following material was retrieved from this horizon: 1097 sherds

(12,303g) of pottery, 419 (3266g) of animal bone, 34 (552g) flints, 19 (249g) burnt flint, 191 (7332g) cbm/tile, 31 fragments of charcoal (19g), 54 pieces of daub (573g), 43 (287g) fragments of iron (SF 506, 531, 533), 3 (10g) glass (SF 512), 7 (82g) fragments of *opus signinum* (SF 505), 4 (144g) pieces of lead (SF 517), 7 (528g) fragments of quern (SF 516, 518), 65 (251g) shall, 2 (66g) stone ore (SF 515), a sheet of cu alloy (SF 501), 2 cu alloy brooch fragments (SF 527 & 530), cu alloy fragment (SF 532), a riveted samian sherd (SF 504), 5 fragments (75g) of coin mould and cu alloy pellet (SF 536).

Period VI Alluvium

Layer **(4)** was overlain by **(3)** which was a dark grey silty clay (Mun 10 YR 4/1). This was between 0.2m and 0.4m thick and was interpreted as an alluvial layer. No finds were observed or recovered from this horizon. It was mechanically excavated.

Period VII Modern era

The alluvium was sealed by **(2)** which was c. 0.35m thick and consisted of a mix of silty, sandy, very pale brown (Mun 10 YR 7/4) and yellowish brown (10 YR 5/8). The following items were recovered from this horizon: 92 (1061g) sherds of pottery, 54 (441g) fragments of animal bone, 1 burnt flint (12g), 12 fragments (429g) of cbm/tile. This horizon is interpreted as the result of dredging the new river course. The uppermost horizon **(1)** was the 'top-soil' which varied between 0.3 and 0.5m thick (Figure 8 and Figure 9). The following material was recovered from the top-soil: 60 (551g) sherds of pottery, 5 (21g) fragments of animal bone, 2 flints (8g), 14 (881g) cbm/tile, 1 cu alloy frag (33g) and 10 (69g) shells.

Plate 1: View of the site and its setting looking southwards

Plate 2: Overall view of the site showing the northern section

Plate 3: Overall view of the site showing the southern section

Plate 4: Coin mould horizon looking east

Plate 5: Detail of western end of coin mould (scale = 1 metre)

Plate 6: Western N-S section (scale = 1 metre)

5 Finds Assessments

5.1 Iron Age coin pellet moulds: Evaluation of the gross morphology of a 10% sample

By Mark Landon

5.1.1 The whole coin pellet mould assemblage

The following report deals with approximately 10 percent of the 3481 fragments of coin pellet moulds (CPM) weighing 29856g found during the 2016 rescue excavation on the bank of the Ford Bridge flowing beside one of the Scheduled areas to the south of Braughing, Hertfordshire. The assemblage has been sorted into 1775 bags, of which 1546 contain single fragments and 229 contain two or more fragments. Bags containing more than one fragment hold either conjoining fragments or fragments with 'no measurable aspect' (defined as having no formal edges or corners, and no holes from which diameter or depth measurements can be taken). In order to obtain the maximum amount of information from the sample, it was decided at the outset not to include any of the bulk bags of fragments with 'no measurable aspect'.

Coin pellet moulds were found in seven contexts during the excavation. In addition, a large quantity of unstratified fragments was recovered; some of this was recovered from soil that had fallen from the bank into the river, and more was recovered by sieving the spoil. All these contexts may safely be regarded as being part of the same assemblage.

The majority of the coin mould fragments retrieved from the 'pavement' found in context (12) were lifted in individually numbered 20cm squares. It is hoped that this will enable significant conclusions to be drawn about any patterns of deposition within the mass of the material, but because this will require the examination of the totality of the gridded material it has been decided not to include any of the gridded portion in the sample. As far as is known, a single deposit of this size and density has not been found before in Britain.

Plate 7 - Coin mould 'pavement' - Context (12) ready for lifting

Context	Frags.	Weight
U/S	475	2011
09	919	4876
12	1395	16467
13	160	1184
17	114	431.5
19	17	315
22	8	209
32	393	4363

Table 1: Total CPM assemblage – numbers and weights by context

5.1.2 The 10% Sample

5.1.2.1 The sample

The sample comprises 162 fragments in 161 bags, weighing 3165g in total. The fragments have been selected proportionately from each coin mould context, distributed thus:

Context	Frags.	Weight (g)
U/S	10	348
09	28	452
12	87	1378
13	9	143
17	3	152
19	2	47

22	1	50
32	22	595

Table 2: 10% sample – numbers and weights by context

The evaluation was carried out in accordance with the protocol set out in Landon, 2016, Chapter 3 and Database Key Version 3.2.

The state of preservation in the sample ranges from 'poor' (surface finishes lost, fractures abraded) to 'very good' (retaining surface finishes and coatings intact). The thickness of the BRR16 10% sample fragments ranges from a maximum of 35.35mm to a minimum of 12.34mm. Average thickness measurements in the sample fall comfortably within the normal range found in Britain to date; however, they are lower than similar measurements either for the BRR07 and Puckeridge assemblages.

Site	Av thick 1	Av thick 2	Av thick 3	Assemblage average
Bagendon 1981	19.18	18.55	20.36	19.36
Blackfriars (Leicester)	23.72	24.25	22.70	23.56
Braughing Ford Bridge 2007	19.64	19.27	20.60	19.84
Braughing Ford Bridge 2016 10%	**17.95**	**17.20**	**17.65**	**17.60**
Henderson Collection	13.33	13.57	13.82	13.57
Old Sleaford sample	17.67	16.28	16.57	16.84
Puckeridge	18.32	17.64	18.28	18.21
Scotch Corner	18.32	17.64	18.28	18.21
Turners Hall Farm	17.50	17.25	17.48	17.44

Table 3: 10% sample – thickness compared with eight British CPM assemblages (comparative assemblages chosen because of their geographically widespread location and the size of the assemblage makes statistical comparison valid)

The average size of fragments in the whole sample is 34.55mm (Length 1) x 30.21mm (Length 2). Breaking this down by context, we see that, aside from contexts (17) and (22), neither of which contains large quantities of CPM, lengths are fairly homogenous through the sample.

Context	Length 1	Length 2
U/S	36.13	35.59
09	34.85	29.39
12	33.02	27.42
13	35.80	29.83
17	44.54	37.21
19	32.25	34.31
22	52.21	36.14
32	35.50	37.02

Table 4: Fragment size broken down by context

Comparing these figures with those drawn from other British coin mould assemblages, we can see that the fragments forming the BRR16 10% sample are, on average, neither outstandingly large nor exceptionally small.

Site	Length 1	Length 2
Bagendon 1981	46.18	37.28
Blackfriars (Leicester)	41.14	38.51

Braughing Ford Bridge 2007	27.19	25.15
Braughing Ford Bridge 2016 10%	**34.55**	**30.21**
Henderson Collection	24.03	21.20
Old Sleaford sample	27.56	24.14
Puckeridge	33.75	31.49
Scotch Corner	30.40	27.27
Turners Hall Farm	21.43	18.07

Table 5: 10% sample dimensions compared with eight British CPM assemblages

5.1.3 The fabrics

Although a full report on the petrology of these coin mould fragments has been produced by Jake Morley-Stone (see 5.2), there are some observations which can be made at this stage.

First, on the basis of different reactions to extreme heat there would appear to be at least three different fabrics present in the sample:

a. A grey, silty fabric with few or no inclusions, which can show vesiculation, bloating and vitrification

b. A relatively hard cream to buff fabric with few or no inclusions, that vesiculates and vitrifies, but does not seem to bloat

c. A pale, soft fabric with large chalk inclusions that vesiculates and turns pinkish and powdery.

The implications of this would seem to be quite important. If clay from three different sources is being used to make trays in a single assemblage of coin moulds, then it is undeniable that a simple, linear model for minting is no longer applicable.

5.1.4 The edge profiles

As demonstrated in Landon 2016, Chapter 3, the formed edge of a piece of coin mould (as opposed to any broken edges) can yield important clues about the method used to make the tray from which it derives. It has been shown that in many assemblages of CPM several different techniques have been used to make the trays forming the pre-use assemblage (Ford Bridge 2007 (Landon 2016, Chapter 5); Puckeridge (Landon 2016, Chapter 6); Scotch Corner (Landon & Morley-Stone in Fell, 2020) and Silchester (Allen in Fulford *et al*, 2018). In addition, it can be shown that it is not physically possible for certain types of edge profile to appear on the same tray (Morley-Stone, Landon & Ponting in 'Contact, Concord, Conquest', Fell *et al*, forthcoming). it appears that the tray-making is not a centralised process, with different workshops and different episodes of mould-disposal at the same site. These facts in turn can help us understand the social framework within which minting was carried out at different places and in different episodes at the same site.

Of 130 edge profiles in the study sample, only 17 are unclassifiable because of damage, heat-induced distortion or insufficient size. The 19 classified as 'other' can be described, but do not fit into any of the listed categories: new categories are only added to the list if they appear with any frequency. During the past 11 years, it has been felt necessary to add to the original list of profile types only once: Profile Type 10, which has a deep step rather than a serif and an upstanding flange on the top corner of the edge (Figure 13), has so far been seen only in the Ford Bridge 2016 material.

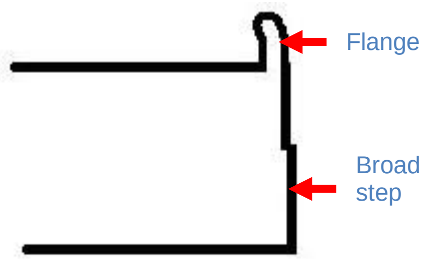


Figure 13: Braughing Type 10 edge profile

This new type has not been added simply because of its appearance, but rather because it appears to result from an entirely new method of tray manufacture. Further research, including targeted experimental work, is required before this new process is fully understood, but at this early stage it seems very likely that the tray moulding process was carried out using some form of two-piece mould which created both the Type 10 and the related broad serif Type 2 variant (Figure 14). Nonetheless, we can be reasonably certain that this was not a conventional bivalve mould.

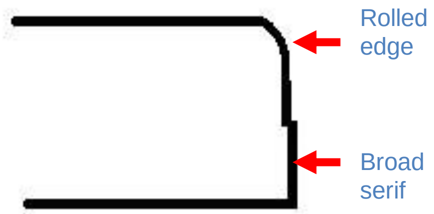


Figure 14: Type 2 edge profile with broad serif

The nature of this mould becomes clearer when one considers that, of the fourteen specimens in the sample that exhibit a thick step, six also exhibit a thin groove on the upper surface of the step (Figure 15). This must have been caused by the edge of the tray mould as a result of forcing clay and mould into contact (this rather odd formulation is required because at this stage it is not possible to tell agent from reagent – was the mould forced into the clay, or was the clay forced into the mould?).

There are, however, observations that can be made at once about the tray mould – it must have been less than 3mm thick at its edge (Figure 15), which would seem to rule out the use of either pottery or wood as the material from which it was made, as a tool of this conformation made with these materials would not have been sufficiently robust to withstand use. The absence of any obvious seam line at any point between step and upper edge of the mould fragment rules out a tray mould made from more than one material, and so the two remaining possibilities are metal or boiled leather.

This technique is far more elaborate than has been observed or hypothesized at any other site. It is known that the British Late Iron Age minting process was not a unitary tradition but should instead be regarded as a grouping of related approaches, which ranged from clay trays of the types recovered from Braughing to stone potin moulds, and re-used sherd moulds.

Figure 15: SF3625 showing groove in upper surface of step

Code	Count	Percent
1	1	0.77
2	55	42.31
3	4	3.08
4	3	2.31
5	23	17.69
6	2	1.54
8	19	14.62
9	17	13.08
10	6	4.62

Table 6: Count of profile types in the 10% sample. Type 7 (cut and tear) was not present

Code	Profile type	Blackfriars, Leicester	Ford Bridge 2007	Henderson Collection	Old Sleaford (sample)	Puckeridge	Scotch Corner	Turners Hall Fm.
1	I-section	0	2.55	3.70	0	5.41	1.32	0
2	Lazy S	28.21	41.58	18.52	0	46.68	6.58	36.11
3	Straight section	0	9.18	37.05	6.67	14.67	0	9.72
4	Angled section	7.69	0.77	14.81	0	2.17	1.32	18.05
5	Rolled edge	23.08	3.06	3.70	20	2.23	56.58	5.56
6	Overhang	0	7.91	3.70	6.67	7.37	15.79	0
8	Other	10.26	0	0	33.33	1.01	7.89	0
9	Uncertain	30.77	34.95	18.52	33.33	20.45	10.53	30.56
10	Step and flange	0	0	0	0	0	0	0

Table 7: Comparative edge profile percentages in seven British CPM assemblages

From Tables 6 and 7, above, it is clear that the type 10 profile is so far unique in Britain (unfortunately, there is no comparable data covering CPM from mainland Europe). Since it has been found in other assemblages that there is often a strong correlation between profile type combination, tray form, hole size (Ford Bridge 2007; Puckeridge; Blackfriars, Leicester; Scotch Corner) and – in the case of Ford Bridge 2007 and Scotch Corner – of metallurgy as well, all of these factors merit the closest examination.

5.1.5 The holes

5.1.5.1 Basic metrics

There are 742 mould holes in the sample, of which 638 are incomplete and 104 are complete, a ratio of 6.13 : 1. This extremely low ratio is undoubtedly the result of the policies governing the sample selection process, where the fragments were selected proportionally by weight from each context, several of these contexts had a far higher proportion of incomplete holes and hence the sample must be regarded as biased in this respect.

5.1.5.2 Hole base diameter

The holes from which base diameter measurements can be taken range from a maximum diameter measurement of 16.90mm to a minimum of 5.2mm. There are 170 holes with a diameter less than 10.30mm, and 56 holes with a diameter larger than 10.30mm. It is important to note that the base diameter range in the 10% sample is significantly different not only from all the other assemblages from the Braughing/Puckeridge area, but also from every assemblage examined to date (see Table 8, below). Although the final resolution of this question must await results from the totality of the Ford Bridge 2016 material, the initial impression is that this assemblage is clearly discriminable from all other assemblages, and that therefore it would be incorrect to aggregate it with either the Puckeridge or the Ford Bridge 2007 material.

Range	BAG pits	BFL	BRR 07	BRR 16 10%	HC	OS	PUC	SC	THF
<4	0	0	0	**0**	0	0	0	5.88	0
4 to 5	0	0	0	**0**	11.43	0	0	48.10	5.88
5 to 6	0	0	0	**4.76**	8.57	0	0	23.18	0
6 to 7	0	5.56	0	**8.33**	71.43	25.00	0	3.46	5.88
7 to 8	12.50	2.78	0.51	**27.38**	8.57	25.00	0.33	0	35.29
8 to 9	0	19.44	2.04	**25.00**	0	37.50	3.16	0	29.41
9 to 10	75.00	2.78	16.84	**3.57**	0	12.50	16.03	1.73	17.65
10 to 11	0	0	39.29	**2.38**	0	0	40.16	5.88	5.88
11 to 12	0	16.67	32.14	**7.14**	0	0	28.74	7.96	0
12 to 13	12.50	36.11	3.57	**10.71**	0	0	2.76	3.11	0
13 to 14	0	13.89	0	**5.95**	0	0	0.24	0.69	0
14 to 15	0	0	0	**3.57**	0	0	0.32	0	0
15 to 16	0	2.78	0	**0**	0	0	1.05	0	0
16 to 17	0	0	1.53	**1.19**	0	0	3.89	0	0
17 to 18	0	0	4.08	**0**	0	0	2.35	0	0
18 to 19	0	0	0	**0**	0	0	0.89	0	0
19 to 20	0	0	0	**0**	0	0	0.08	0	0
20 to 21	0	0	0	**0**	0	0	0	0	0
21 to 22	0	0	0	**0**	0	0	0	0	0

Table 8: Fragment average base diameter distribution in nine assemblages compared

It should also be noted that two groups of holes can be discriminated in the sample on the basis of shape. There are fragments with round holes, which have hitherto been the only shape noted using this protocol, and there are fragments bearing holes with square mouths and subcircular bases, of a type previously noted at Bavay (Scheers et al, 2000) and some other mainland European sites, and the two types never appear on a single fragment. These two groups are also discriminable using other parameters. At this point, we will examine only hole base diameter.

Range	HMS %	Non-HMS %
<4	0	0
4 to 5	0	0
5 to 6	0	6.06
6 to 7	5.56	9.09
7 to 8	22.22	28.79
8 to 9	72.22	12.12
9 to 10	0	4.55
10 to 11	0	3.03
11 to 12	0	9.09
12 to 13	0	13.64
13 to 14	0	7.58
14 to 15	0	4.55
15 to 16	0	0
16 to 17	0	1.52
17 to 18	0	0
18 to 19	0	0
19 to 20	0	0
20 to 21	0	0
21 to 22	0	0

Table 9: Holes with square mouths (HMS) and holes with round mouths (Non-HMS) base diameter distributions compared

The first point to note is that in the 10% sample the square-mouthed holes form a tight group, with a spread of less than 4mm. It is a far more clearly defined grouping than can be seen in the round-hole material from Ford Bridge 2016 (see Table 9, above, and Figure 16). It is even tighter than the grouping of the Henderson Collection material (another Braughing assemblage, probably found no more than 300 metres from the BRR16 site), all of the holes of which could have been formed using a single dibber, according to the results of the experimental work reported in Landon, 2016, Appendix I, and far tighter than noted in the Turners Hall Farm pellet mould, another assemblage which appeared to contain only a single hole size group; nonetheless, it should be remembered that this picture may change somewhat when the full assemblage is examined.

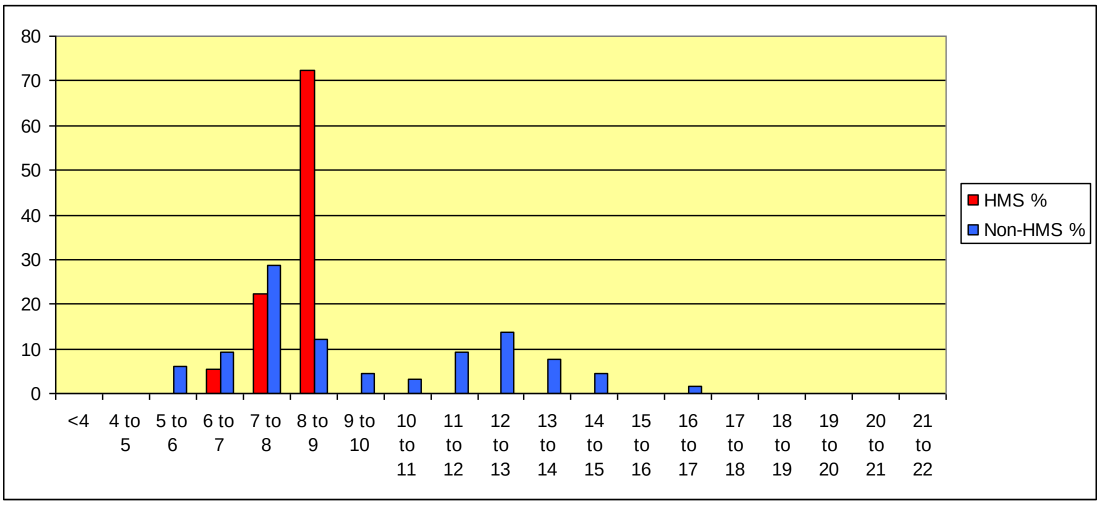


Figure 16: Square (HMS) and round-mouthed (non-HMS) hole base diameters depicted

There is also significant difference between the two groups in terms of intra-fragment variation in hole base diameter (see Table 10, below). This may well indicate that the holes in each group were not made using the same technique.

	HMS	Non-HMS
Sample	14	33
Av diff	1.33	1.14
Max	2.85	4.15
Min diff	0.4	0.1

Table 10: Intra-fragment variation in hole base diameter for square- and round-mouthed holes in mm

5.1.5.3 Hole depth

Individual hole depth ranges from a minimum of 3.5mm to a maximum of 16.6mm. It has been observed elsewhere (Landon, 2016) that the 'depth signature' of every assemblage examined to date has been unique, and this is demonstrably true of the Ford Bridge (Table 11, below). However, it should also be noted that the spread of depth values seems to be closely related to assemblage size, and that therefore a firm conclusion concerning hole depth in the Ford Bridge 2016 material must await examination of the entirety of the assemblage.

Depth range	BAG pits	BFL	BRR 07	BRR16 10%	HC	OS	PUC	SC	THF
<2 mm	0	0	0	**0**	0	0	0.06	0	0
2-3 mm	0	0	0	**0**	10.	0	0	0.95	0
3-4 mm	0	0	0.22	**0**	25.	0	0.18	7.16	0
4-5 mm	25.00	1.30	1.98	**0.69**	27.	0	0.41	20.2	0
5-6 mm	12.50	11.3	7.51	**3.45**	21.	26.0	5.21	20.2	0
6-7 mm	37.50	3.91	25.39	**8.28**	10.	30.4	20.91	14.0	0
7-8 mm	12.50	12.1	30.91	**14.48**	4.2	30.4	35.85	7.88	0
8-9 mm	12.50	13.0	24.28	**15.86**	0	13.0	23.14	9.31	0
9-10 mm	0	10.8	6.18	**26.9**	0	0	8.85	4.53	0
10-11 mm	0	15.6	2.21	**15.17**	0	0	3.28	5.01	0
11-12 mm	0	9.13	0.66	**11.72**	0	0	1.64	3.82	0

12-13 mm	0	8.70	0.44	**3.45**	0	0	0.29	4.06	12.5
13-14 mm	0	8.26	0.22	**0**	0	0	0.18	1.43	0
14-15 mm	0	3.04	0	**0**	0	0	0	0.72	50.0
15-16 mm	0	2.17	0	**0**	0	0	0	0.48	25.0
16-17 mm	0	0.43	0	**0**	0	0	0	0	12.5

Table 11: Fragment average depth distribution in eight assemblages and the Ford Bridge 2016 10% sample expressed as percentages

However, it is instructive to look at the depth ranges for each hole type (see Figure 17). As with hole base diameter, once again the holes with square mouths have a much narrower range of depths than holes with round mouths. A five millimetre spread is less than the 6mm of the Henderson Collection, and only surpassed by experimental results (experiments in which special care was taken to regulate hole depth) set out in Landon, 2016, Appendix I. While it should be borne in mind that this picture could well change once the full dataset has been obtained (there are only 20 depths in the square-mouthed hole dataset), yet again the possibility opens that the two types of hole present in the Ford Bridge 2016 assemblage were not made using the same method.

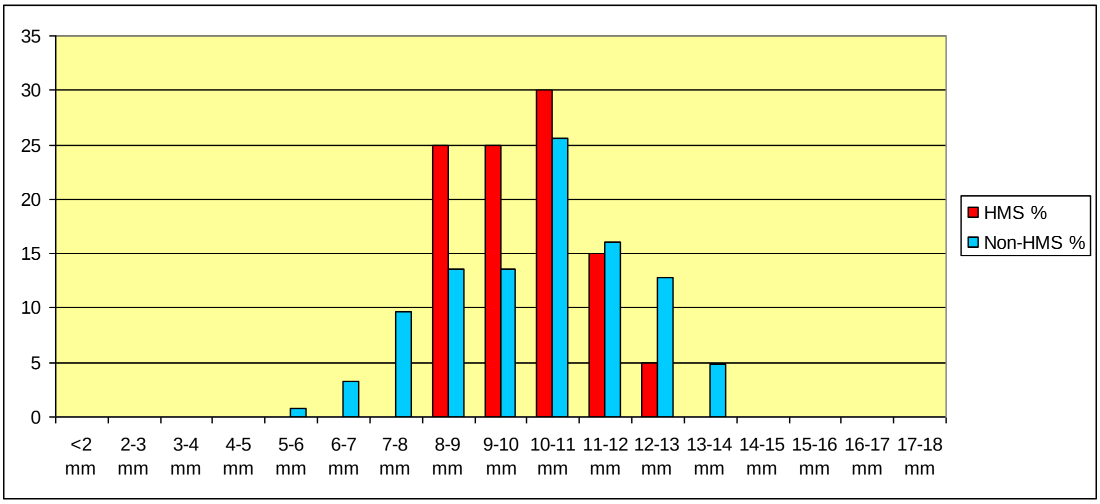


Figure 17: Hole depth distribution for both square- (HMS) and round-mouthed (non-HMS) holes

5.1.5.4 Hole top diameter

In view of the unusual conformation of some of the holes in the sample, it was decided to take two measurements of hole top diameter for holes with square mouths, horizontal and vertical (as with base diameters). Although this can generate no certain answers at this stage, it may provide useful hints about the methods used to make these unusual holes when the full assemblage is examined.

First of all, the spread of top diameter values for all holes in the sample will be compared with values from eight British CPM assemblages (see Table 12, below). The data used to generate the figures for the Old Sleaford column were taken from Elsdon, 1997; the data for the Turners Hall Farm column were gathered by Nicky Metcalf using the standard recording protocol. The total range of the Ford Bridge sample is, at roughly 14mm, surprisingly large, and the total range in the full assemblage may well be greater. The range is 2mm greater than that found in the Ford Bridge 2007 assemblage, and the distribution of values is significantly different, thus strengthening the case for not aggregating these two assemblages, despite their propinquity.

Range	BAG pits	BFL	BRR 07	BRR 16 10%	HC	OS	PUC	SC	THF
<4	0	0	0	**0**	0	0	0	0	0
4 to 5	0	0	0	**0**	0	0.19	0	0	0
5 to 6	0	0	0	**0**	0	0.41	0	1.53	0
6 to 7	0	0	0	**0**	7.14	2.16	0	12.23	0
7 to 8	0	0	0	**1.89**	17.86	8.83	0.13	35.81	0
8 to 9	0	3.33	0	**11.32**	57.14	25.48	0	32.21	0
9 to 10	0	10	0.78	**7.55**	14.29	27.16	0.13	9.06	47.37
10 to 11	20	3.33	1.55	**15.09**	3.57	11.94	2.64	1.64	10.53
11 to 12	80	13.33	18.99	**30.19**	0	4.76	14.82	0.22	42.1
12 to 13	0	10	27.91	**7.55**	0	1.72	36.81	0	0
13 to 14	0	13.33	35.66	**5.66**	0	0.19	28.02	0.22	0
14 to 15	0	23.33	10.08	**3.77**	0	0.06	9.55	0.33	0
15 to 16	0	13.33	1.94	**0**	0	0	1.63	0.44	0
16 to 17	0	6.67	0.39	**5.66**	0	0	0.13	1.53	0
17 to 18	0	3.33	0	**9.43**	0	0	0.38	2.62	0
18 to 19	0	0	0.78	**0**	0	0	1.51	1.53	0
19 to 20	0	0	1.55	**0**	0	0	3.27	0.44	0
20 to 21	0	0	0.39	**1.89**	0	0	0.88	0.22	0
21 to 22	0	0	0	**0**	0	0	0.13	0	0

Table 12: Top diameter spreads from 8 British assemblages compared with the Ford Bridge 2016 10% sample

Proceeding next to the comparison of the two hole type groups, square-mouthed and round-mouthed, we see that there are marked differences (see Figure 18).

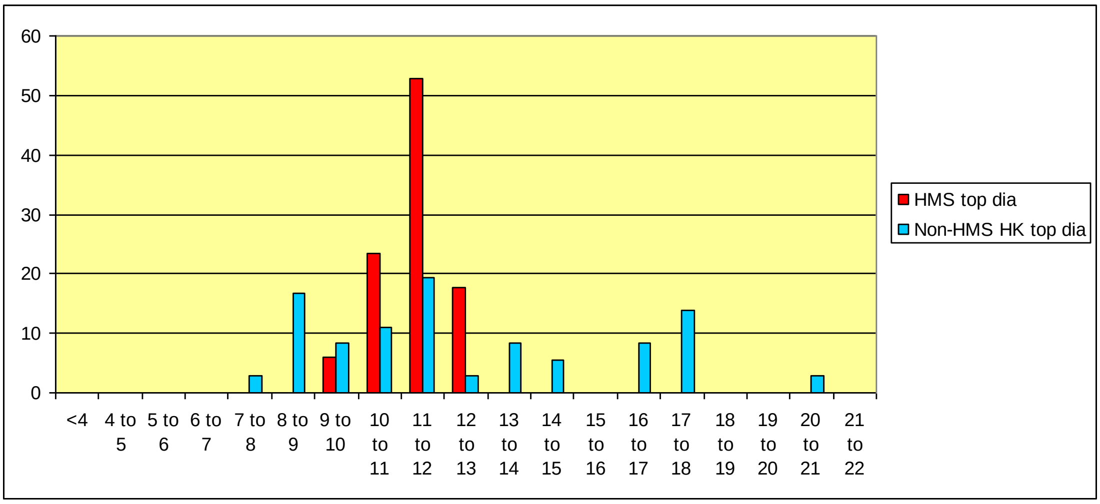


Figure 18: Top diameter of square- (HMS) and round-mouthed (Non-HMS) holes compared

Once again, the HMS material forms a very tight group, in distinct contrast to the non-HMS material. This is a further indication that the two types should be treated separately, as it becomes more likely that they were made separately, quite possibly using different techniques.

5.1.5.5 Hole size groups

Hole sizes (here defined as fragment average base diameter plotted against fragment average hole volume) form a relatively tight cluster at the lower end of their range, and a much looser scatter at the top end.

	Smaller hole size group	Larger hole size group
Largest average hole base diameter	10.30 mm.	16.90 mm.
Smallest average hole base diameter	5.20 mm.	11.38 mm.
Diameter range	5.10 mm.	5.52 mm.
Largest volume	666.44 $mm.^3$	2487.09 $mm.^3$
Smallest volume	187.68 $mm.^3$	730.70 $mm.^3$
Volume range	478.76 $mm.^3$	1756.39 $mm.^3$

Table 13: Hole size groups in the Ford Bridge 10% sample defined (both hole types aggregated)

Once again, although a full picture of the precise dimensions of the hole size groups cannot be gained before the whole assemblage has been examined, but there are nonetheless several observations to be made. The first is that the spread of hole base diameters is unusually broad: experiment has shown that variation in hole diameters made with a single dibber can be as great as 4mm (Landon 2016, Appendix 1), and the spread of base diameter values in a hole size group (See Figure 19 and Table 14, below) tends to be 4mm or less (the Henderson Collection, Braughing, assemblage has a single hole size group with a spread of precisely 4mm).

The Ford Bridge 2016 10% sample has hole size groups with the second largest range seen so far in Britain, in terms of volume as well as base diameter. Only the Puckeridge assemblage – deriving from the same area - shows greater variation in these parameters. When the entire assemblage is examined it seems possible that the range of values will increase. The reason for this wide variation is not immediately clear. It may be that less care was taken in the making of the coin mould in this assemblage, or it may be that the assemblage is composed of coin mould fragments of disparate origin which were only brought together at Braughing.

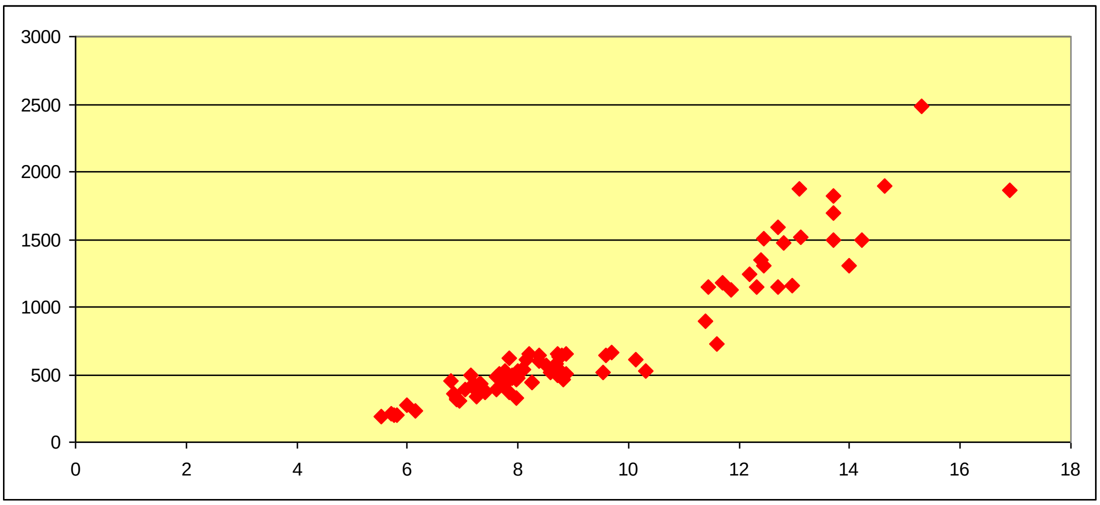


Figure 19: Holes size groups in the 10% sample

Volume: larger hole size groups in mm3			
Assemblage	Largest volume	Smallest volume	Spread
Blackfriars, Leicester	2030.68	1063.99	966.69
Ford Bridge 2007	2068.72	1390.39	678.33
Puckeridge	3214.79	1171.93	2042.86
Scotch Corner	1384.39	552.71	831.68

Volume: smaller hole size groups in mm3			
Assemblage	Largest volume	Smallest volume	Spread
Blackfriars, Leicester	533.5	207.37	326.13
Ford Bridge 2007	1005.29	318.2	687.09
Puckeridge	1358.89	301.83	1007.46
Scotch Corner	204.36	34.71	169.75

Base diameter: larger hole size groups			
Assemblage	Largest diameter	Smallest diameter	Spread
Blackfriars, Leicester	13.45	11.21	2.24
Ford Bridge 2007	17.7	16.5	1.2
Puckeridge	19.5	13.6	5.9
Scotch Corner	13.23	9.67	3.56

Base diameter: smaller hole size groups			
Assemblage	Largest diameter	Smallest diameter	Spread
Blackfriars, Leicester	9.13	6.1	3.03
Ford Bridge 2007	12.36	8.5	3.86
Puckeridge	13.1	7.3	5.8
Scotch Corner	6.95	3	3.95

Table 14: Hole size groups – range of variation in volume and hole base diameter in four assemblages

There are two obvious points to be derived from these figures. The first is that the spread of base diameters in each of the hole size groups in the 10% sample is so great that it would be rash to adduce the production of any particular denomination of coin in either of the groups. The second is that, although many assemblages examined to date contain more than one hole size group, there is certainly no reason to assume a country-wide standard for these groups.

Since it has been demonstrated above that there are already good reasons for dividing the group of smaller size holes according to whether they have square or round mouths, it is worth seeing whether the distinction holds at this level (Figure 20).

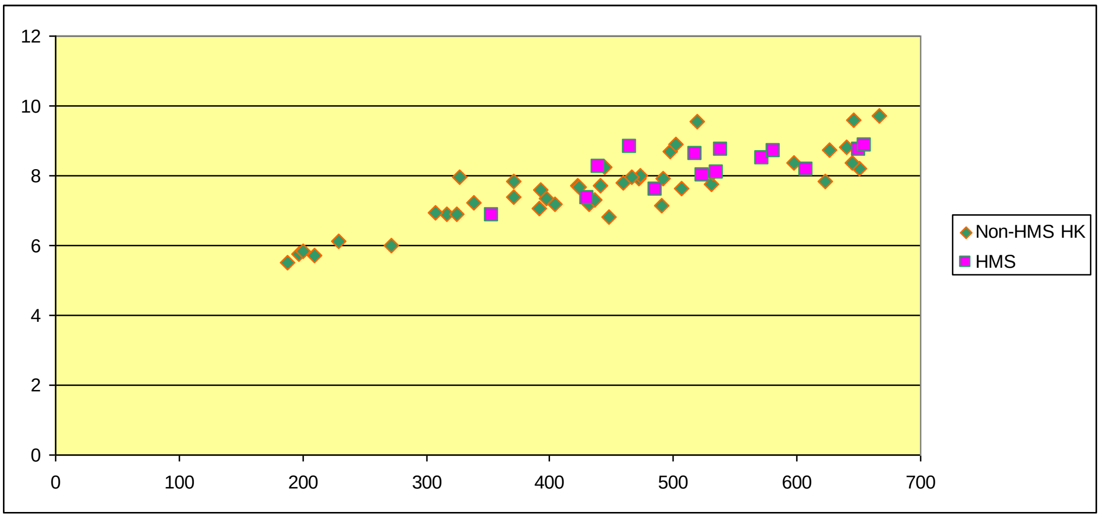


Figure 20: Small hole size group – Square- (HMS) and round-mouthed (Non-HMS HK) holes compared

While at first sight there does appear to be a significant difference in the spread of hole size values between the two hole shapes, closer examination reveals that at this stage of the investigation this difference is insufficiently large to be certain that it is not just a function of the smallness of the sample (Table 15).

	Non-HMS	HMS
Max	666.44	655.18
Min	187.68	353.94
Dif	478.76	301.24

Table 15: Comparing hole size variability in small holes with round mouths and square-mouthed holes

5.1.5.6 Methods of hole making

Although the overwhelming majority of British coin mould examined using the recording protocol set out in Landon, 2016 which exhibits diagnostic signs of hole manufacture seems to have had holes made singly, rather than in multiples or all at once, it was always undeniable that at least one tray – an almost complete example from Saintes in France (Tournaire et al, 1982: plate 31b) – had holes made in multiples of six, and it has also been suggested that a multi-pointed dibber may have been used to make the holes on a fragment retrieved at Scotch Corner (Landon, Ponting and Morley-Stone in Fell, 2020). It has further been claimed of coin mould trays found at Bavay, France (Scheers et al, 2000), had holes made all at once by means of a pegboard (Allen, writing in Fulford *et al* 2018, suggests that some at least of the CPM from Silchester had holes made using a pegboard, but the photographic evidence is too equivocal, and the dataset too inadequate, to be able to judge this claim with confidence).

Nonetheless, the evidence from Bavay seems good, and the marrying of the visible evidence from the trays (Bavay Type 5, after Geoffroy in Scheers et al, 2016, Fig. 2) with a theory for the manufacture of a pegboard is both elegant and credible. The method adopted by Landon (Landon, 2016, Appendix 1) for making a multi-pronged dibber – mounting sections of dowel in holes drilled in a wooden bar – becomes (*pace* Allen, 2018) difficult and fiddly when scaled up to a pegboard. The idea that a pegboard could be made from a block of wood using a saw and chisel accords very well with the rounded hole base circumferences and square-set ribs observable on one of the types of tray noted at Bavay.

The objection raised in Landon, 2016, that the force required to use a pegboard would result in extreme distortion of the edges of a tray, can be overcome by envisaging that the clay might be pressed onto the pegboard, rather than vice-versa., or by the use of some sort of ‘corsetting’ (perhaps looking rather similar to a pastry cutter) to keep that part of the clay slab closest to the pegboard in a regular shape. This would provide a convincing explanation for the exceptionally thick bottom serifs – so thick that they could well be called ‘steps’ - seen on so many fragments with square-mouthed holes in the 10% sample: the slabs of clay used were much thicker than the depth of the tray mould components, and the excess clay bulging from below the ‘corset’ seems to have been removed by cutting, but without great precision.

Figure 21 Holes with square mouths and round bases from Ford Bridge 2016

The evidence for a two-part mould is the upstanding flange of the Braughing Type 10 profile, which appears to be clay extruded through a linear gap between the top of a ‘corset’ and the edge of a pegboard, displaced by the forcing of the pegboard into the upper surface of the tray. However, there would appear to be no strong correlation between stepped profiles and square-mouthed holes: of 13 stepped profiles in the sample, there are six fragments of uncertain hole form; two fragments with square-mouthed holes; and five fragments with round-mouthed holes. Given such a low number of specimens, full resolution of this question must await examination of the full assemblage followed by detailed experimental work, but at this stage it seems quite possible that a pegboard able to make round-mouthed holes was also used.

5.1.6 Signs of heating

There are three basic signs that ceramic has been heated to a temperature above that required for firing: vesiculation (bubbling of the fabric); vitrification (glass forming on or in the fabric); 'powdering' (when the fabric becomes soft and friable). The first two are often localised on an in a fragment, while the third appears always to affect the whole fragment.

Type of heating sign	Count	Percent of sample
Any vesiculation	129	79.63
Any vitrification	21	12.96
Any deformation	24	14.81
Any powdering	37	22.84

Table 16: Signs of heating in the 10% sample

There are 37 examples of 'powdering' in the sample, of which 26 show other signs of extreme heating. The most usual of these is vesiculation: there are 21 instances of the coincidence of powdering with some form of vesiculation. Vitrification, on the other hand, seems to be a much rarer accompaniment of powdering, with only one instance in the sample.

Although it is true that supra-microscopic signs of heating are often equivocal in their import, and above all cannot on their own demonstrate use (Landon 2016, Chapters 3 & 12), given the ubiquity of some assumptions concerning the location on trays of signs of the application of higher temperatures it is still useful to see how far these assumptions appear to apply to a given assemblage.

We know that the melting point of the clay used to make the majority (if not all) of the Braughing/Puckeridge coin mould has a melting point significantly lower than the alloys to be melted in it (around 900°C for the trays, versus 1100°C + for the metals (Tite and Freestone 1983)), and it has been suggested – not unreasonably – that to minimise the risk of failure during use the trays would be preheated to cherry-red, and then temperatures on the upper part would be raised quickly and briefly to a level at which pellet fusion could be achieved, a process requiring between three and five minutes (Gebhardt et al, 2007). The hypothesis to be tested against the data, therefore, is that the signs of greatest heating will tend to appear on the upper parts of coin mould fragments.

Examination of Table 16, above, reveals that – as one might expect – signs of extreme heating appear frequently in combinations. Vesiculation especially tends to affect more than one part of a fragment. Particularly noticeable in the data is a lack of coincidence between the three types of extreme heating sign which can be located on particular parts of a fragment. Vesiculation of the top surface appears only thrice in combination with vitrification of the top surface, and never in conjunction with deformation of the top. This is counter-intuitive, but there are in fact relatively few signs in the sample that greater heat was applied to the top of a tray than to the base (Table 17, below):

Heating sign	Count	Percent
Vesiculation	54	33.33
Vitrification	11	6.79
Deformation	14	8.64

Table 17: Signs of heating on top surfaces in the sample

If one compares these figures with the incidence of signs on the heating of the base of fragments in the sample (Table 18, below), it is clear that while there is a definite bias towards signs of heating on the top of fragments, the preponderance is by no means overwhelming.

Heating sign	Count	Percent
Vesiculation	25	15.43
Vitrification	4	2.47
Deformation	4	2.47

Table 18: Signs of heating on bottom surfaces in the sample

If this finding carries over into the full assemblage, then some explanation must be sought for it, and it would seem that a combination of SEM examination and targeted experimentation is perhaps the best way to reach an answer.

5.1.7 Chalk wash and chalk inclusions

It is a peculiarity so far noted for certain only of pellet mould from Verulamium, Braughing and Turners Hall Farm that many fragments show signs that holes – and sometimes surfaces – have been coated with chalk wash. While Trittschack (Department of Geosciences, University of Fribourg, *pers comm,* 2014) and Dungworth (*pers comm*, 2016) are both of the opinion that this coating must be taphonomic, SEM-EDS and SEM examination confirm the conclusion reached by supra-microscopic inspection (which revealed that chalk wash is occasionally present beneath vitrification, and *never* appears on fractured edges, which indicate that it was present before both use and breakage): the coating is chalk, and it is intentional rather than natural or taphonomic.

It is worth setting out in some detail the chemistry involved:
If one heats chalk (calcium carbonate, $CaCO_3$) to just below 800°C, it begins to break down into CaO (calcium oxide) and CO_2 (carbon dioxide). As the CO_2 passes through the glowing charcoal (carbon) heaped on top of the tray, two molecules of CO (carbon monoxide, which is not stable). In the heat of the hearth, these two CO molecules will each mop up an extra atom of oxygen to form two molecules of CO_2. Therefore, the calcium carbonate does not merely flood the mould hole with CO_2, but is able to affect the makeup of the atmosphere in the hearth environment.

Of the 162 fragments in the 10% sample, 51 – 31.48% - have traces of chalk wash. Clearly this figure may well alter following examination of the full assemblage, but it is nonetheless useful to compare it with comparable figures (based upon the numbers of individually recorded fragments) from other assemblages examined using this protocol, because where it is present it is a measure of the quality of preservation as much as it is an indication of the prevalence of chalk wash in the pre-depositional material (Table 19).

Site	Percent
Ford Bridge 2007	27.49
Henderson Collection	4.76
Puckeridge	47.06
Turners Hall Farm	14.45

Table 19: Percentage of fragments with traces of chalk wash in four assemblages

From these numbers we can tell that the material selected is well preserved, but not exceptionally so. Given that the Puckeridge assemblage has been described by Collis as ‘the best preserved coin mould in Britain’ (2009, *pers comm*), it is not entirely surprising that the Ford Bridge 2016 10% sample (which may well have been trampled underfoot, judging by the large quantity of very small fragments) dies not quite approach this standard.

Analysis of the location of these traces on the fragments is revealing. There are 50 instances of ‘chalk wash in holes’, exactly as one might expect if the function of the wash was to help maintain reducing conditions in the hole. There is only a single instance of chalk wash on a fragment (Context (09), SF 3273) where it is not present in the holes as well as elsewhere. This fragment bears only two holes, neither of which yielded more than a depth measurement, meaning that they were far from intact, thus leading to the suspicion that chalk wash could well have been present, but was dislodged by rough treatment.

There are 21 fragments with chalk wash on the top surface, as might be expected if the primary target was the holes. Sometimes the wash appears as 'dribble marks' (**Error! Reference s ource not found.**, above), thus demonstrating that the wash was applied as a liquid, rather than applied dry (as suggested by van Arsdell, 1989, p. 48). Given that there were a further 10 fragments with chalk wash on their formed edges, and seven fragments with chalk wash on their base, it may be suggested that the wash in the sample was often applied by pouring into the holes and swirling, and occasionally by dipping, but probably not by means of a brush.

There is another way in which chalk may have been used in the minting process at the Braughing/Puckeridge settlement complex. It has already been mentioned in 5.1.3 above) that one of the distinguishing features of posited Fabric Type **c** is the presence of chalk fragments, and there are 46 examples in the sample. However, there has been no discussion of three questions suggested by its presence:

- First, is the chalk a natural constituent of the clay – or was it added deliberately as a temper?
- Second, if the chalk was naturally present in the clay, is it possible that this was a factor in its selection?
- Third, natural or additive, deliberate or accidental, might the presence of chalk in the fabric have affected the performance of mould trays containing it and, if so, in what ways?

While neither the study of the gross morphology of coin mould or informed speculation can provide definitive answers to these questions, they can usefully aid and direct microscopic investigation and experimental work, which are better placed to resolve the issues.

It is suggested that at the very outset of minting in the North Thames region it was noticed by craftspeople that trays made from clay with a naturally high chalk fraction tended to produce fewer trapped pellets, and that this was the origin of the local expedient of coating holes with chalk wash. The soils around Braughing and Puckeridge belong to the *Melford Association*, described as 'deep well drained fine loamy over clayey, coarse loamy over clayey and fine loamy soils, some with calcareous clayey subsoils' derived from chalky till (Soil Survey 1983, 571o). The underlying geology comprised Quaternary Till over Upper Chalk (BGS, sheet no. 221). It is supposed that the 'calcareous, clayey subsoils' are and effect of glaciation on the underlying chalk, and it has been noted that some of the clay extracted locally as part of the experiments in tray manufacture described in Landon, 2016, Appendix I, did contain small chalk fragments and particles, albeit not in any great profusion.

It would seem a reasonable hypothesis that, were the presence of chalk fragments in the fabric of coin mould the result of conscious selection or intentional addition, they must have provided some real or perceived benefit in the process of manufacture or use. Had this benefit been the same as that provided by chalk wash, then an absence of coincidence between the two traits on a single fragment would appear a logical consequence, but this is not the case. In the sample, 32 fragments have both chalk wash and chalk inclusions in the fabric – more than 60% of fragments with chalk wash, and almost 70% of fragments with chalk inclusions. If the appearance of chalk inclusions is intentional, either the tray makers were using a belt-and-braces approach to the creation and maintenance of reducing conditions, or the benefit of chalk inclusions was not the same as the benefit of chalk wash. Perhaps we should look instead at the possibility that – like the grog temper that is a defining characteristic of Late Iron Age pottery in the Braughing/Puckeridge area, but is scarcely ever noted in the fabric of coin mould – chalk inclusions improved the resistance of the fabric to the thermal shock of firing and use.

5.1.8 Grain casts

Grain casts have been an occasional feature in six assemblages across Britain, and especially in the material from Braughing/Puckeridge. It has been suggested (Landon, 2016, Chapter 12) that this indicates that coin mould was being made at a time of year when loose grain was common around settlements; in other words, in the late summer and early autumn, in the weeks following harvest, although Haselgrove has questioned this: 'You find a certain amount of chaff and grain in pots too, and I am not sure whether this must mean manufacture very quickly after harvest, maybe harvest debris was just washing around sites?' (Haselgrove, C., 2012: *pers comm*). However, against this must weighed the fact that loose grain does not long survive unscavenged, and that in the Late Iron Age pottery of the Braughing/Puckeridge area, grain and chaff are not common inclusions (Thompson, I, 2012, *pers comm*).

Furthermore, one must ask how many occurrences are required to turn 'random' into 'significant'? Of 11 groups of coin mould examined to date, seven have had fragments with grain casts. If it is accepted that grain casts are a reasonable indicator if the season in which most British coin pellet mould was made, then it would seem equally reasonable to suggest that there would be reasons why minting might be linked to the agricultural cycle. Haselgrove has suggested (2012, *pers comm*) that this might signify no more than a lull in the round of manual toil, but the fact is that in a mixed farming economy the real lull would have occurred in late autumn/early winter, when the lack of winter fodder entailed a major slaughter of excess beasts. Instead, the period immediately following harvest is a period of surplus (assuming a good crop), the moment when an agricultural society is at its richest. There are two possible grain casts in the sample. One of them is on a fragment with square-mouthed holes, and the other is the apex of a Verulamium form tray with round holes averaging 7.3mm in base diameter. This is a relatively high percentage for a larger assemblage (see Table 20, below), but the figure may well change when the full assemblage is examined.

Site	Grain cast count	Grain cast percent
Bagendon 1981	1	11.11
Ford Bridge 2007	11	1.80
Ford Bridge 2016 10%	**2**	**3.70**
Old Sleaford	1	2.86
Puckeridge	3	0.18
Scotch Corner	6	0.83

Table 20: Incidence of grain casts in six assemblages

5.1.9 Grass marks

Grass marks – the irregular marks, usually on the base of a fragment, of the substrate on which the finished tray was placed to dry – are among the most widespread class of markings seen on coin mould. This would be exactly what one might expect, given the necessity of the drying process and the ubiquity and cheapness of grass, but (particularly in the Puckeridge assemblage) marks suggestive of the use of cloth or matting have been observed.

The Ford Bridge 10% sample is no different in this, but it does have the highest percentage of examples of any of the major pellet mould assemblages examined so far (Table 21). This may be a sign of the good standard of preservation of the Ford Bridge 2016 material, an unusually high proportion of examples throughout the assemblage, or simply a function of the smallness of the sample.

Site	Percent
Blackfriars, Leicester	3.33
Ford Bridge 2007	7.70
Ford Bridge 2016 10%	**17.90**

Old Sleaford sample	2.86
Puckeridge	10.97
Scotch Corner	7.46
Turners Hall Farm	2.29

Table 21: Grass marks in seven assemblages

5.1.10 Tray form

It is of great importance to understand as fully as possible the tray forms present, because this is the only way to approach accuracy when estimating the total output represented by a particular assemblage. The estimate is achieved by means of the '*augmented minimum trays'* formula. Although this formula has been used many times, it has not been formally laid out before, and this assessment is as good a place as any for its first proper outing. It should also be borne in mind that the *augmented minimum* technique cannot be applied to circular or subcircular tray forms and can only generate a meaningful result if applied to an entire retrieved assemblage.

To start with the straightforward Minimum Trays formula:
Let '$n_1 + n_2 + \ldots n_n$' represent the total number of holes in the retrieved assemblage, where 'n' is the number of holes of a given (defined) type.
Let 'h_1'; 'h_2'... 'h_n' represent the number of holes in the tray form associated with each hole type.
Let t_x = the minimum number of trays of a given hole type in a retrieved assemblage.
Therefore:
$t_x = (n_x \div h_x)$ rounded up to the nearest integer
And the total minimum number of trays in a retrieved assemblage will be:
$t_1 + t_2 + \ldots t_n$

If the tray forms in an assemblage are not known, then Min Trays assuming a range of values for h_x is the best that can be achieved. However, if the trays forms are known, it is possible to go a stage further (it should be mentioned at this point that in every assemblage examined to date there has been a significant shortfall in corners):
Let T_x = a given tray type
Let 'CT_x' = the number of corners on a given tray type.
Therefore the total number of corners required for that tray type (T_x) in a retrieved assemblage (CT_xR) will be:
$t_x \times CT_x = CT_xR$
Let 'CT_xA' = the actual number of corners of a given tray type $_{(tx)}$ in a retrieved assemblage.
Let 'CT_xS' = the shortfall in corners for a given tray type (T_x) in a retrieved assemblage
$CT_xS = CT_xR - CT_xA$
If:
$CT_xS = 0$

There are two possibilities.

1. *The retrieved fragments of T_x represent a complete or near-complete dataset*
2. *The figure posited for CT_x.is too low.*

Let 'CT_xH' = the mean number of holes per retrieved corner fragment of a given tray type.
The estimated number of holes on the missing corners (CT_xS) for a given tray type (T_x) will be:
$CT_xS \times CT_xH$
Therefore the estimated augmented minimum total number of holes of a given tray type in the predepositional assemblage will be:
$(n_x + (CT_xS \times CT_xH))$
Therefore the estimated augmented minimum total number of holes in the predepositional assemblage will be:
$(n_1 + (CT_1S \times CT_1H)) + (n_2 + (CT_2S \times CT_2H)) + \ldots (n_n + (CT_nS \times CT_nH))$

And the Augmented Minimum Trays figure for a given tray type (T_x) will be:
$t_x = ((n_x + (CT_xS \times CT_xH)) \div h_x)$*, rounded up to the nearest integer*
And the augmented minimum trays figure will be:
$t_1 + t_2 + \ldots t_n$

Following the demonstration that the Scotch Corner material contained two groups of coin mould, distinguishable in terms of tray manufacturing technique, tray form, tray capacity, metallurgy and depositional treatment (Landon, M; Morley-Stone, J; Ponting, M in Fell, 2020) it has become apparent that as accurate a picture as possible of the makeup of a CPM assemblage is a vital tool in the understanding of the complex social factors surrounding a particular minting episode. What, then, can be said of tray form and tray capacity in the Ford Bridge 2016 10% sample? There are 44 fragments in the sample with small, round holes; 27 fragments with large, round holes; 20 fragments with square-mouthed holes. There are six fragments with distinctive signs of deriving from 'Verulamium form' 50-hole trays. Five of these are fragments with small, round holes, and one has holes of indeterminate size, which equates to 11.36% of the total number in the sample of fragments with small, round holes. On this basis, were the fragments with large, round holes and the fragments with square-mouthed holes in the sample also to derive from 'Verulamium form' trays, we might expect around three fragments with large round holes and around two fragments with square-mouthed holes to show the diagnostic signs of the 'Verulamium form'. Instead, we see none in either case. Inevitably the question must be whether the predepositional assemblage contained more than one tray form.

While this cannot be regarded at this stage as more than a reasonable hypothesis, it is nonetheless worth remembering that, in the Ford Bridge 2007 and Puckeridge assemblages, the fragments with the largest holes (15mm – 20mm base diameter) were shown to derive from a quadrilateral 25-hole tray known as the 'Puckeridge form'. Although the base diameter range of larger holes in the Ford Bridge 2016 10% sample is not the same (10.3mm – 16.9mm), it would not be at all surprising were at least fragments bearing holes of 15mm or greater were to derive from 'Puckeridge form' trays.

5.1.11 Conclusions

The conclusions to be drawn from the study of the gross morphology of the 10% sample fall into two categories:

1 Firm conclusions that can applied with confidence to the whole assemblage
2 Provisional conclusions that can so far be applied with certainty only to the 10% sample, and for which the entire assemblage must be examined in order to provide a definitive answer

5.1.11.1 Firm conclusions

There is already strong evidence that there is more than one fabric present in the assemblage. We can therefore be certain that the process or processes that led to the creation and deposition of this assemblage were neither simple nor straightforward.

It is also certain that an entirely new manufacturing technique has been used to make some of the trays in the assemblage, and that for the first time in this country we now have strong evidence that some trays had holes that were made all at once. The closest parallels for this derive from Bavay in France (Scheers et al, 2000) and Rheinau in Switzerland (Bucher, 2011).

There are at least three groups of holes represented in the sample:

a. A group with round mouths and a base diameter range from 4mm to 10mm b A group with square mouths and a base diameter range from 6mm to 9mm

c A group of holes with round mouths and a diameter range from 11mm to 17mm

This picture may be modified somewhat when the full assemblage is examined, but the group of square-mouthed holes is noticeably different in several ways from any other hole-group examined to date. Inter-fragment variation in base diameter is, at 3mm, the least seen so far. Inter-fragment variation in depth is 6mm, which is also lower than has been observed before; it is also the first time that a significant link has been detected between base diameter and depth in an assemblage containing more than one group of holes. Inter-fragment variation in hole top diameter is also restricted and is further evidence that the holes in this group were probably made using a process so far not identified elsewhere in Britain. It is no surprise, therefore, to discover that variation in volume in the square-mouthed hole group is also substantially less than volume variation in the small diameter round-mouthed hole group.

The presence of chalk wash in the assemblage is both undeniable and wholly expected.

The finding of grain casts firmly links the Ford Bridge 2016 material to the presumed seasonal aspect of minting in Braughing.

5.1.11.2 Provisional conclusions

On the basis of the examination of the 10% sample, it seems likely that the Ford Bridge 2016 should not be regarded as part of the same act of deposition as the Ford Bridge 2007 assemblage. If this is confirmed by examination of the full assemblage, this conclusion, on its own, is highly significant. Why was Braughing the site of numerous discrete large deposits of pellet mould? Deposits found so far at Verulamium are spread over a wider area, but are much smaller, while the Old Sleaford assemblage is apparently the result of a single minting episode which has been dispersed and redeposited by later activity.

The three major Braughing/Puckeridge assemblages all appear to have been redeposited during the early to mid-Roman period, but as discrete and distinguishable bodies of material. This argues a certain amount of intentionality to the deposition process – why else would there be so little mingling of the assemblages?

The presence in the sample of three incompatible edge profile types suggests that at least three different ‘hands’ were responsible for making the trays from which the assemblage derives. While it would not be surprising to discover more ‘hands’ in the full assemblage, it would greatly enhance our understanding of the socio-economic context within which minting occurred to be able to be able to answer this question with greater precision.

It has been shown that the range of intra-fragment average base diameter in the sample is greater than in any assemblage examined to date, with the exception only of the Puckeridge material. This range may well increase with the examination of the full assemblage. The hole depth range in the sample is significantly narrower than in either the Ford Bridge or Puckeridge assemblages, and it would be useful to know if this conclusion is good for the full assemblage.

Hole size and hole type groups have been distinguished in the sample, but these may be subject to considerable modification in terms of parameters as well as proportions when applied to the full assemblage.

In terms of ‘signs of heating’ in the 10% sample, the most obvious conclusions would seem to be:

1. That signs of extreme heating are rarely confined to the upper surface alone of a fragment.
2. That the relative rarity of vitrification suggests that the factors involved in its creation are more complex than simply great heat and the presence of wood ash (as suggested by Tournaire and Henderson in Tournaire *et al* (1987).

However, once again a full dataset could well necessitate modification of these statistically-derived conclusions.

5.2 Iron Age Pellet Moulds - Preliminary Study Report on the materials

By Jake Morley-Stone

This report comprises the results of a preliminary study into the Iron Age pellet mould material discovered during excavations at Braughing in 2016. The purpose of this study is to outline the nature of the assemblage and provide the necessary data to inform a larger study of the material at a later date. This report runs in tandem with the preliminary reports produced by Mark Landon (2019a and 2019b), following the same hypotheses and research questions outlined in sections 1.0 and 2.0 of Landon (2019b). A portion of the total assemblage was sent for sampling, from which two fragments were selected and sampled for scanning electron microscopy (SEM), while a further two were thin sectioned for petrographic study (Table 22).

Small Find Number			Context	Analysis technique
2532			12	Petrography
3095			09	SEM
3215			09	SEM
3675			12	Petrography

Table 22 List of fragments selected for analysis

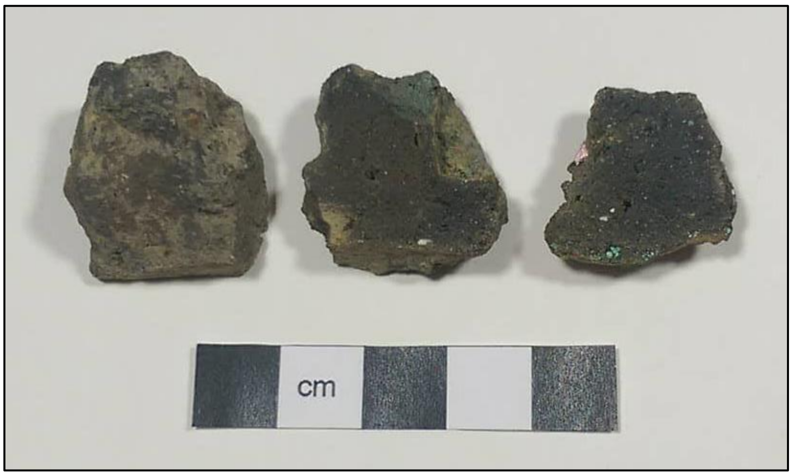
5.2.1 SEM analysis

Under the SEM, samples from fragments **3095** and **3215** reveal data regarding both the metallurgy of residues (or prills), as well as further information regarding the ceramic matrices. Metallic residues absorbed into the ceramic matrix observed under the SEM and subject to energy dispersive spectroscopy (EDS) to identify their chemical compositions. In most cases the prills are extremely small (up to several microns wide). Analysis of precious metal alloys has been done in triplicate, with the data below representing a normalised average of the recorded readings.

Fragment 3095

During the sampling of **3095**, metallic residues visible to the naked-eye were observed on a sectioned surface not intended to be studied (Figure 22). This additional surface showed extensive green copper-oxide deposits, suggesting a copper-based alloy may have been used. This additional section was also mounted and studied, alongside the initially intended section.

Figure 22 Layers of fragment 3095 following sectioning. The central fragment shows the mould hole in section with green metallic residues on the top surface. A large metal globule is visible in the lining of the fragment on the right (left of centre).



The ceramic matrix was heavily vitrified throughout with a high degree of vesiculation (porosities). Prills of silver-copper, gold-copper and copper-tin alloys in varying compositions were observed throughout the edges of the mould hole linings and upper surface, alongside several tinned-copper phases within the vitrified ceramic (Figure 23, Table 23). The metal globule observed during the sample sectioning is significantly larger than the other residues commonly observed within the moulds. In order to properly asses the composition, six points across its surface were analysed via EDS and the average calculated (**BRR16 3095 005**).

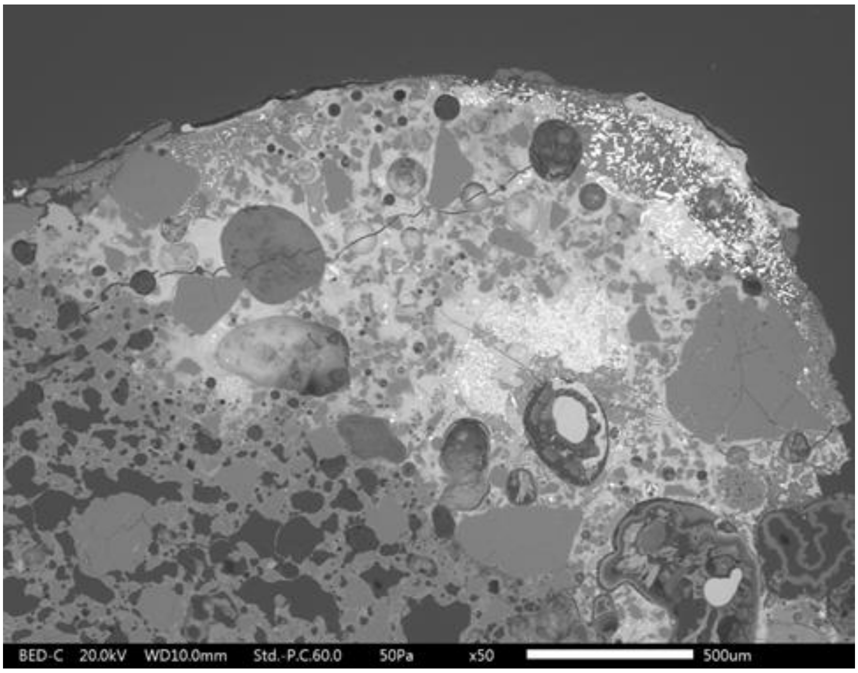


Figure 23 Copper (light grey) and tin (white) residues merged with the vitrified ceramic.

Sample	Copper %	Silver %	Tin %	Lead %	Gold %
BRR16 3095 001	38.94	19.17	11.54	30.35	
Std. dev.	1.74	2.44	0.54	1.20	

BRR16 3095 002	93.76				
Std. dev.	0.64				
BRR16 3095 003	61.95	38.05			
Std. dev.	0.66	0.66			
BRR16 3095 004	3.12		96.88		
BRR16 3095 005	96.63		3.38		
Std. dev.	1.70		1.70		
BRR16 3095 006	13.50				86.50
Std. dev	1.17				1.17

Table 23 SEM analysis of metallic residues in fragment 3095

Fragment 3215

Fragment 3215 shows partial vitrification, though not as extensively as fragment 3095. The sample exhibited minimal traces of metallurgical residues. Of the prills observed, none contained a mix of precious metal alloys (silver, copper, gold). Prills of tinned-copper and silver sulphate were observed separately (Table 24), similar to observations made of the Ford Bridge pellet moulds (Longden 2007). Inclusions of iron sulphate were also observed within some of the voids (Figure 25). These have been suggested to have filtered into the sample following their deposition (Landon *pers. comm.*). A microfossil was observed along the hole lining, suggestive of a calcareous wash (Figure 24).

Sample	Sulphur %	Copper %	Silver %	Tin %
BRR 3215 001	9.04		90.96	
BRR 3215 002		69.47		3.53

Table 24 SEM analysis of metallic residues in fragment 3215

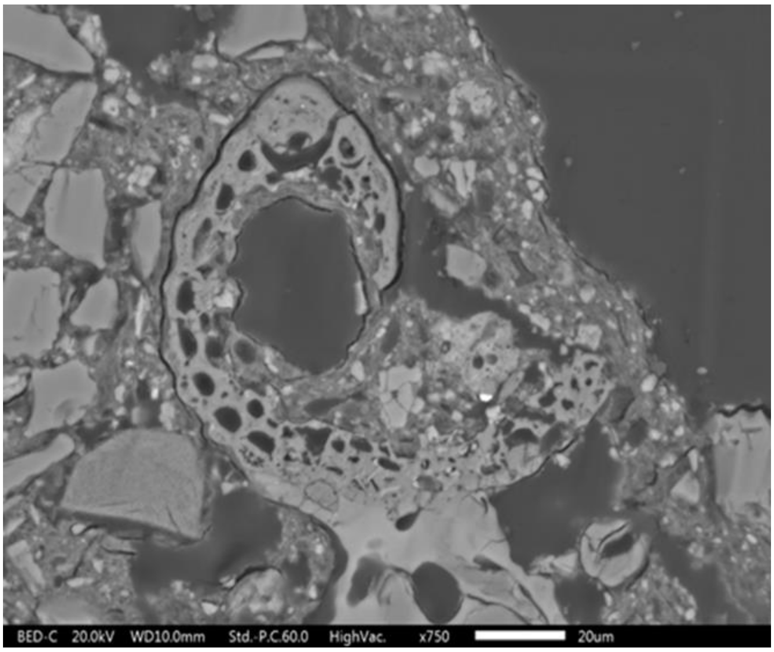


Figure 24 A large microfossil embedded just below the edge of the mould hole, suggesting a wash was applied to the surface prior to pellet production

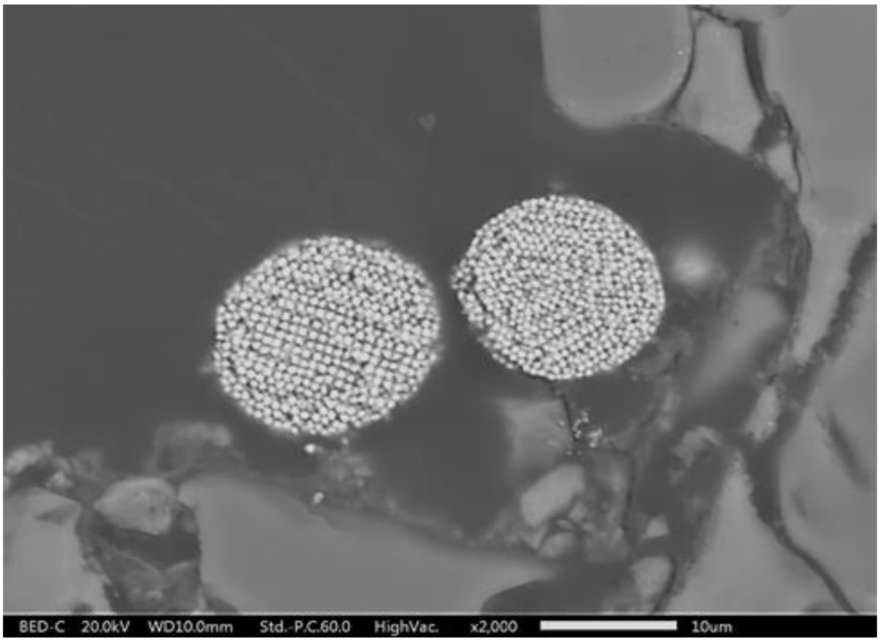


Figure 25 Iron-sulphur inclusions within voids in the ceramic matrix

5.2.2 Petrology

Petrographic study of fragments 2532 and 3675 was performed under a polarising microscope in order to provide a basic characterisation of the clay fabrics.

Fragment 2532

The fragment is comprised of a fine-grained calcareous clay matrix free of fossiliferous inclusions (if present, they may have since dissolved in the soil chemistry). Aplastic components include very fine grains of quartz, feldspar, hematite and the occasional clinopyroxene (Figure 26). Larger angular grains of quartz are present in sparse quantities in a range of <5%. Clasts of argillaceous calcareous clay are also present, with fine grained quartz inclusions (Figure 27). Landon's observations (Landon 2019a) note 'Fabric type c' as having possible chalk inclusions, though given the lack of defined angular edges and microfossils within the clasts, it is more likely the inclusions in this fragment are grog/argillaceous clays. Elongated voids within the sample do not follow a single alignment and may be indicative of an organic component added to the clay to prevent fracture and maintain a reducing atmosphere during firing (Figure 28). The characterisation of this ceramic fabric may be geographically associated with the local Melford Association of soils in which deposits of calcareous clays have been observed in the underlying geology (Cranfield University 2019). Little to no vitrification was observed in the sample, suggesting the fabric is refractory in nature.

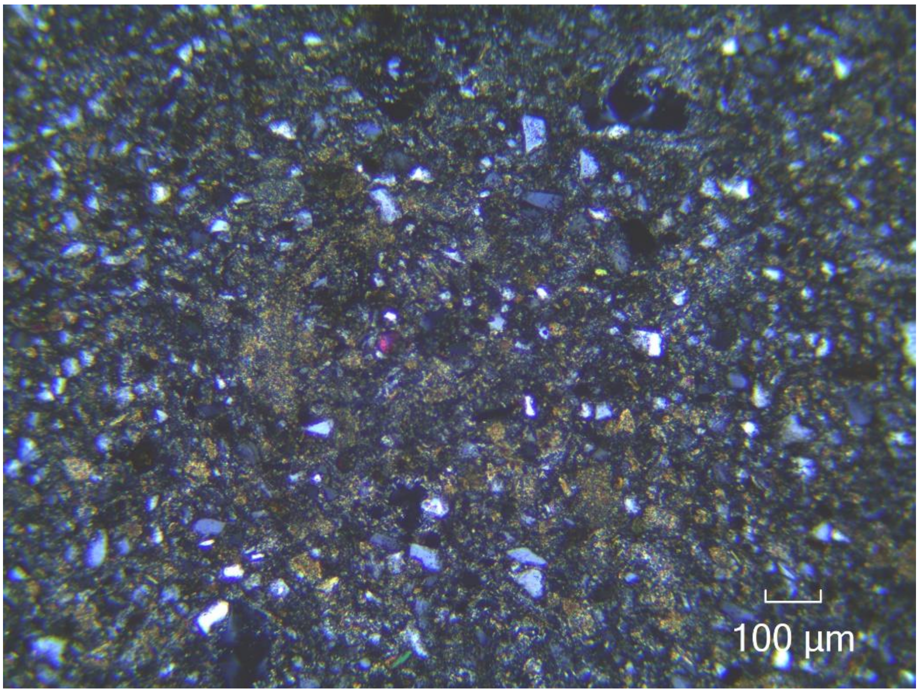


Figure 26 Fragment 2532 viewed in cross-polarised light.
The calcareous matrix is the underlying yellow/brown phases, with quartz and feldspars grains ranging from white to grey. Hematite grains appear dark and opaque (top right of centre) whilst the olivines and pyroxenes show birefringence up to second order (bright pink and yellow grains, centre).

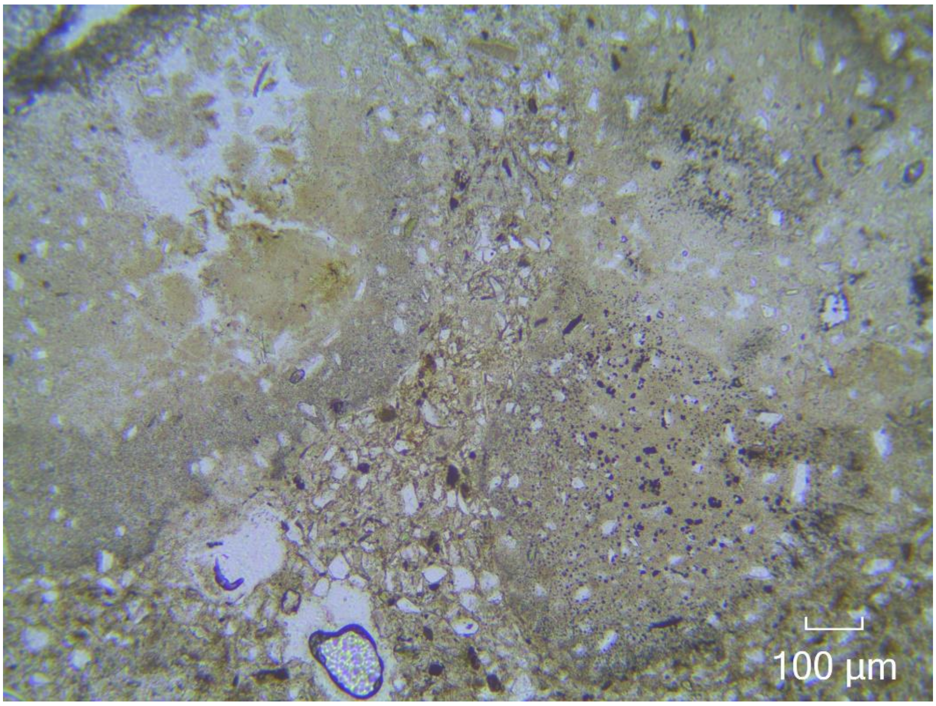


Figure 27 Calcareous clasts with very fine-grained quartz inclusions

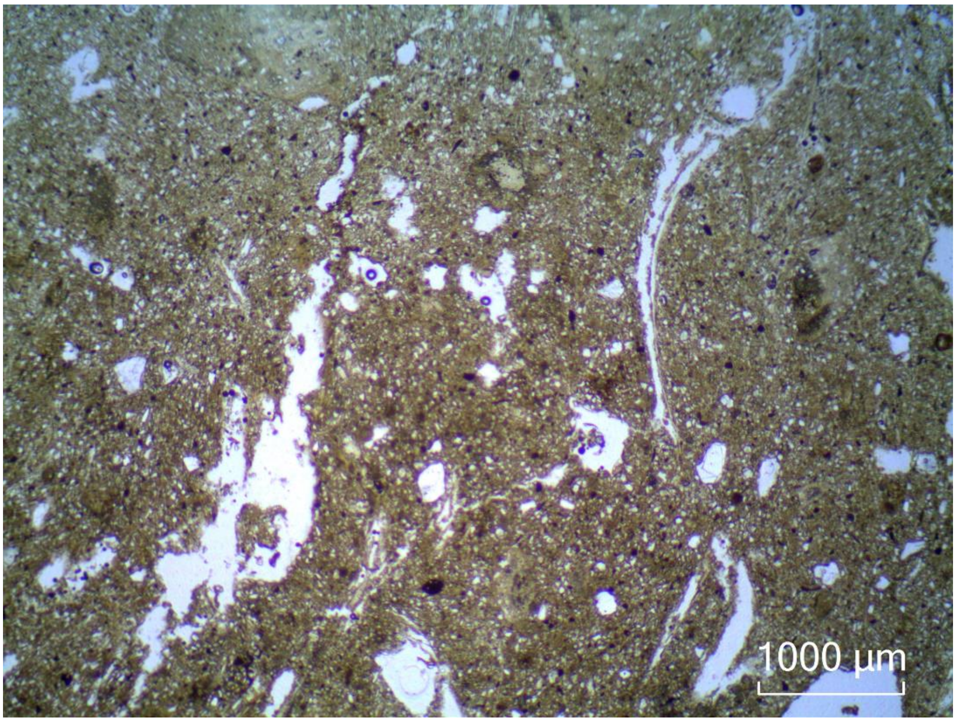


Figure 28 Irregular elongated voids may indicate the inclusion of organic based plant matter

Fragment 3675

Fragment 3675 directly contrasts the previous sample as the clay matrix is distinctly non-calcareous. The darker colour of the plastic matrix indicates the clay is iron-rich and fired within a reducing atmosphere, supported by the presence of red-brown phases of iron oxides fused with areas of vitrified matrix (Figure 29). The level of vitrification also indicates the pellet mould has been fired to a temperature in excess of c.950°C (Rice 1987, 103-104).

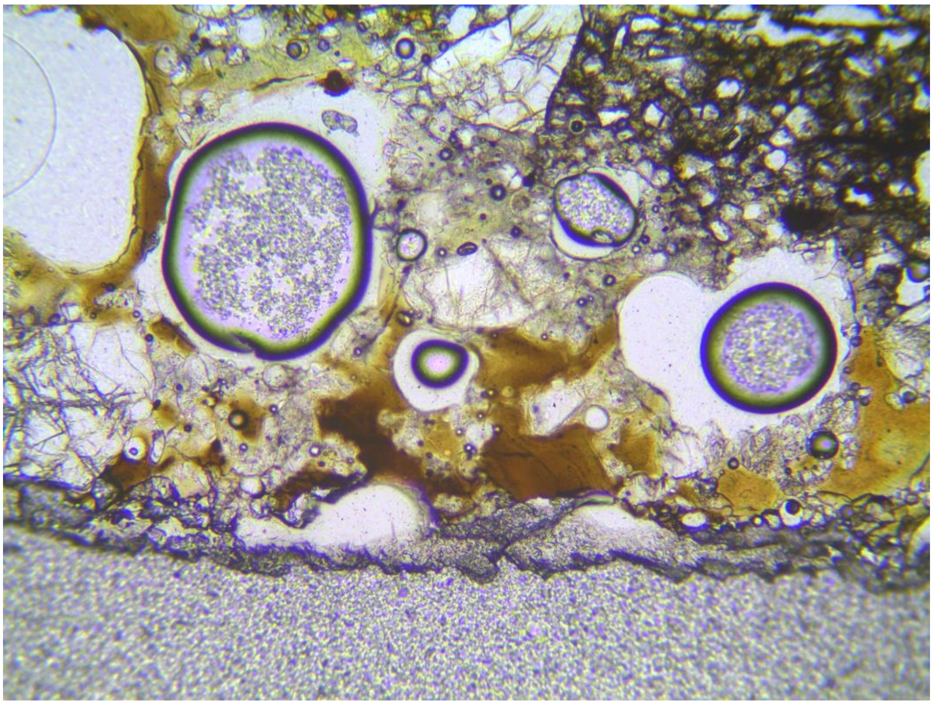


Figure 29 Phases of vitrified ceramic along the edges of fragment 3675

The sample shows a greater variety of aplastic components, with quartz and feldspar being the most common (Figure 30). The minerals appear in an increased quantity and range of grain sizes than the previous fabric, with the patterns of angularity and fracturing suggesting the quartz has been added as a temper (Smith 2008, 104). Instances of olivine and calcite were also observed. A large opaque mass with both voids and minerals trapped within was observed in the centre of the section (Figure 31). The phase did not allow light to pass through when switching to a cross-polarised view, indicating the material is too dense. It is suggested here that region is evidence of an extensive iron-rich vitrified phase, a phenomenon that has been previously observed in samples of pellet mould from Scotch Corner (Morley-Stone in Fell 2020). The fabric has been loosely identified as a common ‘brickearth’ clay (Landon *pers. comm.*), however study of further examples will be necessary in order fully characterise the fabric and determine if the source is local or further afield. Instances of calcareous deposit were found lining some of the internal voids and have likely been deposited through filtration of groundwater post-deposition (Quinn 2013, 204-212).

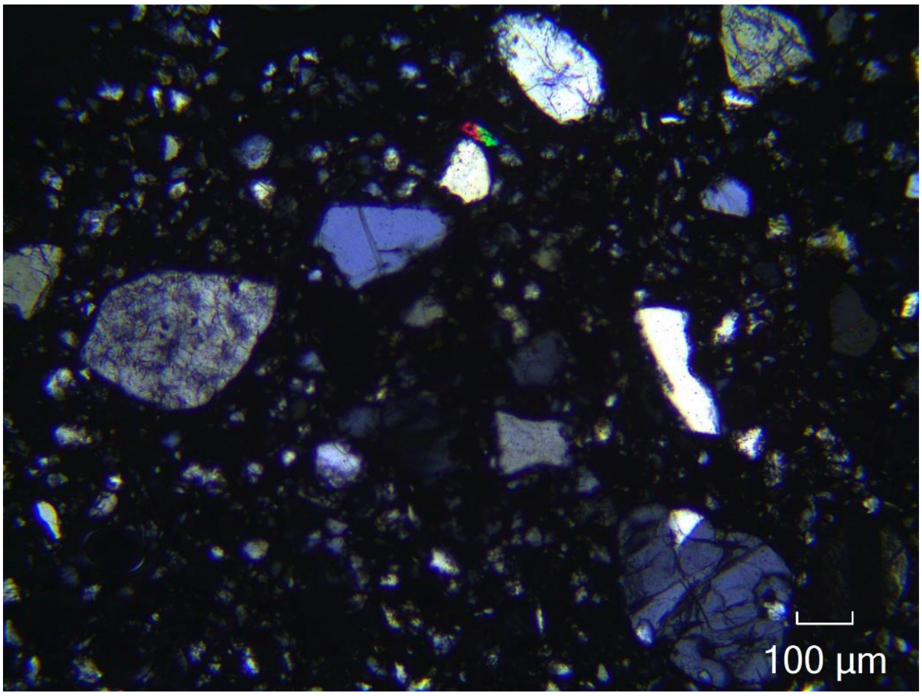


Figure 30 Fragment 3675 under cross-polarised light
(Large grains of degraded felspars and fractured quartz are visible (white to grey). A grain of olivine is also identifiable due to the second order pink and green birefringence colours)

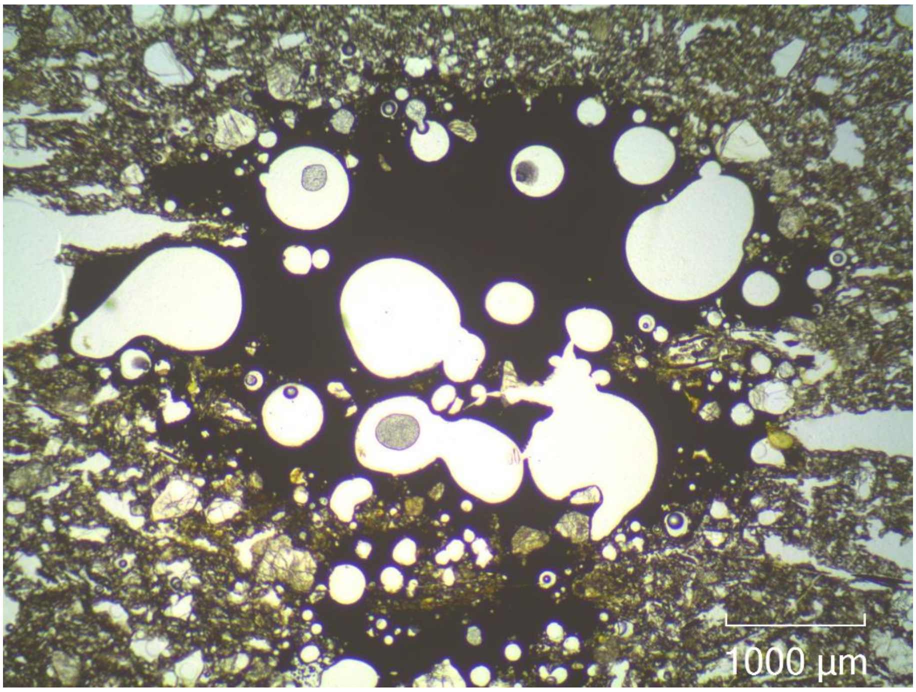


Figure 31 A dense opaque mass which remains unaltered under various light conditions, indicative of an iron-rich vitrified phase

5.2.3 Discussion

The metallurgical evidence is unequivocally indicative of precious metal alloys being used to produce pellets. Whilst the compositions observed may be attributed to contemporary coinage alloys, the current compositional data is limited and cannot infer function or intended use of the pellets. An additional level of complexity is added in the case of fragment 3095. The variety of metallic elements present may be evidence for the reuse of pellet mould trays for further series of pellet production, and in this case, pellets of differing composition. The extent of tinned-copper residue suggests a failed attempt at making a bronze pellet within the mould, though alternatively the fragment may be interpreted as having been used as furnace furniture following its initial use to produce pellets. The fragment may have supported an instance of bronze smelting in which splashes of bronze have adhered to the fragment's surfaces. These suggestions amount to no more than conjecture given the data is from a single fragment. In order to assess the metallurgy in more certain terms, an extensive compositional analysis of the assemblage is necessary.

The four fragments analysed have produced a variety of data regarding the moulds, with each fragment highlighting something distinct from the others. It is clear from the vitrification data that the moulds produced from non-calcareous fabrics suffered more severe transformations in the microstructure. The fact that the calcareous fabric shows no vitrification may indicate a technological choice being made by the mould creators. The petrographic analysis shows that there are at least two distinct clay fabrics present in the four moulds analysed and are separated over two contexts. The presence of a local calcareous fabric and another 'brickearth' fabric of undetermined origin has a clear impact on the nature of the deposited assemblage. If moulds are indeed being brought together from both local production and productions further afield, then the significance of the deposition event must also be considered alongside the rest of the pellet production process.

The size of this sample versus the BRR16 assemblage on a whole prevents generalised conclusions of the material, though they do make the questions outlined by Mark Landon (2019b) ever more relevant and intriguing. Primarily, these results show that the assemblage of pellet mould fragments is more complex than a single instance of pellet production and subsequent deposition of the used trays. The extent of this complexity cannot be assessed from the data here and must be analysed with a larger dataset.

5.3 Small Finds Assessment

by Laura Pooley

A box of numbered small finds was sent to the author for assessment. The small finds are prefixed with the site code BRR16 and then numbered from SF501 to SF537. The author was not sent SF502, SF534 or SF536.

Assessment has revealed at least 117 individual objects/part objects. All have been catalogued, weighed and measured as part of this assessment.

5.3.1 Prehistoric

One piece of flint, SF507, was included in the assemblage, from context 32. It was identified by CAT lithics specialist Adam Wightman as a piece of possible waste flint that may be knapping waste but is equally likely to be of natural origin.

5.3.2 Late Iron Age/Romano-British

All of the remaining finds are either of Late Iron Age or Romano-British date or are likely to date to these periods however, no context information was provided with the finds to aid identification, phasing or interpretation. Furthermore, the identification of some of the copper-alloy and iron objects might change if further work (i.e. conservation and x-rays) is carried out. The quantification of these Late Iron Age/Romano-British finds by object type is shown in Table 25.

Object Type	Number of objects
Pottery	14
Ceramic building material	7
Fired clay	12
Glass	3
Haematite	2
Animal bone	2
Shell	1
Copper-alloy objects	16
Lead objects	5
Iron nails	42
Iron objects	7
Metalworking debris	4
Burnt flint	1

Table 25 Quantification of Late Iron Age/Romano-British small finds by object type

5.3.2.1 Copper-alloy objects

Sixteen copper-alloy objects were recovered from contexts 04 (x4), 07 (x9) and U/S (x2) with one object stored within a bag labelled context 09 with its associated label stating 04. None have been conserved. Only two are complete objects, both coins. Coin SF514 is completely illegible but is probably a 4th century nummus although conservation work may allow for a more accurate identification. Coin SF529 is very worn and virtually illegible. The size and shape of the coin suggests an as but initial identification indicates that it might actually be a sestertius of Claudius with SPES AUGUSTA reverse. Again conservation work may allow for a more accurate identification. Incomplete objects include: a fragment from the head of a 1st century Langton Down type brooch (SF527); a fragment of terret ring (SF530); a fragment of disc-shaped mirror (SF501); and other unidentified small fragments (SF503 (x9 pieces possibly part of the same object), SF532 & SF537).

5.3.2.2 Lead objects

Two fragments of lead (SF517a & d) and three pieces of lead sheet (SF517b-c & SF528) were recovered from contexts 04 and 05.

5.3.2.3 Iron objects

Forty-two incomplete iron nails were recovered from contexts 04 (SF506 x31, SF531 x3 & SF533 x1), 05 (SF509 x1), 09 (SF510 x5) and 17 (SF535 x1). Where possible to determine, the nails appeared to have a square-sectioned shank and flat round head, indicating a Manning Type 1b nail (1985). A couple of hobnails may also be present. Five indeterminate fragments of iron were also recovered from contexts 04 (SF506 x5) and 05 (SF509 sx1) along with an iron object from context 04 (SF525) which has been very tentatively identified as a key. X-rays should be taken to aid descriptions/identifications of all of these items.

5.3.2.4 Metalworking debris

Eighteen objects are associated with/or likely to be associated with metalworking, recovered from contexts 04, 07, 09, 12 and 32. Of particular interest is a large clay block (SF521) (associated with SF522-SF523). Eleven smaller fragments of fired clay may be from a mould(s) or could be structural (i.e. furnace debris etc), five of which have original surfaces (SF505 & SF524b-c). In addition are four fragments of metalworking debris/slag (SF506 & SF526) and two pieces of heamatite (SF515 & SF520).

5.3.2.5 Glass
Three fragments of Romano-British glass were recovered from context 04. Two were vessel fragments including a corner piece from a square or rectangular bottle (SF512) and one a piece of glass waste (SF513).

5.3.2.6 Shell
One fragment of oyster shell was recovered from context 09 (SF511).

5.3.3 Discussion
The Small Finds assemblage is of variable significance. The presence of the metallurgical debris is further demonstration of the role that metalworking played in the settlement and may be directly associated with the deposit of the coin-moulds themselves. The remainder of the Late Iron Age and Roman objects are of a domestic nature most likely deposited as a result of casual loss or rubbish disposal and are of local significance in that they give further information as to the date and nature of the associated settlement.

5.4 Late Iron Age pottery
By Isobel Thompson

The site is remarkable for the quantity of coin pellet moulds (37.5kg), which exceeds the amount of late Iron Age to early Roman pottery (33.9kg) found with them. However, 34kg of pottery is still a fair-sized amount from a comparatively small excavated area. Two thirds of this assemblage is grog-tempered.

This group is more varied in type and in better condition than the adjacent riverbank assemblage BRR07 (which consisted of tiny scraps). It includes a fair number of large sherds with minimal wear, from a good many vessels. But this ‘better condition’ is only comparative; the 2016 assemblage is much broken up, with very few joins.

Following preliminary inspection in October 2016, the late Iron Age (grog-tempered) component of the assemblage was examined more fully in May 2019. It amounts to 1125 sherds in GROG, weighing 21,296g, and including a few sherds which technically qualify as BSW (‘Black-Surfaced Ware’) but are still evidently at the grog end of the spectrum, rather than sandy.

Context	***GROG sherds***	***GROG weight (g)***	***Remarks***	***Other fabrics***
01	31	329g	Includes BSW	
04*	400	6654g	Includes 1 BSW sherd	6 shelly (56g)
05	11	154g		
07	5	107g	Includes 1 BSW sherd	TN plate copy
09*	206	2783g		?limestone sherds, 5
12*	245	6339g		GSW plate; ?limestone sherds, 6; chalk/shell, 2 chips
13*	37	665g		?limestone, 1 (30g)
15	40	494g		1 shelly
17*	37	1116g	Includes 2 BSW sherds	
19*	28	430g		
20	17	374g		
22*	6	88g	1 = grog & shell (14g)	
30	6	77g		
32*	56	1686g	Includes 2 hard late sherds	TN, samian, Roman fineware; ?limestone, 1
Total	**1125**	**21,296g**		

Table 26 Quantification of late Iron Age pottery. Contexts marked with * included coin pellet mould (Landon 2019)

5.4.1 Contexts (see also Table 26 Forms follow Thompson 1982):

(1)
Machining, and dumped deposits on the riverbank derived from dredging. No CPM. The range of grog-tempered forms included the usual rilled jars and combed storage jars, several cordoned sherds in the standard dark grey and one sherd in BSW (Black-Surfaced Ware) which contains some grog but is almost Roman grey sandy ware.

(04)
This layer was above (09) and contained a good deal of Roman pottery including samian, colour coat, a 'London Ware' sherd and grey sandy wares. It also had nearly twice the amount of grog as any of the other contexts in the assemblage. A small number of sherds appear to be comparatively late, hard-fired and comparable to BSW. Much of this grog-tempered material is from storage jars (hence the weight), with some rilled jars (some in late versions and in large pieces) and only a few other forms. These include a rim sherd from a round bowl with distinctive flange attached to the shoulder. This is a distinctive Braughing form which might be classified as a variation of G2-3, rounded wide shallow bowls with (horizontal) flanged rim. The Braughing variation has parallels at Skeleton Green on the northern edges of Puckeridge (Partridge 1981 fig.46, nos.44, 45: 'hardly known elsewhere'); one in grog temper and one in Roman grey ware). The fabric of the BRR16 example is essentially halfway between the two from Skeleton Green as it is 'BSW', i.e. still grog-tempered but hard-fired with quartz, and unburnished dark grey surfaces. Other forms present are an L6 lid (possibly two), a fragment of an A1 pedestal base, and sherds from plain jar bases, a possible butt beaker, single-

cordoned everted-rim jars, and a carinated vessel. Also present were six plain and worn sherds in a shell-tempered fabric.

(05)
A small group, only 11 sherds of grog with some Roman fragments including samian. The grog forms include an A1 pedestal base, an L6 lid, two coarse combed storage jar sherds and part of a rilled jar in a hard transitional fabric.

(07)
Another very small group, of five grog-tempered sherds including one in BSW with a shallow cordon. The others were a single body sherd, and three from a very large combed storage jar with some flint lumps in the body. All these, as well as the accompanying Roman sherds and a grey ware copy of a terra nigra plate, were abraded.

(09)
The uppermost CPM layer. This is one of the larger groups of grog-tempered pottery, but is especially broken up, and a few sherds are burnt. A small amount of Roman grey ware was present, as well as some samian and early Roman fine wares. The grog-tempered assemblage includes the usual storage jar and rilled jar rims, one or two everted jar rims, and a rim sherd from a large and well-made E1-1 carinated cup, as well as flat jar bases and a few sherds with cordons. One of the storage jar rims is tempered with a mix of grog and hard pale gritty pieces which may be limestone; there are similar sherds in (12) and (13).

(12)
The coin mould 'pavement'. In this were sherds from two or three types of amphora, and scraps of samian and hard Roman sandy wares, as well as a good deal of hard grog-tempered ware. This is the second largest group, but is much broken up and many vessels are represented by a single sherd. The rims include six large storage jars, two rilled jars, 12 everted jars, a G1-2 plate, a G1-4 plate in BSW, and a large L8 lid. Base sherds represent the usual storage jars, a probable carinated bowl, a possible plate, and a pedestal base. There are also a carinated sherd from the lower half of a very fine E1-2 carinated bowl (similar to examples from Prae Wood and Hertford), and one or two sherds from cordoned/burnished vessels. Six body sherds from a combed storage jar are in a fabric similar to that in (09), with grog and possible limestone grits.
Two joining pieces of a large plate of G1-1 form appear to copy terra nigra, in a hard micaceous pale grey sandy fabric.

(13)
This layer was beneath the main mass of coin moulds. It is not a large group, as the context carried on below the water table and was not fully excavated. The sherds are mostly large, and Roman fabrics are absent. But the grog-tempered ware is hard and not noticeably early. The few rims amount to a storage jar, a small rilled jar, and an everted-rim jar; there are also two flat jar bases, one with shallow tooled decoration. Body sherds are from combed storage and rilled jars, including one storage jar sherd with the possible limestone grits, as in (09) and (12). Two joining sherds with a cordon separating faint diagonal tooled lines above from two rows of circular impressions below are reminiscent of decoration on some 1st century BC hand-made jars (as Partridge 1981, fig.42), but the fabric is hard and brittle.

(15)
Another mixed group, of small (some very small) fragments. The rims include two sherds providing much of the profile of a D1-1 everted-rim bowl (although the two are not certainly from the same vessel), and two small everted-rim jar sherds. The bases amount to two storage jars, and the body sherds include the usual storage jars, rilled jars and cordoned scraps. Also present were one shell-tempered sherd, two samian scraps, and four small scraps of a Roman red micaceous fabric.

(17)
A small group, not quite as large as (15) although the sherds in this layer are noticeably larger and heavier, and in a range of forms. These include a rim from a large heavy B3-1 cordoned jar, with tooled cordons and traces of diagonal tooled decoration; and an L1 lid in a sandy micaceous grog-tempered fabric which amounts to BSW. Also present are the usual storage jar and rilled jar sherds, a flat jar base in BSW, and sherds from the rippled neck of a B2 jar (much worn). A rouletted sherd from a butt beaker is in a non-local fabric.

(19)
Only one rim in this small group, a flaring jar rim sherd; as well as a well-made flat jar base, combed and rilled sherds, and plain scraps, including one samian sherd.

(20)
There was no coin mould in this group, and not a great deal of pottery. But the forms are more varied than in most of these contexts. There are the usual combed and rilled sherds (and a Roman jar sherd), but also a B1-1 cordoned jar rim, the rim of a B5-3 or B5-5 barrel jar, and a corrugated sherd of uncertain form. This is thin and fairly crudely shaped from the inside by the potter's fingers, and is possibly from a B2 ripple-necked jar although the angle is doubtful. It might be a copy of some sort of imported Gallo-Belgic beaker; or from a much more unusual form, D3-5, a corrugated conical jar which is known chiefly from burials in Kent. I have seen a similar corrugated sherd from Braughing, but the whole form remains uncertain.

(22)
Only six sherds, notably a lid in a hard shelly fabric with some grog and red-brown surfaces. The only other form represented is the usual rilled jar.

(30)
Again only six sherds in grog (as well as a few Roman), including a small cordoned B3-1 jar rim, an everted rim, and a combed sherd from near the base of either a storage jar or a rilled jar.

(32)
This context was beneath the bank separating the trench from the river, and the last part of the site to be excavated; the assemblage probably relates to (12). Many of the 56 grog-tempered sherds are from large combed storage jars. One or two sherds from cordoned jars are also present, notably a large piece from what may have been a tall cordoned barrel jar of form B5-3. Also in this context were several pieces from Roman fineware jars including a lug handle, part of a terra nigra plate (as Cam 1), and a scrap from a samian plate rim.

Form	***Description***	***Date range in grog***	***Minimum nos***
A1	Pedestal base, ordinary	Mid 1st cent BC to mid 1st cent AD	3
B1 group	Plain everted-rim jar, usually with a single cordon at the offset neck	Mid 1st cent BC to later 1st cent AD	many
B1-1	B1 group, rim only	As above	1
B2 group	Ripple-necked everted-rim jar	Mid 1st cent BC to mid 1st cent AD	1
B3 group	Everted-rim jar with multiple cordons	Later 1st cent BC to c.AD 70	many
B3-1	Wide-mouthed jar with multiple shoulder cordons	As above	2

B5-3/5	Barrel jar with bead rim and cordons	Later 1st cent BC to mid 1st cent AD	2
C6-1	Storage jar, usually combed	Later 1st cent BC to early 2nd cent	33
C7-1	Jar with horizontal rilling	Later 1st cent BC to later 1st cent AD	21
D1-1	Wide bowl with offset neck and often one cordon	As B1 group	1
D3-5	Corrugated conical bowl	Later 1st cent BC	?1
E1-1	Simple carinated cup with one cordon constricting waist	Later 1st cent BC to mid 1st cent AD	1
E1-2	Wide-mouthed carinated bowl with multiple cordons	Later 1st cent BC to mid 1st cent AD	1
G1-2	Wide straight-sided plate with bulging wall	Early to mid-1st cent AD	1
G1-4	Plate with overhanging rim and one inner moulding	Late 1st cent BC to mid 1st cent AD	1
G odd	Bowl with attached flange at rim	Mid 1st cent AD	1
G5 group	Butt beaker	Early to mid-1st cent AD	?1
L1	High bell-shaped lid, out-turned rim	Later 1st cent BC to mid 1st cent AD	1
L6	Plain conical lid	1st cent AD	3
L8	Conical lid, out-turned rim	Mid 1st cent AD	1

Table 27 Grog-tempered forms (Thompson 1982)
NB it is difficult to estimate the relative numbers of the B1 and B3 groups, and the storage and rilled jars, as they are usually too broken up for any sort of accurate figure. But all are present in considerable quantity. This is in evident contrast to all the other forms.

5.4.2 Conclusions

The 'late Iron Age' part of the pottery assemblage is not exciting, although something can be said about it. In character it is entirely normal for Braughing, with some specifically local traits and forms (such as plenty of lids, and the flanged bowl). The range of forms is narrow, and is dominated by the very common storage and rilled jars which are ubiquitous in Hertfordshire at this period, as well as a smaller range of everted-rim jars with one or more cordons. But it also includes fragments of specialist vessels made by expert potters, in forms found at major places and significant contexts. In addition there are absences; there are no bead-rim or lid-seated jars (both of which are unusual in grog at Braughing), and only one possible butt beaker fragment.

The date range is broad, and includes a few insular forms which in general should belong to the first half of the 1st century AD (and can be earlier), but the presence of BSW and a general hardness of fabric suggest that much of the assemblage could date to the second half of the 1st century. Most of it is apparently pre-Flavian, although the ubiquitous storage jars could include some of a later date. This does not, of course, date the deposition of this material. Its condition suggests an interval between manufacture and use, and its subsequent association with the CPM.

5.5 The Roman Pottery

By Andrew Peachey

Context (12) contained a total of 18 sherds (394g) of Roman pottery in a moderately fragmented and slightly abraded condition. This small group includes a mix of south and central Gaulish samian ware, coarse wares and amphorae that are to be expected in this region (Table 28); and although the group is limited to body sherds, it likely represents deposition spanning the late 1st to early/mid 2nd centuries AD.

The pottery was quantified by sherd count, weight (g) and R.EVE with fabrics examined at x20 magnification; in accordance with the *Standard for Pottery Studies in Archaeology* (Barclay *et al* 2016), which complement the guidelines of the Study Group for Roman Pottery (Darling 1994). Fabrics are described in the text below and/or cross-referenced, where possible to the National Roman Fabric Reference Collection (Tomber & Dore 1998) or appropriate regional kiln groups. Samian ware forms reference Webster (1996).

<u>Fabric Codes and Descriptions</u>

LGF SALa Graufesenque samian ware (Tomber & Dore 1998, 28)
LEZ SA2 Lezoux samian ware 2 (Tomber & Dore 1998, 32)
VER WH Verulamium region white ware (Tomber & Dore 1998, 154-5; Seeley and Drummond-Murray 2005, 84)
GRS1 Sandy grey ware 1. Mid grey. Inclusions comprise common fine quartz (0.1-0.25mm) and common fine silver mica (<0.1mm), especially visible on the surfaces. A hard fabric with a powdery finish, but not a product of the Wattisfield industry; perhaps from a source around Colchester (Symonds & Wade 1999: 418).
GRS2 Sandy grey ware 2. Mid grey. Inclusions comprise common medium quartz (<0.5mm), sparse fine mica and sparse dark grey grog (0.25-1.5mm). Potentially a locally-produced Romanised variant of Belgic grog-tempered wares.
HOR RE Horningsea reduced ware (Tomber and Dore 1998, 116; Evans *et al* 2017, 52).
BAT AM2 Baetican (Late) amphorae 2 (Tomber & Dore 1998, 85).

Fabric	Sherd Count	Weight (g)	R.EVE
LGF SA	1	8	-
LEZ SA2	1	1	-
VER WH	3	84	-
GRS1	2	12	-
GRS2	2	6	-
HOR RE	5	135	-
BAT AM2	4	148	-
Total	*18*	*394*	-

Table 28 Quantification of Roman Pottery

5.5.1 Discussion

The samian ware in the small group from Context (12) includes fabrics imported from south Gaul (LGF SA) and central Gaul (LEZ SA2). The LGF SA appears to be from the base of a Dr.18 platter, common in the latter half of the 1st century AD; while the LEZ SA is limited to an indeterminate flake. If the former was a fairly long-lived survival, these vessels may have been contemporary in the Hadrianic period, but it appears equally likely that this small group represents a less homogenous accumulation of material of late Flavian to Hadrianic date (late 1st to early/mid-2nd century AD). The coarse wares in the group include notable body sherds from a large jar or storage jar manufactured by the Horningsea industry at the southern tip of the fens *c.*40km to the north, and commonly transported by river. Further storage or transport vessels are represented by small body sherds of Baetican amphorae (BAT AM2), imported from southern Spain likely as containers for olive oil, and probably also re-distributed from regional hubs and ports via river and road networks. The sandy grey ware vessels (GRS1 & GRS2) represent closed vessels, likely jars, while the VER WH appears from the lower body of a flagon or jar.

Fabric GRS2 is consistent with types produced in local kilns (i.e. Partridge 1982, 44), and although analysis of contemporary groups from previous investigations at Braughing did not include the provenance of fabric types due to the state of knowledge at the time, the descriptions available suggest a similar pattern of supply (Witherington & Trow 1988, 133-6). This pattern of supply, beginning in the late 1st/early 2nd centuries AD has since been supported by assemblages from the town of Great Chesterford (Martin 2011, 305) *c*.20km to the north-east, and it is highly likely that early Roman Braughing was part of the same regional trade network, albeit with the requirements for local coarse wares amply met by kilns in the close vicinity, including those around Much Hadham.

5.6 Ceramic building material (CBM)

By Laura Pooley

A total of 7 pieces of Roman ceramic building material (brick/tile) and *opus signinum* were recovered from context 04, SF505 and SF516. They include a single tessera cube with traces of *opus signinum* on three surfaces, three fragments of brick/tile with *opus signinum*, two fragments of *opus signinum* and one fragment of burnt brick/tile.

5.7 Environmental Archaeology Assessment

By Dr James Rackham

5.7.1 Introduction

During the rescue excavations seven environmental bulk soil samples were collected from the deposits (Table 29, Figure 32, Figure 33, Figure 34), and ten small pollen samples were collected, eight from a sequence of deposits at the base of the exposed section (Figure 34) and two from 'peat' deposits exposed in a sondage (Figure 32). The bulk sampled deposits, contexts 007, 011, 013, 014, have been provisionally dated to the Late Iron Age (1st century AD) and Roman period, bulk and pollen sampled contexts 019 and 020 are currently dated to the early Roman and late Iron Age respectively (Table 29), while the sequence of 'river silts' (alluvium) sampled for pollen analysis (samples 1009-1017) stratigraphically predate all the above samples and may be of Late Iron Age date. All seventeen samples were submitted to the Environmental Archaeology Consultancy for processing and assessment.

Sample no.	Context no.	Samp. vol (l).	Sample weight (kg)	Feature	Period	Spot date
1001	07	28	31.5	patch of clay	IV	Roman and LIA?
1002	13	22	36	silty pebbly clay	II	Possibly 1st C AD
1003	14	3	2.1	charcoal deposit	II	
1004	11	2.25	1.79	charcoal deposit	IV	
1005	19	24*	32	waterlogged organic layer – ? fill of ditch or pit **(18)**	III	LIA, 1-2nd C

1006	19			Organic layer above **(20)**	III	Pollen sample
1007	20			Gritty sandy peaty silt	II/III	Pollen sample
1008	20	1.4	1.36	Gritty sandy peaty silt	II/III	LIA
1009	31			Silty grey clay – 25mm	1	Column of pollen samples in **(31)**, ? river muds? At following depths below top of layer 31 – 25mm, 225, 425, 625, 725, 825, 925, 1025 (see Fig. 3) Late Iron Age?
1010	23		36g	Silty grey clay – 200mm below base 31	1	
1011	24		50g	Silty grey clay – 200mm below base 23	1	
1012	25		70g	Silty grey clay – 200mm below base 24	1	
1013	26		68g	Silty grey clay – 100mm below base 25	1	
1014	27		48g	Silty grey clay – 100mm below base 26	1	
1015	28		48g	Silty grey clay – 100mm below base 27	1	
1016	29		32g	Silty grey clay – 100mm below base of 28	1	
1017	32	23*	30	Same as 12 – grey clay deposit	III	1st C AD – Roman & Late Iron Age

* small sub-sample retained for potential pollen analysis

Table 29 Environmental samples collected from the excavations at Braughing

With the main aim of the project being the recording and context for the coin-moulds the environmental evidence is primarily concerned with establishing the character of the sampled deposits and selecting material suitable for establishing a radiocarbon date that can be associated with these finds. Over 1.5kg of clay moulds were recovered from context 032 (sample 1017) and a single vitrified pellet mould from waterlogged context 19 (sample 1005) which may or may not be a fill of context 018 a possible ditch or pit. The sequence of pollen samples were taken from alluvial layer 31 provisionally interpreted as river muds/silts which underlie the archaeological deposits. These silts carry the potential through pollen analysis for establishing the local landscape character of the period pre-dating the deposition of the coin moulds (Period I) possibly contemporary with the development of the major Late Iron Age settlement. The two pollen samples from waterlogged deposits 19 and 20 may be contemporary with the deposits containing coin moulds and would extend the pollen sequence into periods II/III and III.

5.7.2 Methods

The bulk soil samples were processed in the following manner. Sample volume and weight was measured prior to processing. The samples were washed in a 'Siraf' tank (Williams 1973) using a flotation sieve with a 0.5mm mesh and an internal wet-sieve of 1mm mesh for the residue. Both residues and floats were dried, and the residues subsequently re-floated to ensure the efficient recovery of charred material. Contexts 19 and 20 contained waterlogged organic remains and these flots were retained wet. The dry volumes of the flots were measured, and where samples were waterlogged the ‘damp’ volume, and the volume and weight of the residues recorded.

The residues were sorted by eye, and environmental and archaeological finds picked out, noted on the assessment sheets and bagged independently. A magnet was run through the residues in order to recover magnetised material such as hammerscale and prill. The residues were then discarded. The floats of each sample were studied under a low power binocular microscope. The presence of environmental finds (i.e. snails, charcoal, carbonised seeds, bones etc) was noted and their abundance and species diversity recorded on the assessment sheets.

The floats were then bagged. The floats and finds from the sorted residues constitute the material archive of the sample. The individual components of the samples were then preliminarily identified and the results are summarised below in Table 30 and Table 31.

5.7.3 Results

The samples washed down to a residue of sub-angular, rounded and occasional sharp flint, with smooth pebbles, coarse sand and sediment concretions. Archaeological finds are relatively abundant with pottery in five samples, an iron object, clay pellet moulds in context 32, with a small vitrified fragment of pellet mould in context 19, bone in five samples, firecracked flint in four, fired earth in four, and hammerscale in five (Table 30). Hammerscale frequency is low but context 19 produced over 40 flakes and its presence in the samples indicates contemporary Roman iron smithing nearby. Flint is relatively abundant but much of that recovered during sorting may be natural chips, although a possible flake occurs in context 07, and some of the other debris may be debitage. The pottery in all the washed samples dates to the late Iron Age and Roman periods and it is evident that the assemblages from the bulk samples are probably 1st C BC and 1st -2nd C AD.

Sample	Context	Vol in l.	Residue vol .in ml.	Pot no/wt g	Fe no/wt g.	Flint no/wt g	Magnetic comp. g.	Hammer-scale no flakes	Fired earth wt g.	Fire-cracked stone	Marine shell wt g.	Bone wt g.	Other
1001	7	28	6000	16/124.6	1/3.4	55/15.6	4.2	1fl	19.2	32		55.2	Flint-1 poss. flake + chips – poss. debitage
1002	13	22	10000	23/227.8		49/10.4	6.8	8fl	11.6	86.6		65	Flint- poss. debitage
1003	14	3	180			4/0.2	2.8	2fl		5.6		+	Flint- chips-natural?
1004	11	2.25	200	3/3		7/0.2	1.2		0.7			7.6	Flint-chips-natural?
1005	19	24	7400	32/144.8		132/43.4	7	11fl 5sph		1.8	6.4	76.6	Mortar/lime/degraded limestone? – 112.2g; vitrified pellet mould – 2.8g
1008	20	1.4	85	-	-	-	0.5	-	+	-	-	+	
1010	23	36g#	22g#	-	-	-	-	-	-	-	-		
1012	25	55g#	17g#	-	-	-	-	-	-	-	-	+	
1017	32	23	11500	14/93.6		24/7	8.6	43fl 2sph	2	114		71.6	Clay mould – 1148g; clay without holes – 534g; flint-chips – natural?; tiny fragment CBM

+ - present but too small to weigh; # - unwashed sample and residue weighed in grammes not volumed.

Table 30 Summary of archaeological finds from the samples

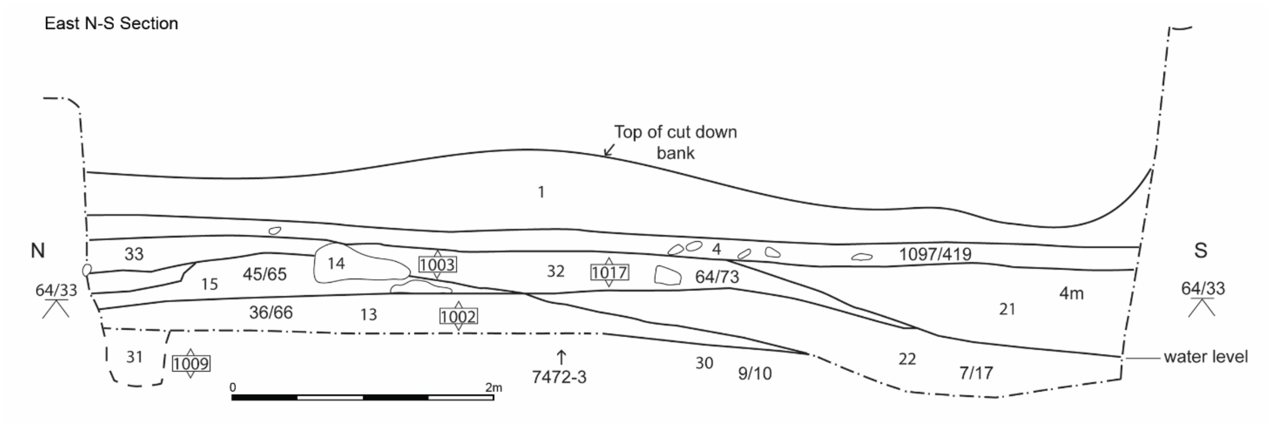


Figure 32 Eastern North-South Section - Location of samples

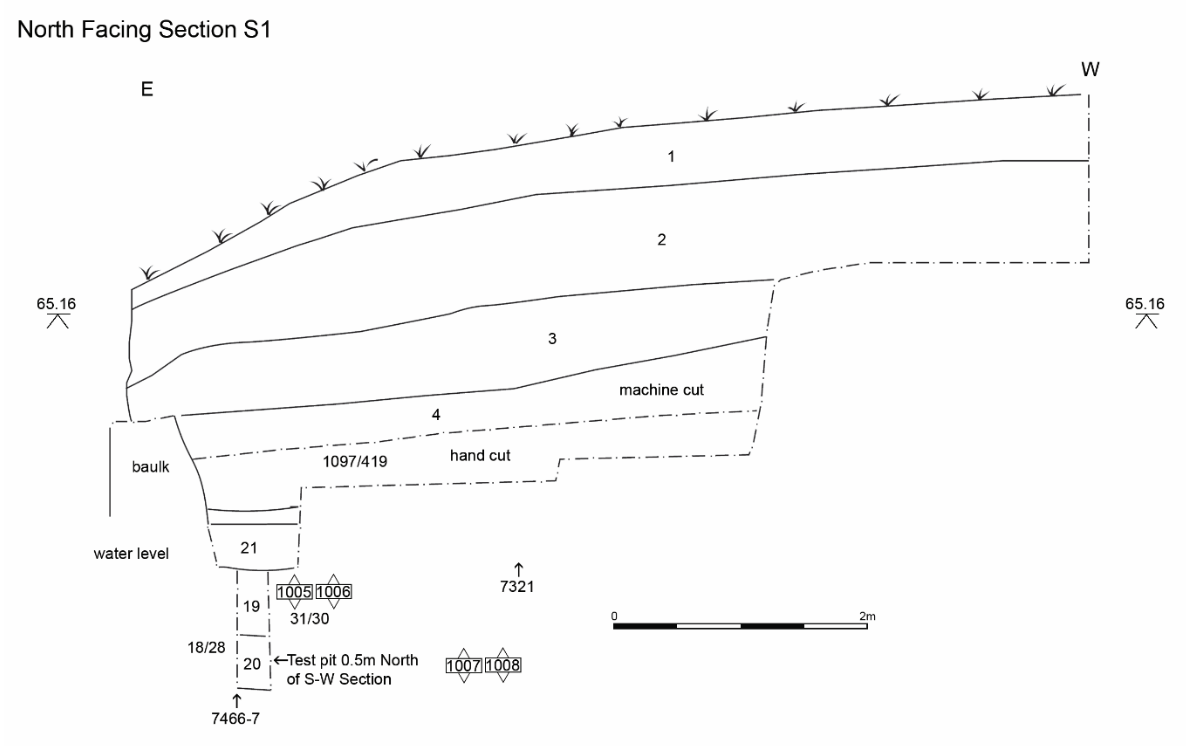


Figure 33 North facing section S1 - Location of samples

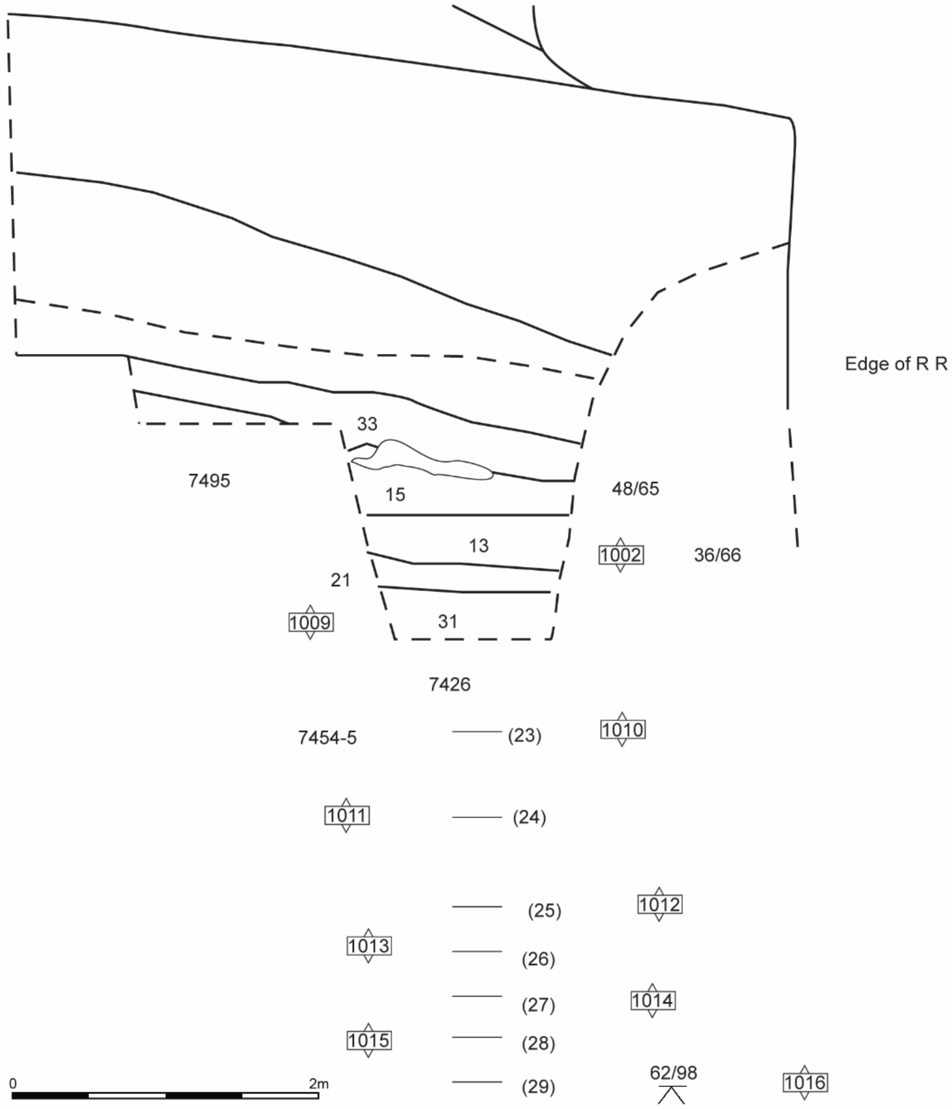


Figure 34 South-facing section - Location of samples

The coin mould debris was recovered from samples 1017 and 1005, contexts 32 and 19, with over 1.5kg in 32 and just 2.8g of vitrified mould in 19 (Table 30).

The environmental assemblages are variable. Charred plant remains and/or charcoal has survived in all the samples, while two samples included waterlogged preservation - although the abundance of identifiable seeds is relatively small in context 19 the sample from the peaty silt deposit from context 20, immediately below context 19, has a different composition. This sample contains abundant waterlogged organic remains, herbaceous stems, vegetable matter and seeds but also a quantity of mineralised plant material and seeds, some mineralised invertebrates (millipedes?) and waterlogged beetle fragments. The heavy mineralisation of seeds, including cereal remains, matted mineralised herbaceous stems, charcoal, charred cereal grain and some chaff combined with a proportion of small flint gravel and sands suggests that this deposit was not a natural 'peat' as originally interpreted on site. While it is evident from the large size of the waterlogged flot and the character of some of the remains that this was a rich and matted (compacted) organic layer it does not appear to have been a peat but may be a dumped deposit of hay, straw or stable sweepings, the mineralisation perhaps suggesting an input of urine and/or animal dung, such mineralisation can also occur in cess pits, suggesting an archaeological rather than natural deposit. A single *Trichurus* egg in the pollen sample from context 20 indicates the presence of intestinal parasites suggesting animal or human faecal material, while a single *Ascaris* egg in the sample from context 31, the top of the 'river silt' sequence also suggests animal or human faecal material was present. Small samples of the underlying 'river muds/silts' from pollen samples 1010 and 1012 were also processed to identify if an archaeological component was present in these apparently 'natural' river side sediments and to try and recover material suitable for radiocarbon dating.

A single terrestrial snail, *Trichia hispida/plebia*, was recorded in context 07, and two, *Carychium minimum* and *Vitrea* sp., in context 32 but none were found in the other samples suggesting that the soil conditions may have been unsuitable for their survival. Small assemblages of domestic animal bone include fragments of sheep/goat, pig, cattle, dog and chicken, with the small mammals and amphibians including house mouse, field vole, bank vole, water shrew, and frog/toad and single distal tibio-tarsus fragment from a small bird (Table 31). The presence of house mouse in at least three of the samples suggests the probable proximity of buildings since this species does not generally occur far from human habitation or farm buildings. Four of the samples produced fish bones in small numbers among which eel is the best represented with several bones of other small fish taxa. With a single fragment of oyster shell from context 19 the remaining fish bones may include marine taxa, indicating some trade with coastal centres. If these deposits are 'dumped' then the evidence will relate to where the material derives from rather than the find location, so the smithing, buildings, coin making, etc may have been taking place in several locations some distance from the excavation site.

There were traces of beetle fragments in two samples (<1002>, <1017>), which are probably intrusive, but those in the waterlogged samples <1005> and <1008> are likely to be contemporary, and although limited in context 19 (1005) are fairly abundant in context 20 (1008) and include some mineralised invertebrates, including millipede segments. Those in context 20 should add to the information relevant to interpreting the origin and character of this deposit.

Small sub-samples of two of the pollen series (sub-contexts 23 and 25 – Table 29) from the underlying alluvium (context 31 Medlycott 2018) were washed in order to try and recover material suitable for radiocarbon dating and learn a bit more about the contexts. Between 27 and 30% of the samples by weight were composed of fine and medium sand, coarse grits and small flint. This is inconsistent with a floodplain clay or silty clay derived from overbank flooding and perhaps more likely to be a river edge silt. The character of this deposit is considered below.

Table 31 Summary of Environmental finds from the processed samples

Sample no.	Cont no.	Samp. vol. (l)	Flot vol. (ml)	Char coal */<2*	Charred grain *	Charred chaff *	Charred seed *	Wl seeds*	Bone*	Insect*	Snails *	Comment
1001	7	28	24	3/5	2		1	1	1		1	Small nos (c 10-20) charred grains mainly well-preserved *Hordeum vulgare* (hulled 6x) also *Hordeum/Triticum* grains; traces charred weed seeds (*Rumex*, cf *Bromus*, Poaceae); fairly good nos id'ble charcoal fragments; occ uncharred seeds (*Rubus, Chenopodium, Alnus*); sheep/goat, cattle size, indet bone, including burnt, house mouse, frog/toad, chicken, eel, other small fish, fish scales; snails – *Trichia hispida* x1; roots
1002	13	22	73	5/5	3	1	1	2	1	1		Good nos (c 100+-) charred grains poorly preserved mainly *Hordeum vulgare* (hulled 6x) also *Triticum dicoccum/spelta, Triticum,* cf *Avena*, indet); traces chaff (*Triticum* spikelet base); occ charred weed seeds (*Bromus, Carex*); very large nos id'ble charcoal fragments; small nos uncharred seeds (*Rubus,Carex, Aethusa cynapium, Sambucus, Chenopodium, Euphorbia*); sheep/goat, pig, sheep size, indet, incl. burnt, house mouse, field vole, frog/toad, bird, eel, other small fish; occ. insect (beetle) fragments; some roots & fine sediment crumb
1003	14	3	107	5/5				1	1			NO CPR; virtually all charcoal (round wood & rectilinear fragments) with >nos potentially id'ble fragments; occ uncharred seeds (*Chenopodium*); occ small mammal bone fragments; some roots
1004	11	2.25	10.5	3/5	2		1	1	1			Small nos (c 10-20) charred grains mainly well-preserved *Hordeum vulgare* (hulled 6x) also cf *Triticum,* cf *Avena* grains; traces charred weed seeds (*Corylus avellana* shell, Poaceae (small)); fairly good nos id'ble charcoal fragments; occ uncharred seeds (*Sambucus*); cattle size, indet bone, incl burnt, indet. rodent; good amount of sediment crumb

1005	19	24	198	5/5	5	5	4	3	2			Waterlogged flot (100ml) & washover (98ml); Rich CP assemblage (>nos grains - *Hordeum vulgare* (hulled 6x) , *Triticum dicoccum/spelta,*cf *T. aestivum*, *Triticum, Avena*, indet); >chaff (*T. spelta, T. dicoccum, Triticum* glume bases, spikelet bases, *Hordeum* rachis, *Avena* awns); good nos charred weed seeds (*Rumex, Galium aparine, Sherardia arvensis, Vicia/Lathyrus, Plantago lanceolata, Carex, Eleocharis, Bromus*, Poaceae (large, small);*Corylus avellana* shell, culm nodes, rhizome fragments); >charcoal with >nos id'ble fragments; mod nos uncharred seeds (*Fallopia convolvulus*, *Ranunculus, Coium maculatum, Corylus avellana* shell, *Atriplex,,Chenopodium, Carex, Eleocharis, Sambucus*); good nos stem fragments; sheep/goat, pig, cattle, indet. bone, mouse, water shrew, frog/toad, eel, occ burnt fragments bone; oyster; roots & sediment crumb (mainly in washover); 25% organic flot scanned
1008	20	1.4	800	3/5 e	3e	1	1	5+M	+	3e	-	Waterlogged and mineralised vegetable matter and seeds from (damp) grassland & disturbed/waste ground habitats (*Ranunculus, Urtica dioica, Atriplex, Polygonum aviculare, Rumex, Potentilla, Aethusa cynapium,Hyoscyamus niger, Sonchus, Sambucus, Carex*, >*Eleocharis*, >wild Poaceae) ; mineralised grain; charred grain (*Triticum dicoccum/spelta*, *Hordeum vulgare* (hulled 6x) and hulled wheat chaff fragments (*Triticum dicoccum* spikelet fork, *T. dicoccum/spelta* glume bases) and charred weed seeds (*Galium aparine*); charcoal; indet small bone fragments, small bird; mineralised and waterlogged insects and other invertebrates
1010	23		-	2/4	+	+			+	-	-	Charred grain, *Hordeum* sp. x1; chaff, legume, seed; a little waterlogged vegetable matter, uncharred *Sambucus* sp.; tiny indet bone;
1012	25		-	2/4	1		1	2+M	+	-	-	Indet charred cereal grainx1; uncharred *Chenopodium* sp. *Urtica* sp., *Sambucus* sp., mineralised seeds

1017	32	23	15	3/5	2		1	1		1	1	Small waterlogged flot; small nos (*c.* 12) charred grains - *Hordeum vulgare* , *Triticum,* indet; traces charred weed seeds (*Corylus avellana* shellx5); mod nos id'ble charcoal fragments; small nos uncharred seeds (*Sambucus, Urtica dioica, Silene, Carduus/Cirsium*); occ insect (beetle) fragments; sheep/goat, pig, cattle size, dog, house mouse, frog/toad, small fish, fish scale; broken snail fragments, *Carychium minimum* (1), *Vitrea* sp. (1); caddis larval case; >roots

* = abundance: 1=1-10, 2=11-50, 3=51-150, 4=151-250, 5=250+

/<2 = abundance >2mm/abundance < 2mm; M – mineralized seeds also present; e – estimated from studying part of the sample

5.7.4 The Charred Plant remains

By John Giorgi

Eight of the nine soil samples processed produced variable amounts of charred plant remains including a very rich assemblage in a ‘waterlogged’ ditch/pit fill (19) (sample <1005>) and good amounts in deposits (13) (sample <1002>) and (20) (sample <1008>). Cereal grains made up the majority of the charred remains and were present in all eight productive samples, the better preserved remains consisting mainly of *Hordeum vulgare* (barley) (well-preserved records in several samples showing the presence of six-row hulled barley) and *Triticum dicoccum/spelta* (emmer/spelt wheat) with occasional grains of possibly *Triticum aestivum/turgidum* (free-threshing wheat) and *Avena* (oat).

Cereal chaff was recorded in four samples with only occasional fragments in deposits (13) (sample <1002>), (23) (sample <1010>) and (20) (sample <1008>) but a rich assemblage in a ‘waterlogged’ fill (19) (sample <1005>) which consisted mainly of hulled wheat chaff (glume bases, spikelet bases, rachis fragments) including evidence for both *Triticum spelta* (spelt) and *Triticum dicoccum* (emmer) plus a few barley rachis fragments and oat awn fragments.

Charred wild plant/weed seeds were present in seven samples albeit in only very small amounts with the exception of a good assemblage in ‘waterlogged’ fill (19) (sample <1005>) with remains from a fairly wide range of species. Some of these seeds were from typical arable weeds, for example *Sherardia arvensis* (field madder), *Galium aparine* (cleaver), and *Bromus* (brome), and also plants indicative of damp ground, for instance, *Eleocharis* (spike-rush), *Carex* (sedge). Occasional *Corylus avellana* (hazel) nutshell fragments were also noted in several samples, probably the residues of gathered wild foods. Other potential cereal debris included the presence of culm node and root/rhizome fragments in the waterlogged fill (19) (sample <1005>).

Most of the charred plant assemblages from the samples have only the potential for providing basic information on crop husbandry, limited to the range of cereals being used and probably being grown in the vicinity of the site at this time. Initial results suggest that hulled wheat (both spelt and emmer) and hulled barley were the main grains with occasional finds of possibly free-threshing wheat, results similar to current evidence from other Iron Age and Roman sites in southern England (Greig 1991, 306, 309). The one rich charred plant assemblage from the ‘waterlogged’ fill (19) (sample <1005>) containing good amounts of grains, chaff and wild plant/weed seeds, also however has the potential for investigating other aspects of crop husbandry including the range of soils that may have been cultivated and sowing times; for example, *Sherardia arvensis* may point to the use of light calcareous loams for growing crops while *Galium aparine* may suggest the autumn-sowing of cereals.

The individual charred plant assemblages may also provide information on different activities taking place across the site, most of the small assemblages containing debris from small-scale domestic activities associated with the final stages of crop cleaning and food preparation. The larger charred botanical assemblage from ‘waterlogged’ fill (19) (sample <1005>), however, contains debris from other stages of crop-processing including sieving by-products (weed seeds) and the de-husking of hulled wheat (chaff).

‘Waterlogged’ Plant Remains

Two of the seven samples, from ‘waterlogged’ fill (19) (sample <1005>) and context 20 (sample <1008>), were processed for the recovery of ‘waterlogged’ plant remains.

Sample <1005> produced a fairly good number of uncharred seeds from plants associated with disturbed/waste ground habitats, for example *Fallopia convolvulus* (black bindweed), *Atriplex/Chenopodium* (orache/goosefoot etc), from trees/shrubs (*Corylus avellana, Sambucus*) and from species found in damp/wet ground environments, for instance *Carex, Eleocharis*, as well as a good number of stem fragments.

Sample <1008> from peat deposit (20) produced a rich 'waterlogged' plant assemblage containing similar remains to those found in fill (19) with a good representation of species associated with (damp) grassland and disturbed/waste ground habitats. The waterlogged (and charred) plant remains in this sample, however, do not suggest that this is a peat deposit but probably represents re-deposited debris from human/animal activities possibly close-by including stabling/flooring materials and crop-processing debris (see above).

The other samples only produced occasional or small numbers of uncharred seeds which may be intrusive.

5.7.5 Charcoal

By John Giorgi

All nine samples produced charcoal with potentially identifiable fragments with rich assemblages in deposit (13) (sample <1002>), charcoal deposit (14) (sample <1003>) (with both round wood and rectilinear fragments) and 'waterlogged' fill (19) (sample <1005>), and modest to good amounts in three of the other samples. The identification of these remains may provide general data on woodland resources (and the nature of the local environment) during the late Iron Age and Roman periods, but if the deposits are primarily secondary dumps the assemblages cannot be confidently associated with any specific activities, except context 19 with its assemblage of crop processing debris.

5.7.6 Pollen analysis

By Rob Scaife

5.7.6.1 Introduction

Pollen analysis of four of the series of ten pollen samples taken (Table 32) from Late Iron Age to early Romano-British contexts has been undertaken to ascertain if sub-fossil pollen, spores and other microfossils are preserved. If present, pollen data would provide information relating to the on and near site vegetation and environment of the site and possible origin of some of the deposits associated with the coin moulds. Sub fossil pollen and spores were recovered from the four samples examined and as such, useful palaeoenvironmental data has been obtained.

5.7.6.2 The pollen data

Four samples (Table 32) thought to be of Late Iron Age and 1st C AD date have been examined for sub-fossil pollen and spore (Table 33) content. These comprise organic silts and alluvial sediment from which information on the vegetation and environment of the site at this time has been obtained and a sample (1007) from an organic deposit of archaeological origin. Analysis of earlier and later age sediment was not requested and thus, it has not been possible to ascertain longer-term environmental changes, although <1007> is stratigraphically later than the other samples and of archaeological origin rather than riverine alluvium.

Sample	***Context***	***Feature type***
<1007>	(20)	Organic deposit
<1012>	(25)	Alluvial silt/clay
<1009>	(31)	Alluvial silt/clay
<1016>	(29)	Alluvial silt/clay

Table 32 Samples examined for pollen

Standard procedures were used for the extraction of the sub-fossil pollen and spores. Details of the method are given in the appendix. Pollen preservation was found to be very variable in the four samples examined. There was, however, sufficient pollen preserved to allow pollen counts from all of the samples. The contexts with highest absolute pollen frequencies (APF) were organic deposit (20) and river alluvium (25) with pollen counts of 300 to 500 grains per sample made. Contexts (29) and (31), the top and bottom of the alluvial sequence, were relatively poor with low APF and also with evidence of differential preservation in favour of pollen with robust exines (the pollen wall); typically the Lactucoideae dandelion types. Smaller pollen counts/totals were made, the lowest being 100, from (31). Pollen and spore count data are given in Table 33 and percentages calculated (TP) are given in parenthesis and in discussion.

Overall, the pollen assemblages are dominated by herbs with only very small and insignificant numbers of tree and shrub pollen and diversity. The herb pollen assemblages come largely from grassland and are of pastoral affinity. There is, however, an arable agricultural component with cereal type pollen and from associated segetals. The taphonomy of pollen in pit and ditch contexts can be especially complicated with pollen sources being very varied. In general, the pollen catchment is usually very small and representing vegetation growing on and closely adjacent to the site. Furthermore, there is also the possibility of secondary and derived/reworked pollen. The latter may include pollen coming from domestic waste ranging from food, human and animal ordure, floor covering, animal bedding and many other sources, all of which may contain pollen. This is believed to be the case here, particularly for context 20. Faecal material is possibly present as indicated by occasional intestinal parasite eggs including whipworm (*Trichuris trichuria*) and roundworm (*Ascaris* cf *lumbricoides*). In the river alluvium pollen can be derived from a large catchment upstream as well as local sources so can be expected to give a more regional picture, including material derived from the large Iron Age settlement on the banks of the river.

The palynological characteristics of the individual samples are described.

(20) <1007>: This organic deposit of archaeological origin is assigned to the late Iron Age. Pollen preservation was excellent with substantial numbers of pollen present. Trees and shrubs are almost absent with only single records of *Corylus* (hazel) and *Alnus* (alder). Poaceae (grasses) attain extremely high levels (87% of total pollen). Other plants/herbs of grassland include *Plantago lanceolata* (ribwort plantain; 3%), *Ranunculus* type (buttercups), Lactucoideae (dandelion types) and sporadic occurrences of other taxa also of possible pastoral affinity. Of note is a single egg of the whipworm (*Trichuris*) an intestinal parasite of humans and pigs. This may indicate the presence of faecal material or offal which may have been incorporated in this deposit.

(31) <1009>: This is the top sample from the deposits interpreted on site as river alluvium (Table 32; Figure 34). Pollen is poorly preserved and sparse in this sample with evidence of differential preservation in favour of robust pollen forms. A pollen count of only 100 grains was obtained. The assemblage has the same characteristics as the other contexts analysed. That is, dominated by herbs which comprise Poaceae (48 %) and Lactucoideae (44 %) but with a low overall taxonomic diversity. A small number of cereal pollen grains and *Polygonum* *aviculare* (black bindweed) attest to arable activity but as with contexts (20) <1007> and (29) <2016> these cereal pollen and the intestinal parasites present in this and context 20 possibly indicate a secondary origin. High values of Lactucoideae (dandelion types) are typically overrepresented in poor preserving conditions (Dimbleby 1985). The presence of less robust Poaceae suggest that latter may have been more contemporaneous with the soil/sediment whilst the former because of its resilience will have had a longer residence time in the soil. It is likely that the Lactucoideae were reworked with the sediments. Along with the grasses, the Lactucoideae do indicate a largely pastoral habitat in proximity to the site.

(25) <1012>: This sample was taken three fifths of the way down the 1.3m thick alluvial deposit 31 (Figure 34; Medlycott 2018). Although a pollen count of 300 grains was obtained, this sample material had a low APF and much degraded pollen. The relatively high values of Lactucoideae (dandelion types) is indicative of these poor conditions which resulted in the differential preservation of this taxon. Pre-Quaternary palynomorphs are present which implies sediment inwash from erosion and, it is possible that the resilient Lactucoideae derive from earlier soil eroded by the river upstream. However, the Lactucoideae do also indicate a pastoral/grassland habitat which is again borne out by the very substantial numbers/dominance of grass pollen (Poaceae; 72% of total pollen). Other indicative taxa include *Plantago lanceolata*, *Medicago* (medick) and sporadic occurrences of other taxa which may be attributed to grassland (*Ranunculus*/buttercups, *Trifolium* type/vetches, *Centaurea nigra*/knapweed). There is also some evidence for arable agriculture with cereal pollen and other possible indicators of disturbed ground (*Spergula*/spurrey). This sample has occasional fen/wetland plants with *Typha angustifolia/Sparganium* (bur reed/bulrush) and occasional sedges. These, of course, imply that the context was wet or at least damp, consistent with a river edge/floodplain context.

(29) <2016>: This sample comes from the base of the sampled alluvial sequence (Figure 34). As with all of the contexts examined, herbs are dominant with few trees and shrubs. Here the latter comprise small numbers of pollen of anemophilous taxa and are likely to be of regional or long-distance origin, especially the *Pinus* (pine). However, hazel *Corylus* (hazel) macrofossils (Giorgi see above) have been recovered from some contexts which may indicate at least some local growth. Anything more than occasional growth would be expected to produce a fuller representation in the pollen spectrum. Poaceae are dominant (64% TP) with other grassland indicators present.

Context	***(20)***	***(31)***	***(25)***	***(29)***
Sample	***<1007>***	***<1009>***	***<1012>***	***<1016>***
Taxon				
Pinus				3
Quercus			1	2
Tilia (degraded)		1		
Alnus	1			
Corylus avellana type	1		2	4
Poaceae	436 (87%)	48 (48%)	215 (72%)	179 (64%)
Cereal type	17 (3%)	2 (2%)	7 (2%)	16 (5%)
Poaceae (large)			1	
Ranunculus type	9		1	1
Brassicaceae				3
Hornungia type			1	1
Fabaceae indet.	1			3
Trifolium type	1	1	1	
Medicago type			6	
Lathyrus type	1			
Dianthus type	1	1		
Cerastium type				1
Cf. *Spergula* type			1	
Chenopodiaceae			1	2
Filipendula			1	1
Polygonum aviculare type		1		2
Fallopia convolvulus				1
Rumex	1			1
Myosotis				1
cf. Anagallis			1	
Scrophulariaceae			2	1
Plantago lanceolata	14 (3%)		11 (4%)	9 (3%)
Plantago media/major	1			1
Bidens type	2			
Anthemis type	1		2	
Cirsium type		1		
Centaurea nigra type	1		1	
Lactucoideae	9 (2%)	44 (44%)	41 (14%)	27 (9%)
Cyperaceae	5	1	1	25 (9%)
Typha/Sparganium			3	3
Callitriche				1
Dryopteris type		1	3	7
Pteridium aquilinum	3	5	10	14
Polypodium				3
Pre-Quaternary palynom.		8	14	51
Trichuris (intest. parasite)	1			
Ascaris (intest. parasite)		1		
Unidentified pollen (degr.)	1	5	1	1
Total pollen	***502***	***100***	***300***	***288***
Total spores	***3***	***6***	***13***	***24***

Table 33 Pollen count data from contexts (20) (25) (29) (31) in stratigraphic order, highest to the left

Here cereal pollen is relatively more important than in the other contexts examined. Cereal pollen and associated arable plants are less well represented in pollen assemblages than are pastoral taxa. Whilst the arable elements recovered here may derive directly from cultivation, the presence of round/maw worm (*Ascaris*) as with *Trichuris* noted in (20) <1007> may indicate the presence of faecal material so there is the possibility of secondary sources for some of the pollen. For instance cereal pollen can remain trapped in ears of grain and remain through crop processing and into farinaceous (starch rich) products (Robinson and Hubbard 1979). Once consumed it readily passes through the gut and ends up in cesspits, latrines and places where 'night soil' was disposed of. Because of the small number of indicator nematode eggs, it is not conclusively the case in these samples. Such pollen may also derive from other domestic sources floor sweepings, building material and from crop processing. As with (25) <1012> there is evidence that this context was damp or wet with strong representation of Cyperaceae (sedges) with some *Typha/Sparganium* (burr reed and or bulrush). Unusually, however, a single record possibly of *Triglochin* (arrowgrass) is present, possibly indicating standing water, but consistent with a wet or marshy floodplain. However, as noted, the taphonomy of pollen obtained from these contexts is complex and this pollen may easily have come from other sources or further afield.

5.7.6.3 Summary and Conclusions on the pollen results

This study sought to establish if sub-fossil pollen and spores are preserved in the sediment of a number of contexts from this site. This proved to be the case, allowing pollen identification and counts to be made which have yielded some useful palaeo-environmental data pertaining to the site. The following principal points have been made in this study.

Pollen is variably preserved being especially rich in the organic sample <1007>. Pollen is both less rich and poorly preserved in the samples from the alluvial river silt/clay and is especially poor in <1009> the top of the alluvial sequence.

Samples examined are of Late Iron Age-1st C AD age (Rackham pers com.) and as such the pollen obtained (given the possibility of some reworked/derived material) provides information relating to the archaeological site.

The taphonomy of the pollen is complex with a variety of possible sources, with context 20 probably having a direct archaeological origin, while the alluvial sediments are probably largely naturally deposited.

Overall, the samples are dominated by herbs with very few tree and shrub pollen. Where the latter occur, these are sporadic and of high pollen producing, anemophilous taxa. As such, these are probably of more regional or long-distance origin and not of significance here.

Herbs are dominant and suggest a markedly open environment/habitat.

Pollen from grasses and other associated taxa probably pasture (especially ribwort plantain) are most important in the assemblages. Cereal pollen and associated weeds are, however, also present. The latter are generally poorly represented in pollen spectra and their presence here attests to a mixed agricultural economy.

Although the samples examined are an organic deposit and alluvial sequence, the presence of occasional intestinal parasites (whipworm and roundworm) suggest that there may be a faecal/cess component. This also implies proximity to the settlement or, perhaps animals on this rough/floodplain pasture.

Whilst the cereal pollen certainly implies the growth and use of cereals with the pollen coming directly from cultivation, it is also possible that this pollen and associated segetals may be secondary. That is, derived from faecal material, other domestic waste, or crop processing activities which was dumped into the river channel or along the river bank/edge.

The context of the rescue excavation did not allow the collection of samples of older and younger age which might have allowed longer-term changes and possible environmental impacts to have been addressed, although preservation is so variable that this is likely to be the major factor effecting the different pollen ratios rather than the contemporary environment.

5.7.6.4 Discussion

Period I. The only samples from Period I are the series of eight pollen samples from 'alluvial layer' 31. No finds were recovered from this deposit so it is undated although a later 1st millennium BC date seems likely. The proportion of sand and small flint stones in the two very small washed samples from this deposit suggests that it probably is not an overbank alluvial deposit, and Hunn was of the opinion when he sampled the layer that it was possibly river edge sediments although whether the present course of the River Rib is close to the late Iron Age course is not known. An old course of the river appears to lie just east of the present course as a residual channel, now apparently overgrown, but the channel may have been located elsewhere two thousand years ago. The size of the samples does not allow much inference, but both samples produced a little charred cereal grain, charcoal, a piece of chaff in 1010 and charred seed in 1012, a few uncharred seeds, and mineralised seed in 1012. This appears insignificant but given the size of the sample washed – less than 50 grammes this would be equivalent to 600 charred grains in a 30 kilogramme sample which is as rich in charred grain as any of the other samples. There is clearly a significant amount of charcoal and charred cereal entering this 'alluvial' deposit which suggests that it is probably contemporary with the large Iron Age settlement on the river bank and much of it may have become incorporated into channel edge sediments directly from the settlement. The presence of parasite eggs in the top of the deposit would be consistent with this although animals watering at the river could introduce these.

The pollen evidence would suggest the contemporary landscape is open pasture with some arable, but with limited local woodland, perhaps restricted to hedgerows and small copses. The pollen preservation is variable with the top sample in the sequence (1009) showing poor preservation and low pollen frequency and a very high proportion (44%) of the robust dandelion type grains. The lower two samples appear progressively better preserved with the basal sample having the lowest proportion of dandelion type, but a much higher wetland/marsh element perhaps supporting a river edge or marsh context. Cereal pollen is relatively abundant in this basal sample (Table 33) but with a large settlement adjacent to the river this pollen may derive from crop processing activities rather than fields of cereal, although it does suggest local arable production. The top of context 31 may have been a former land surface, which could account for the deterioration in the pollen at this level and the incorporation of some archaeological debris.

Although stratigraphically assigned to Period I, deposit 31 in the south-facing section lies altitudinally above Period II deposit 20 in the north facing section.

Period II. Samples from contexts 13, 14 and 20 were taken from deposits assigned to Period II predating the coin mould deposits. Layer 13, a pebbly clay, lay across much of the site and its large residue of sub-angular flint and pebbles with occasional chalk may in part derive from the gravel layer (30) beneath it. The sample was relatively rich in pottery, flint chips – possibly debitage, and also produced fired earth, animal bone, fire-cracked stone and a few flakes of hammerscale (Table 30). It included a hundred+ grains of barley, emmer/spelt and probable oats, with one or two fragments of chaff and charred weed seed. As well as domestic animal bone fragments it also included house mouse, bird, eel and other small fish (Table 31). Much of the archaeological debris can be considered domestic waste. Apart from this rubbish it is difficult to characterise the deposit although it may have been dumped to raise the ground level and lay just above the water level in the river at the time of excavation (28/08/16). Although assigned to the pre-coin mould horizons this deposit produced 162 fragments weighing over 1.5kg.

Context 14 was a localised charcoal rich deposit sealing 13 (Figure 32). The flint, pebble and sand residue was relatively small (Table 33) and the recovered flot only 107ml, almost entirely composed of charcoal with no visible charred plant remains. This appears to be a single event deposit and apart from a little fire-cracked flint, two flakes of hammerscale and a few flint chips – probably natural – no finds were present. The charcoal includes identifiable roundwood and rectilinear fragments but with no functional interpretation for the deposit it may not deserve study.

Context 20 was a rich organic deposit originally described as a peat but it is evident from the analyses that it has an archaeological rather than 'natural' origin. The layer includes compacted and matted vegetable matter, some of it quite heavily mineralised. Organic remains are well preserved in both a waterlogged and mineralised state including cereal grain and seeds, and charcoal and charred plant remains are also present. The quantity of sand and small flint stones deposits. The pollen assemblage from this deposit was the best preserved, probably due to the compacted organics creating a suitable burial environment. Grass pollen (Poaceae) comprise 87% of the assemblage, with 3% of cereal type, perhaps suggesting that much of the matted vegetable material could be grass stems, reeds and leaves. A higher cereal component might have been expected from cereal straw. There is very little woody material among the organics. The charred elements include cereal grains, chaff and charcoal (Table 33) with barley, emmer and emmer/spelt present. The pollen sample included an egg of the intestinal parasite *Trichuris* (whipworm) and the deposit may derive from a mixture of stable sweepings, hay, flooring materials and crop processing debris. It clearly reflects an actual dumping episode of this organic waste and the mineralisation may indicate some urine or dung present.

Period III. Two of the sampled deposits were assigned to Period III, contexts 19 and 32. No samples were taken from the primary coin mould deposit, context 12, but the sample from context 32, the baulk between the trench and the river, produced over 1.5kg of coin moulds and clay sheets without moulds, while context 19 produced just one vitrified pellet mould. Both contexts produced pottery of both late Iron Age and early Roman date.

These two contexts produced pottery, flint (probably natural) fire-cracked stone, clay pellet moulds, animal bone, one produced marine shell, and higher concentrations of hammerscale than any of the other samples (Table 33). While the latter does not occur at densities suggestive of a smithy they do indicate contemporary iron smithing, presumably somewhere near wherever the debris was first generated. It would certainly appear from the density of debris in context 12 (Medlycott 2018 Plate 5) that this was dumped, but from how far away is of course unknown. These deposits would appear to have a variety of origins. The clay pellet moulds indicate one production activity, the hammerscale a second, the large collection of charred grain, chaff and weed seeds in context 19 debris from an earlier stage of crop processing, while the domestic animal bone, eel, other small fish, oyster, hazelnut shell and presumably some of the charred cereal grain all point to domestic food rubbish (Table 31), along with broken pottery and firecracked stone potentially from domestic hearths suggesting other domestic rubbish. Context 19 contains a small waterlogged organic component with a few seeds associated with disturbed/waste ground habitats, shrubs and wet/damp ground, while context 32 contains an even smaller waterlogged element with elder, nettle, campion and thistle, but also a caddis larval case indicating an aquatic element and *Carychium minimum* suggestive of a marshy environment. This mixture may well represent episodes of dumping from several different locations while much of the waterlogged flora could have grown *in situ* and the small wetland component been introduced from by the river.

Period IV. Two contexts, 7 and 11, were sampled from deposits of this period. Context 11 lay directly over cleaning horizon, context 9, at the top of the coin mould deposits and context 7 overlay 11. Both were small isolated deposits, 07 a patch of 'clay' and 11 a patch of charcoal (Medlycott 2018 Fig 3a). 11 produced a little pot, some flint chips, a little fired earth, animal bone and a small flot with charred cereal grain, hazel nutshell, and charcoal. Considering this was a relatively small sample this represents a reasonable density of domestic rubbish. Context 07 has similar densities of material including pot, flint chips (including possible debitage), fired earth, firecracked flint and pebbles, animal bone, a single flake of hammerscale and a corroded iron object, but has a much lower density of charcoal and charred plant remains, including cereal grains. The bones include sheep/goat, chicken, house mouse, eel and other small fish, and the whole collection again has the character of domestic rubbish. A fifth of the sample is a residue of sub-angular flint, pebbles, occasional chalk and sand indicating a mixed deposit, not a pure clay. The assemblage of ceramics from 07 includes late Iron Age fabrics and Samian, but the 3 sherds from context 11 have not been reported.

5.7.7 Radiocarbon dating

There are two questions with respect to the dating of the site. The primary one relates to the date of the coin pellet moulds and the secondary one relates to the sequence of pollen samples from the sediments of Period I predating the main archaeological deposits.

Two samples were taken from deposits associated with the moulds, contexts 19 and 32, but only the sample from context 32 produced significant quantities of clay pellet moulds (Table 30). This latter sample produced few charred cereal grains, a couple of pieces of charred hazel nutshell, and a few pieces of charcoal all of which are potentially suitable for radiocarbon dating. But with this deposit (including context 12) producing both late Iron Age and late 1st-early/mid-2nd century pottery (Peachey 2019) it is questionable as to whether a radiocarbon date from any of this material could be relied upon to give any result that could confidently be related to the coin moulds or have greater precision than the ceramics. There is a rich assemblage of charred plant remains in context 19 which suggests a single event, and grain from this deposit may at least give a radiocarbon date for this event, but if these deposits are re-deposited from elsewhere this result may be unrelated to the coin moulds.

Context 20 underlies the coin mould deposits and includes waterlogged material. This includes some small wood and also matted organic and mineralised organic material. This material clearly reflects an archaeological dump, possibly even a single event or short duration deposit. The sample, <1008>, produced no ceramics but 17 sherds of grog-tempered late Iron Age pottery were recovered during the excavation (Thompson 2019). Radiocarbon dating of surviving organics from this context should give a date for the deposition of this organic material (i.e. a date after which the deposits above were 'dumped'), although once again it would not date the moulds themselves. It would attach a date to the pollen sample from this context, but since this is clearly a dumped deposit it cannot be considered representative of the local landscape at the time.

The underlying pollen sequence from alluvial deposit 31 produced no dating evidence but is presumed to predate what appears to be securely dated late Iron Age deposits above. In an effort to recover material that could be used for radiocarbon dating this sequence small sub-samples samples of <1010> and <1012> were washed. <1010> produced a single charred barley grain and a small legume, two pieces of charcoal suitable for dating and an uncharred elder seed. This sample is just below the top rather poor sample in the series and should indicate the approximate date for the upper part of this deposit. Sample <1012> is 40cm below and produced charcoal, charred and uncharred seeds some of which are suitable for radiocarbon dating. The pollen from this sample was significantly better preserved than the one higher in the sequence and the open grassland landscape that it suggests could be dated using this material. There may be suitable material for radiocarbon dating in the other pollen samples none of which has yet been processed or studied.

5.7.8 Conclusions

By Dr James Rackham

The material in the bulk samples from the late Iron Age and early Roman deposits appears to have a variety of origins. They show evidence for two potentially industrial scale activities, the coin production and local iron smithing, early crop processing stages, domestic rubbish, possible stable or floor sweepings and/or hay, local vegetation growing on the site and probably some slight riverine input. Despite the proximity of the modern river though, there is relatively little evidence for an aquatic or marshy (river edge) element. A few seeds of wet ground plant taxa, a snail typical of marsh, a caddis larval case (aquatic), pollen of Cyperaceae (sedges), water star-worts and bur-reeds or bulrush all point to wet ground, marsh of river edge communities and probably reflect the proximity of the river and the damp character of some of the land. The high incidence of ruderals, species typical of disturbed, perhaps nutrient rich waste ground, may reflect a habitat that could have developed locally through animal grazing and watering at the river edge or through other disturbance, but equally could have come in with dumped material from elsewhere on the site. This latter interpretation would seem the most likely for the deposits with the coin moulds (see Medlycott 2018 Plate 5) where the density of clay mould debris and pottery must reflect dumping, perhaps from site clearance somewhere nearby prior to development in the early Roman period? The dumping could also have been part of a programme of raising parts of the river floodplain, such as infilling a hollow left by a former course of the River Rib. The dumps themselves may then have been colonised by these ruderal species and shrubs such as elder.

There are indications of the contemporary late Iron Age and early Roman diet at the site. Cattle, sheep/goat, pig and chicken bones have been identified in the samples, along with eels and other small fish quite possibly taken from the river (although species will require identification), although some of the fish could have been washed in by the river. A small bird bone might derive from a song bird that was caught or a natural death while oyster indicates at least some trade with the coast. The cereals grown include barley, emmer, spelt, probably free-threshing wheat and oats, although the latter may have been a ‘weed’ rather than specifically cultivated. Occasional charred hazel nutshell indicates some exploitation of local resources. The frequency of house mouse teeth suggests buildings but these could have come in with the ‘dumped’ material, as could the other small vertebrates although the field voles, water shrew and frog/toads could have been living on and around the ‘dump’. The rich charred plant assemblage from context 19 contains the waste product of sieving the crop and the de-husking of hulled wheat indicating stages of crop-processing were being conducted within the settlement. Whether this processing was of Late Iron Age or early Roman date is problematic since this context produced pottery from both phases and the cereals are found in both (Greig 1991). The other cereal assemblages are typical of small scale accidental domestic waste generated during the final stages of crop cleaning and food preparation.

The pollen evidence from context 20 perhaps reflects hay rather than straw in this organic deposit, while that from the sequence through context 31 suggests an open largely cleared landscape, presumably in the late Iron Age although the pollen does not offer any evidence for the date of the sediments. The presence of cereal pollen suggests local arable, but whether the pollen entered the deposits from adjacent fields or as a result of crop processing activities nearby is not known. A cleared agricultural landscape is characteristic of the Late Iron Age in lowland Britain.

5.7.8.1 Acknowledgements

We should like to thank Trude Maynard and Angela Bain for the washing, floating and sorting of the bulk soil samples.

5.7.8.2 Pollen preparation procedures

Standard procedures (Moore and Webb 1978; Moore *et al* 1991) were used for extraction and concentration of the sub-fossil pollen and spores but, with additional techniques to remove mineral sediment. Pollen sub-samples were initially deflocculated in 10% boiling Potassium Hydroxide (KOH) followed by sieving at 150u to remove coarse material. Micromesh sieving (10u) was then used to remove any clay fraction. Samples were boiled in HF for 40 minutes, washed in distilled water. Samples were dehydrated and then given a standard Erdtmans acetolysis of three minutes duration. After washing, residues were stained with safranin and mounted in glycerol jelly, a personal preference where oil emersion at x1000 is frequently used. All stages involved centrifugation for 4 minutes at 3000rpm. The extracted pollen was identified and counted using an Olympus BH microscope fitted with Leitz optics at magnifications of x400 and x1000 with phase contrast facility. An extensive reference collection was available for identification of critical taxa. Pollen count data are presented in table form since too few samples were examined to warrant construction of a pollen diagram. Where percentage have been calculated, these are given as a percentage of total pollen (TP). Taxonomy, in general, follows that of Moore and Webb (1978) modified according to Bennett *et al* (1994) and Stace (1991).

6 Potential and significance of results

6.1 Realisation of the original Research Aims and Objectives

The project has studied a 10% sample of the total Late Iron Age coin-mould deposit as well as the associated finds and a sample of the paleoenvironmental evidence.

It has achieved some of its original Aims and Objectives, in that it has established the nature and date of the Braughing coin-moulds (A1 and O1-8). It has also contributed towards better understanding of the stages involved in the creation of coinage in Late Iron Age society, both as an object in itself and as a catalyst for change (A2, O8), largely by further elucidating the manufacturing processes for coin-making and possibly associated social interactions. It has also added to the sum of knowledge for the nationally important site of Braughing, both in the form of material culture and the local and wider environment (A3, O3, O7, O9).

Aim 4 (O8), Ensuring that the archive (both written and artefactual) is available to the public for further study will be achieved once the post-excavation process is completed.

6.2 Significance and potential of the individual datasets

6.2.1 Stratigraphic sequence

The site is located within the scheduled area of the Late Iron Age settlement and Romano-British small town of Braughing. It was a centre of political, religious and economic activity.

Despite the small scale of the excavations, the stratigraphic dataset has provided a body of evidence from seven distinct phases of activity: Period I: Pre-occupation horizon (Late Iron Age), Period II: Pre-coin mould horizons (Early Roman), Period III: Coin mould horizon (Early Roman), Period IV: Post-coin mould horizons (Roman), Period V: Post-Roman horizon, Period VI: Alluvium, Period VII: Modern era. All of the Periods, with the exception of Period 1 contain a mix of Late Iron Age and Roman material, reflecting the scale of activity on the site during those periods.

Late Iron Age

Period I Pre-occupation horizon

The primary horizon **(31)** consisted of a smooth, dark grey alluvium, interpreted as a sequence of river muds/silts within a largely pastoral habitat with some arable and limited local woodland. The charcoal and charred cereal within the deposit suggests that it is probably contemporary with the large Iron Age settlement at Braughing.

Early Roman

Period II Pre-coin mould horizons

Above the alluvium were a number of layers, some of which were probably flood layers. However other layers, such as **(13),** seem to represent dumping of settlement waste (eg context (13), possibly to raise the ground level next to the river. Context **(20)** contained compacted and matted vegetable matter, probably derived from a mixture of stable sweepings, hay, flooring materials and crop processing debris.

Period III Coin mould horizon

Sealing the above contexts was the coin mould horizon which was sub-divided into four contexts (**12**, **16**, **32** & **33**). **(12)** was the principal context with (**16**) being those coin mould fragments that were retrieved during water washing/sieving process and (**32** & **33**) were those finds retrieved from the 'baulk' that separated the excavation (*c*.0.4m wide) and the modern course of the River. Rib**.**

Context **(12)** was a dump or 'pavement' of 1415 fragments of coin mould and other finds in a very dark grey clay matrix that lay in the middle of the excavation trench. The pottery is predominately Late Iron Age in date but includes some early Roman wares (late 1st-early/mid-2nd century AD). When the finds from the cleaning horizon **(9)** were combined with **(12)** and **(32)** the total number coin mould fragments is 2429 (31,811g).

The range of habitats suggested by the environmental analysis suggest that there were episodes of dumping from several different locations within the wider Braughing site, with a small wetland component introduced by the river.

Roman period

Period IV Post-coin mould horizons

The earliest post-coin mould layers appear to derive from domestic rubbish disposal.

On the northern side of the site a half exposed oven/kiln **(5)**, as well as a small spread of chalk and another of cobbles and a single posthole.

Period V Post-Roman horizon
Overlying all the features was **(4)** which was a very dark grey loamy clay some 0.5m thick. The top half was mechanically removed, while the remainder was manually excavated.

Period VI Alluvium
Layer **(4)** was overlain by a layer of alluvium **(3)**.

Period VII Modern era
The alluvium was sealed by **(2),** a layer which derived from dredging the new river course. The uppermost horizon **(1)** was the top-soil.

Recommendations for further work:
The stratigraphy needs cross-referencing to the find-reports.

6.2.2 Coin Moulds

The coin-mould assemblage has national, and possibly international significance. Its significance rests primarily on the fact that it is one of only a small number of coin-mould assemblages identified either in Britain or in Western Europe. In addition, it is one of the largest assemblages of coin-moulds so far discovered. There have been between 7-9 other finds of coin-mould deposits from Braughing, making it the primary site for coin-moulds discoveries in Britain.

The Late Iron Age settlement at Braughing appears to have been a centre of assembly and conspicuous consumption on a large-scale, with a focus on a nodal position in the Late Iron Age routeway or road network. The material culture from the wider site includes in addition to the numerous coin-moulds, a rich collection of early imported continental vessels and amphorae. The trade-goods that came into Braughing appear to have been distributed from there to the settlements of Hertfordshire and perhaps beyond. This trade is the most visible element of the move towards 'romanisation' in the tribal society of post-Caesarean Britain, and Partridge (1975 argues that Braughing was 'the most important trading settlement in southern England'. This central position may be of relevance in understanding the potentially dispersed sources of the raw materials for the clay moulds identified by the SEM analysis and for presence of several manufacturing workshops being apparently involved in their creation. It is possible that the coin-moulds were made in different locations from where they were found, and they that they were brought to Braughing, either to be used or to be disposed of.

It must be remembered that all the following observations are based on a 10% sample of the assemblage and this may be subject to change if the remainder of the assemblage is assessed.

More than one fabric present in the assemblage, suggesting that the raw materials used for creating the moulds came from different sources. It is also certain that an entirely new manufacturing technique has been used to make some of the trays in the assemblage, and that for the first time in this country we now have strong evidence that some trays had holes that were made all at once. The closest parallels for this derive from Bavay in France (Scheers et al, 2000) and Rheinau in Switzerland (Bucher, 2011).

There are at least three groups of holes represented in the sample:

a. A group with round mouths and a base diameter range from 4mm to 10mm

b. A group with square mouths and a base diameter range from 6mm to 9mm

c. A group of holes with round mouths and a diameter range from 11mm to 17mm

This picture may be modified somewhat when the full assemblage is examined, but the group of square-mouthed holes were probably made using a process so far not identified elsewhere in Britain.

The assemblage shows clear evidence of chalk-washing, possibly to help maintain reducing conditions in the holes and to ensure that the metal did not stick.

The finding of grain casts firmly links the Ford Bridge 2016 material to the presumed seasonal aspect of minting in Braughing.

On the basis of the examination of the 10% sample, it seems likely that the Ford Bridge 2016 should not be regarded as part of the same act of deposition as the Ford Bridge 2007 assemblage. If this is confirmed by examination of the full assemblage, this conclusion, on its own, is highly significant. Why was Braughing the site of numerous discrete large deposits of pellet mould? Deposits found so far at Verulamium are spread over a wider area, but are much smaller, while the Old Sleaford assemblage is apparently the result of a single minting episode which has been dispersed and redeposited by later activity.

The three major Braughing/Puckeridge assemblages all appear to have been redeposited during the early to mid-Roman period, but as discrete and distinguishable bodies of material. This argues a certain amount of intentionality to the deposition process – why else would there be so little mingling of the assemblages?

The presence in the sample of three incompatible edge profile types suggests that at least three different ‘hands’ were responsible for making the trays from which the assemblage derives. While it would not be surprising to discover more ‘hands’ in the full assemblage, it would greatly enhance our understanding of the socio-economic context within which pellet-making occurred to be able to be able to answer this question with greater precision.

It has been shown that the range of intra-fragment average base diameter in the sample is greater than in any assemblage examined to date, with the exception only of the Puckeridge material. This range may well increase with the examination of the full assemblage. The hole depth range in the sample is significantly narrower than in either the Ford Bridge or Puckeridge assemblages, and it would be useful to know if this conclusion is good for the full assemblage.

Hole size and hole type groups have been distinguished in the sample, but these may be subject to considerable modification in terms of parameters as well as proportions when applied to the full assemblage.

In terms of ‘signs of heating’ in the 10% sample, the most obvious conclusions would seem to be:

1. That signs of extreme heating are rarely confined to the upper surface alone of a fragment.

2. That the relative rarity of vitrification suggests that the factors involved in its creation are more complex than simply great heat and the presence of wood ash (as suggested by Tournaire and Henderson in Tournaire *et al* (1987).

However, once again a full dataset could well necessitate modification of these statistically-derived conclusions.

Recommendations for further work:

Only a 10% sample of the coin-mould assemblage has been assessed and a number of significant observations have been made (see above). However in order to ensure that the conclusions drawn are as valid as they can be, it is recommended that the remainder of the coin-mould assemblage is assessed using the same methodologies

A central question that remains to be answered is the total number of tray forms present in the assemblage. and the settling of this question would result in a much more thorough description of the degrees of difference within the assemblage. If, as was achieved at Scotch Corner (Morley-Stone in Fell, 2020), the comparison of SEM and SEM-EDS results with that of the gross morphology of the coin moulds will generate the beginnings of a model of production in this assemblage.

The evaluation of the 10% sample suggests that there are signs of a previously unknown technique of making trays and that there are signs of a previously unknown method of making holes in some of the trays.

Comprehensive cataloguing of the distinguishing features of these techniques and the fullest possible elucidation of the processes used will be extremely important for two reasons: first, that this will enable the development of a much fuller picture of the composition of the assemblage; second, that our understanding of the use of coin pellet mould as a group of related techniques, rather than as a unitary tradition, will be vastly enhanced.

It has been suggested of several pellet mould assemblages that they result from a decentralised, contributory minting process rather than a centralised, 'command' model. If it can be shown that the fabrics present in the full Ford Bridge 2016 assemblage derive from geologically distinct areas, then it will be possible to show the areas served by the mint-masters at Braughing, and hence to build a tentative picture of contemporary socio-economic relationships.

The full examination of the gridded portion of Context (12) will reveal whether there are any distribution patterns in the deposit, which will address whether deposition was a single act or was carried out in stages, and whether the material existed as a single deposit before redeposition or was brought together specifically at the place where it was found. This approach has never before been used on a coin mould assemblage, partly because an assemblage of this nature has never been found before, and partly because this is an absolutely new area of research.

Finally, given the wealth of CPM data already obtained from Braughing using the same protocol, there is now an opportunity to calculate in detail the scale of the operation thus far revealed. By establishing hole size groups across all of the Braughing material found to date, establishing a maximum common volume for each group (thus revealing the largest probable pellet module for each group)and, as has been achieved at Scotch Corner, linking particular alloys to particular hole size groups, it will be possible to produce reasonable estimates for the quantities of metal involved. Using data obtained elsewhere for the amount of charcoal required to melt a given amount of metal, it will be possible to deduce the quantity of charcoal needed in the Braughing operation. The type of timber used in this type of metalworking is known, as are figures for the time needed to turn it into charcoal, the weight of green wood required to produce a given amount of charcoal, the area of woodland needed to produce such a quantity of green wood, and the time required for the coppicing cycle to grow it. The results will produce a credible picture of this industry and the resources required to sustain it. Moreover, it will be possible to produce timescales required for the production of these resources per head of workforce.

6.2.3 SEM and metallurgical analysis

Only a small proportion of the coin mould sample has been assessed, and in order to assess the metallurgy in more certain terms, an extensive compositional analysis of the assemblage is necessary. However the results of this initial analysis are of high significance.

The metallurgical evidence is unequivocally indicative of precious metal alloys being used to produce pellets. Whilst the compositions observed may be attributed to contemporary coinage alloys, the current compositional data is limited and cannot infer function or intended use of the pellets.

An additional level of complexity is added in the case of fragment 3095. The variety of metallic elements present may be evidence for the reuse of pellet mould trays for further series of pellet production, and in this case, pellets of differing composition or the subsequent re-use of the mould as furnace furniture.

The four fragments analysed have produced a variety of data regarding the moulds, with each fragment highlighting something distinct from the others. It is clear from the vitrification data that the moulds produced from non-calcareous fabrics suffered more severe transformations in the microstructure and may represent choices made by the manufacturers. The petrographic analysis shows that there are at least two distinct clay fabrics present in the four moulds analysed and that these are separated over two contexts. If moulds are indeed being brought together from both local production and productions further afield, then the significance of the deposition event must also be considered alongside the rest of the pellet production process.

Primarily, the results show that the assemblage of pellet mould fragments is more complex than a single instance of pellet production and subsequent deposition of the used trays. The extent of this complexity cannot be assessed from the data here and must be analysed with a larger dataset. Given the size and typological variety of the BRR16 pellet mould assemblage and the nature of its deposition, petrographic analysis of the mould fragments will be crucial to mapping and understanding the variations present and what insights this may give regarding Iron Age mould production, the extent of specialisation in the industry, and the curation of the artefacts following their use. To produce a suitable dataset, petrographic study of the moulds should encompass and accommodate at least three samples from each morphological type and each observable fabric type (per Landon's analysis). It is recommended to assess three samples of each type in order to identify secure patterns within the groupings. In discussion with Mark Landon a minimum number of **18 samples** (including the two in this report) is suggested to encompass any differences between Landon's observed fabric differences, as well as the typological variations in hole size and form (i.e. circle or square mouthed holes).

Recommendations for further work:

Further metallurgical study of the moulds should go in hand with the petrographic study (**18 samples,** including the two in this report), as metallurgical comparison between the mould classifications may distinguish separate instances of pellet production and instances of specific alloy productions. The analysis may further include samples from moulds containing trapped pellets for a thorough review of the metallurgical composition. Four mould fragments with trapped pellets have been recorded, so it would be diligent to assess a minimum of two. In tandem with the already assessed assemblage from Ford Bridge nearby (via SEM analysis by Henrietta Longden in 2007), analysis of the BRR16 assemblage has the potential to extend our understanding of the artefact type in the local area. The ability to perform a condensed analysis on multiple assemblages within close proximity will enable a greater understanding of this artefact type and its interactions with Iron Age society, more so than any other singular assemblage. The data can be directly compared with the data from Ford Bridge and surrounding sites to produce a clear picture of the pellet industry in the area, providing a core model from which assemblages from further afield may be examined.

6.2.4 Small Finds

The Small Finds assemblage is of variable significance. The presence of the metallurgical debris is further demonstration of the role that metalworking played in the settlement and may be directly associated with the deposit of the coin-moulds themselves. The remainder of the Late Iron Age and Roman objects are of a domestic nature most likely deposited as a result of casual loss or rubbish disposal and are of local significance in that they give further information as to the date and nature of the associated settlement.

6.2.4.1 Flint

Recommendations for further work: None.

6.2.4.2 Copper-alloy objects

Sixteen copper-alloy objects were recovered from contexts 04 (x4), 07 (x9) and U/S (x2) Only two are complete objects, both coins. Incomplete objects include: a fragment from the head of a 1st century Langton Down type brooch (SF527); a fragment of terret ring (SF530); a fragment of disc-shaped mirror (SF501); and other unidentified small fragments (SF503 (x9 pieces possibly part of the same object), SF532 & SF537).

Recommendations for further work:
All of the objects should be sent for conservation/cleaning. After conservation, the identification of the objects will need to be checked/confirmed and a more detailed description/analysis undertaken for the final report. Three of the objects (brooch, terret ring and mirror) should be illustrated.

6.2.4.3 Lead objects

Two fragments of lead (SF517a & d) and three pieces of lead sheet (SF517b-c & SF528) were recovered from contexts 04 and 05.

Recommendations for further work: As the assemblage is not readily identifiable, a short description for the final report should be sufficient.

6.2.4.4 Iron objects

Forty-two incomplete iron nails were recovered from contexts 04 (SF506 x31, SF531 x3 & SF533 x1), 05 (SF509 x1), 09 (SF510 x5) and 17 (SF535 x1). Five indeterminate fragments of iron were also recovered from contexts 04 (SF506 x5) and 05 (SF509 sx1) along with an iron object from context 04 (SF525) which has been very tentatively identified as a key.

Recommendations for further work:
All of the objects should be sent for x-ray. Once x-rayed all of the objects will need to be returned to a small finds specialist to be checked and further identifications/descriptions made.

6.2.4.5 Glass

Recommendations for further work: The three pieces could be sent to a glass specialist for identification and reporting, estimated 0.5 days. Alternatively if a short description of the assemblage for the final report would be sufficient this could be completed by the author, estimated 1 hour.

6.2.4.6 Shell

Recommendations for further work: None

6.2.4.7 Metalworking debris

Recommendations for further work: The metalworking debris will be sent to Mark Landon and Jake Morley-Stone to form part of the analysis of the coin mould and associated metal debris assemblage.

6.2.5 Late Iron Age pottery

The Late Iron Age pottery assemblage is of local significance. In character it is entirely normal for Braughing, with some specifically local traits and forms. It is dominated by the very common storage and rilled jars which are ubiquitous in Hertfordshire at this period. But it also includes fragments of specialist vessels made by expert potters, in forms found at major places and significant contexts. The date range is broad, covering much of the first century BC. Its condition suggests that it may have been either in use or lain in middens over a long period before finally being dumped together with the coin-moulds.

Recommendations for further work: None

6.2.6 Roman pottery

The Roman pottery assemblage is of local significance. It dates to the late 1st/early 2nd centuries and suggests that early Roman Braughing was part of the same regional trade network as that of Great Chesterford and other neighbouring settlements, albeit with the requirements for local coarse wares amply met by kilns in the close vicinity, including those around Much Hadham.

Recommendations for further work: None

6.2.7 Ceramic building material (CBM)

The ceramic building material is of local significance. It comprises 7 items, consisting of brick and tile, *opus signinum* and piece of tesserae.

Recommendations for further work: None

6.2.8 Environmental analysis

The environmental remains are of local significance. The material in the bulk samples from the late Iron Age and early Roman deposits appears to have a variety of origins. They show evidence for two potentially industrial scale activities, the coin production and local iron smithing, early crop processing stages, domestic rubbish, possible stable or floor sweepings and/or hay, local vegetation growing on the site and probably some slight riverine input. There are indications of the contemporary late Iron Age and early Roman diet at the site. The presence of cereal pollen suggests local arable, but whether the pollen entered the deposits from adjacent fields or as a result of crop processing activities nearby is not known. A cleared agricultural landscape is characteristic of the Late Iron Age in lowland Britain.

Recommendations for further work: None

7 ASSESSMENT: UPDATED PROJECT DESIGN

7.1 Revised Project Aims and Objectives

The project aims and objectives remain broadly similar to those identified for the first phase of the project (see Section 2), although taking into account the results of the initial assessment.

7.1.1 Aims

The aims of the project are to:-

A1 Establish the nature and date of the Braughing coin-mould deposit, including its associated contextual, artefactual and environmental evidence

A2 Contribute to a better understanding of the manufacture and role of coinage in Late Iron Age society, both as an object in itself and as a catalyst for change, including a consideration of the wider nature and context of Late Iron Age coin-mould assemblages and monetary usage in Britain

A3 Contribute to a fuller understanding of the history and significance of Late Iron Age and Roman Braughing, both regionally and nationally.

A4 Ensure that the archive (both written and artefactual) is available to the public for further study

7.1.2 Objectives

O1 Determine whether the clay fabric of the remainder of the coin-mould assemblage is single-source or from a range of sources, as suggested by previous studies, and consider whether this reflects the role of a scattered community bringing together raw materials in a structured way to create coinage.

O2 Establish what coin-mould forms are present within the remainder of the assemblage, and how does this compare both to previous excavated examples from Braughing and from other coin-mould deposits

O3 Establish the chemical signature of the metal that remains in the coin moulds in order that comparisons can be made with existing metallurgical data for Iron Age coins and for other metalwork from Braughing

O4 Undertake further SEM-EDF analysis of the moulds to cover a range of microscopic evidence relating to the manufacturing process, including the presence of prills, microscopic inclusions and signs of heating ?

O5 Consider the nature of the coin-mould deposit: is it the result of a single deliberate dumping event perhaps to symbolically destroy the means of making coins, or is it more casual deposition perhaps after they have ceased to be of use, in order to raise or stabilise the river bank

O6 The combined information from the coin-mould deposit (coin-moulds, pottery, animal bone and small finds) will help contribute to a fuller understanding of the material culture and diet of Late Iron Age/Roman Braughing and its trading links and relative status.

O7 To provide an overview of the entire assemblage to enable comparison with other Late Iron Age coin-mould assemblages

O8 Ensure that the results are available to other researchers

7.2 Project Team

Maria Medlycott, MA, MCIFA, FSA: Senior Historic Environment Consultant

Maria is an archaeologist of 28 years professional experience, specialising in landscape history, both urban and rural. She has a strong background in archaeological field work and long term experience in the provision of historic environment advice to local planning authority clients. Maria also has considerable experience in the development and delivery of large-scale research projects, both locally and further afield. These have included the completion of numerous post excavation reports and publications and historic environment characterisation reports. They have included the Roman Town of Great Chesterford, Prehistoric Springfield Lyons, the Revision of the Research Frameworks for the Eastern Region, and a World Heritage Site Comparative Analysis for the Landscape and Cultural Heritage of the Wadden Sea. She regularly works with local archaeological societies and conservation groups, both professional and amateur. Her skills include: documentary and cartographic research, GIS-based computer-systems, community engagement and activity planning for volunteers. She has published numerous articles and books on archaeology and her knowledge and enthusiasm makes her a popular public speaker.

Mark Landon: Coin pellet mould specialist

Mark has been involved in Archaeology since 1968. In 1998 he formed Braughing Archaeology Group and has directed an extensive programme of fieldwalking in North-East Hertfordshire. A report on investigations at the Bromley Hall Roman kiln site is available as part of the Roman Rural Settlement Project.

In 2006 he discovered his first piece of coin pellet mould (CPM) eroding out of the bank of the River Rib. Subsequent excavation in 2007, directed by Dr. Jonathan Hunn and funded by English Heritage, retrieved approximately 8kg of CPM. In the absence of any agreed protocol for recording CPM Mark devised a methodology that enables the comparison of coin mould from different sites. This was published as Appendix 4 of the 2007 report by Dr. Hunn 'Remedial Excavation: River Rib, Ford Bridge, Braughing, Hertfordshire, on behalf of English Heritage'. He also examined the Wickham Kennels and Henderson Collection assemblages of coin mould from Braughing, and held in Hertford Museum.
It was at this time that he began his long-term collaboration with Dr. Matthew Ponting of the Liverpool University Archaeomaterials Unit. In 2008 Mark also examined the so-called 'Puckeridge Assemblage' on behalf of the owner, and in 2009 wrote 'The Puckeridge Assemblage – An interim report' for the P.A.S. scheme. His article 'Making a Mint – The archaeology of a Late Iron Age industry' was published in Current Archaeology, number 234 in the same year.

In 2010, Mark was invited to speak at the Current Archaeology conference, held at the British Museum in conjunction with the Portable Antiquities Scheme. He also wrote a first report on the Ford Bridge assemblage for Hertfordshire County Council Historic Environment Unit. He was also commissioned by Dr. Tom Moore, then Senior Lecturer in Iron Age Studies at Durham University, to examine coin mould from 'The Ditches' (a site near Bagendon, Gloucestershire) and write a report on it for inclusion in a forthcoming book about the site. In 2011, he went to the British Museum to work on a sample of CPM from Old Sleaford that had come to light there for inclusion in the book about coin mould that he had begun to write. He also worked with Nicky Metcalfe, then of Verulamium Museum, to gather data from the Turners Hall assemblage. During 2012 and 2013, Mark devoted most of his time to carrying out analyses of his substantial database, and writing drafts of most of the chapters of his book '*Making a Mint – Comparative studies in British Late Iron Age coin mould*.'

In 2014, he was commissioned by Wardell Armstrong Archaeology to write a report on the coin mould found during developer-led excavations at Blackfriars, Leicester. At the same time, he directed the first of a series of small but important excavations involving Braughing Archaeology Group at the site of the former Braughing Station, adjacent to the Scheduled Monument Site of Wickham Hill. These demonstrated that significant Roman and Iron Age archaeology survives intact beneath much of the Station area. This work continued into 2016, and he is currently involved in producing the reports on this work, which are intended for publication in the Hertfordshire Archaeology series.

In 2015, Mark, together with Dr Ponting and Jake Morley-Stone, worked with Northern Archaeological Associates to work on the very important CPM assemblage found at Scotch Corner. This work was published in 2020.

In 2016, Mark was commissioned by Prof. Martin Biddle to write a report on the coin mould discovered in 1965 for inclusion in his report on the Winchester excavations. He also co-directed a rescue dig in the BRR16 mint site, after he and Braughing Archaeology Group discovered a second very large mint site eroding out of the bank of the River Rib. In the same year his book was at last published by Archaeopress. It received a very favourable review by Prof. Colin Haselgrove writing in the Prehistoric Society Book Reviews in July 2017, and is currently the standard work on the subject.

Jake Morley-Stone, BA, MSc: Petrographic analysis

The core interest of Jake Morley-Stone's archaeological career has been in material sciences and its application to data-driven investigation of the ancient past. He has specialised in the chemical analysis of metals and industrial ceramics, primarily through use of SEM-EDS, optical microscopy, and their related analytical techniques. Through his studies, he has also developed a keen interest in the British Iron Age, specifically the late period. His interest here lies in metal production techniques, and their place in the wider socio-economic landscape. Over the past three years, he has focussed on the study of Iron Age pellet moulds, analysing samples from Scotch Corner to assess their function and use, working with Mark Landon and Dr Ponting. His Master of Science in Archaeology (University of Liverpool) thesis, for which he gained a distinction, was on *Investigating the Metallurgical remains in LPRIA Pellet Moulds at Scotch Corner.* In 2020 he published the Scotch Corner coin pellet moulds - Morley-Stone J., Landon M. & Ponting M. (2020) 'Coin Pellet Moulds' in Fell D. (ed.) *Contact, Concord, Conquest*, Northern Archaeological Associates. His current doctoral research focuses on the study of Iron Age pellet moulds, analysing samples from across the UK to assess their function and use. In the final two years of his PhD he expects to participate in conferences such as the

Iron Age Research Student Symposium, Historical Metallurgy Society, Prehistoric Society, as well submitting articles to the journals Archaeometry and Antiquity.

Laura Pooley MA, Small Finds, Colchester Archaeological Trust

Laura graduated from the University of Birmingham in 2001 with a first class degree in BA Hons Ancient History and Archaeology. She first worked for the Colchester Archaeological Trust (CAT) from 2001-2007 on large fieldwork projects in Colchester. Large post-excavation projects included writing reports for Abbotstone and excavations at the Colchester Garrison, which included hundreds of Roman burials and the Colchester Roman circus. During this time she also worked as the finds officer coordinating post-excavation finds processing and CAT volunteers. While working at CAT, Laura completed an MA in Museum Studies at the University of Leicester (distance learning course). Between 2007-2015 Laura held various museum positions: at the Royal Cornwall Museum, Brading Roman Villa, York Archaeological Trust and the Grosvenor Museum in Chester. Since returning to CAT in 2015 Laura has worked as a post-excavation Project Officer writing up archaeological reports for excavations, evaluations and watching briefs. She has just completed the report on a large Roman cemetery on Area H of the Colchester Garrison. Other notable reports include the medieval site at Orange Street, Thaxted and the Roman site at Chapel House, Long Melford. Having developed a good understanding of archaeological small finds while working in both archaeology and museums, Laura now compiles small finds reports for CAT. She has co-authored small finds reports for excavations at Orange Street, Thaxted and 73-73a High Street, Brentwood, and has authored small finds reports for excavations at Flagstaff (Colchester Garrison), Colchester Northern Growth and Fiveways Fruit Farm, as well as a number of smaller projects.

7.3 Methods Statement

7.3.1 Tasks

The summary task-list are based on the recommendations for further work identified in Section 6.2:

Task 1: Project management: Ensure that the project runs on time and to budget, and addresses the aims and objectives identified in the Project Design.

Task 2: Analysis of the coin-mould assemblage: Recording of the coin-moulds using the methodologies established by Mark Landon for Late Iron Age coin moulds in order to enable cross comparisons with previous work undertaken for Braughing and other Late Iron Age coin-mould deposits. The remaining 90% of the coin mould assemblage will be assessed and measurements taken to identify coin-mould forms and fabric types in order to enable comparisons with other coin-mould assemblages in Britain and Gaul. Since much of the assemblage was lifted in 200 mm squares, analysis of the full body of coin mould will show with certainty whether there are any patterns of deposition which may indicate the way in which the material was brought together.

The MNI will be calculated for the sample, to provide some further quantification about the scale of the assemblage. The samples will be assessed for refitting in order to establish a better understanding the depositional processes. The analysis will also attempt to establish the original size of the moulds.

The initial identification of samples for scanning electron microscope with energy dispersive spectrometry (SEM-EDS) analysis of a representative sample of the pellet moulds (Task 4), petrological analysis (Task 5) and metallurgical analysis (Task 6) will be part of Task 3, the respective specialists will then make the final decision as to which samples will be assessed.

Task 3: SEM-EDS analysis
Scanning electron microscope with energy dispersive spectrometry (SEM-EDS) analysis of a representative sample of 12 of the coin moulds, covering the identified tray and hole types. The SEM will facilitate both the chemical investigation of the ceramic fabrics, and the metallurgical investigation of microscopic residues.

Task 4: Petrological analysis: The deposit of coin moulds discovered at Braughing makes it clear these objects were heavily involved within trade and social networks at the time. Thin-section petrographic study of the coin moulds will form an integral part of the Braughing research project and is crucial to understanding these moulds and the circumstances surrounding their manufacture and deposition.

The analysis will comprise the identification of 10 samples for thin-sectioning, from which the ceramic matrices will be characterised, recorded and compared (with both themselves and other geological data from the site/region). The samples will be chosen so as to cover the full range of coin-mould typologies present.

Task 5: Metallurgical analysis:
The analysis will comprise the identification of metal fragments from the microscopic residues present in the coin moulds for analysis (using the 10 samples analysed in Task 4) and a sample of the trapped pellets. The samples will be chosen so as to cover the full range of coin mould typologies present.

Task 6: Small finds analysis:

38 small finds have been recovered from the site. All of the copper alloy objects should be sent for conservation/cleaning. After conservation, the identification of the objects will need to be checked/confirmed and a more detailed description/analysis undertaken for the final report. Three of the objects (brooch, terret ring and mirror) should be illustrated. As the three lead small finds are not readily identifiable, a short description for the final report should be sufficient. All the iron objects will be x-rayed, then assessed and identifications/descriptions made. Depending on the results of the x-rays and further identification, SF525 (if it is an object and not a nail), may require illustration. A short description of the glass assemblage for the final report will be prepared.

Task 7: Preparation of report
The report will comprise the site narrative, finds assessments and a discussion that will analysis all of the individual reports and place them within a local, national and international context. The report will be informed by the ongoing work by Isobel Thompson and Stewart Bryant on pulling together the evidence for the wider Braughing area.

Task 8: Preparation of publication article
The report will form the basis of an article for submission to a peer-reviewed journal, such as Antiquity or the Journal of Roman Studies.

Task 9: Collation and deposition of archive
The bulk of the archive is currently stored with Mark Landon (the environmental material is held by Dr James Rackham). It is intended that the physical archive, comprising the written archive, the finds and environmental samples will be deposited with Hertford Museum, who hold earlier discoveries from Braughing. The digital archive, comprising the assessment report, specialist reports, database, scans of the recording cards, and plans, and photographs will be archived with the Archaeology Data Service.

At this stage it is not known precisely how many files will be created so the figures quoted for archiving are indicative**. If the project does not proceed beyond the assessment phase both the physical and digital archive will be sent for archiving, if however the project proceeds to full analysis and publication archiving will take place after this second phase of work.**

7.4 Health and Safety Statement

This project will be desk-based and no specific health and safety issues have been identified. Essex County Council and Place Services have a fully-inclusive corporate Health and Safety policy for employees. The individual specialists have their own health and safety policies.

7.5 Risk Log

Risk number	1
Description	The specialist reports are delayed
Probability	Medium –The bulk of the material is the coin-moulds and Mark Landon and Jake Morley-Stone are all committed to achieving the best result with the material and have extensive experience of working with this type of finds. There is an issue however with securing lab access for the SEM analysis while the current Covid restrictions are in place, this is allocated on a booking-system.
Impact	Medium – will delay completion of the project
Countermeasures	The timetable allows for an amount of 'slack' time to enable the various specialisms to fit this project into their existing commitments and constraints imposed by Covid. The Project Manager will ensure work proceeds in accordance with agreed timetable and inform HE if unavoidable delays occur
Estimated time/cost	1-2 months delay, no cost implications
Owner	MM
Date this entry last updated	

Risk number	2
Description	The Project Co-ordinator is unavailable or busy on other projects
Probability	Low –The Braughing Project will be structured into Maria Medlycott's timetable, and Place Services has enough Historic Environment personnel to ensure a replacement co-ordinator can be put in place if illness delays the project
Impact	Medium – will delay completion of the project
Countermeasures	The timetable allows for an amount of 'slack' time to enable the various specialisms to fit this project into their existing commitments. The Project Manager will ensure work proceeds in

	accordance with agreed timetable and inform HE if unavoidable delays occur
Estimated time/cost	1-2 months delay, no cost implications
Owner	MM
Date this entry last updated	

Risk number	3
Description	Delay in response from Historic England
Probability	Low –The Braughing Project will have a nominated Historic England supervisor to ensure that documents are commented on by HE staff in a timely fashion
Impact	Low - could delay completion of the project if comments on draft report delayed
Countermeasures	The Project Co-ordinator will chase up on Historic England comments
Estimated time/cost	1-2 months delay, no cost implications
Owner	MM
Date this entry last updated	

7.6 Products, communication and engagement

7.6.1 Report

A final report will be produced. This will comprise:-

1) Introduction to the project
2) Summary background history of the wider Braughing site
3) Stratigraphic assessment of the excavation
4) Finds reports
    a) Coin moulds
    b) SEM-EDS report
    c) Petrological report
    d) Metallurgical report
    e) Small Finds report
5) Environmental reports
6) Discussion considering both the site and the coin moulds themselves and placing them within a local, regional and national context.

The report will be available to researchers and the wider public through the Historic England Research Reports Archive https://historicengland.org.uk/research/results/reports/ and ADS. An article using the report as a basis will be submitted to a peer-reviewed journal such as Antiquity, the Oxford Journal of Archaeology and the Journal of Roman Studies.

7.6.2 Publication

The data obtained during this study will also form a major part of a book provisionally entitled 'The Mints of Braughing', a collaboration between Mark Landon and Jake Morley-Stone to be published by Archaeopress. This is a long-term project and will be funded by the authors. This book will bring together all of the available data on what has become the largest Iron Age site for coin pellet mould deposition so far discovered in Europe and, in conjunction with directly comparable data from other sites, attempt to answer general questions about the manufacture, purpose and use of this class of artefact. It will consider the nuances and range of practices present in the manufacture of Iron Age coins. It will also give an authoritative picture of the scale and output of the Braughing operation, and give new insights into the social, economic and symbolic value structures prevalent at this site.

7.6.3 Digital archive

The archive, comprising the assessment report and any associated data or images will be supplied to ADS for digital storage and to ensure that there will be permanent public accessibility to the results of the project.

7.6.4 Physical archive

The physical archive, comprising the finds, the paper archive and a copy of the digital archive, will be deposited with Hertford Museum.

7.6.5 Communication and engagement

The report and digital archive will be available to the public via the ADS website.

Both Mark Landon and Jake Morley-Stone will give lectures to specialist and general audiences on what they have discovered during their research into this assemblage. It is anticipated that this will include talks to the Iron Age Research Student Symposium, and the Historical Metallurgy Society and Prehistoric Society conferences.

In addition to the final report at the end of this study, it is intended that articles covering particular aspects of the methodologies and findings will be published in several recognised journals, such as Antiquity, the Oxford Journal of Archaeology and the Journal of Roman Studies.

Mark Landon and Jake Morley-Stone are intending to prepare a separate volume, provisionally entitled *The Mints of Braughing,* to be published by Archaeopress, which will draw together and interpret all the coin mould data from all of the Braughing sites, including the results from this project.

Outreach to the wider public will take the form of updates on the Place Services and Historic England website and twitter feed.

7.6.6 Products:

Product number: P1
Product title: Final report
Purpose of the Product: Analysis of the material evidence from the Braughing coin-mould excavations and discussion of the significance of the results
Composition: Report
Derived from: Project results
Format and presentation: .pdf document
Allocated to: Maria Medlycott
Quality criteria and method: Editing text by Richard Havis
Person/group responsible for quality assurance: Project Manager
Person/group responsible for approval: Richard Havis
Planned completion date: Draft report for circulation end Dec 2021

Product number: P2
Product title: Archive
Purpose of the Product: Collation and deposition of an ordered and structured archive (artefactual and written)
Composition: Artefactual and written archive
Derived from: Assessment phase (and any further analysis undertaken)
Format and presentation: Digital and paper documents, artefacts
Allocated to: Maria Medlycott
Quality criteria and method: Richard Havis
Person/group responsible for quality assurance: Project Manager
Person/group responsible for approval: Richard Havis
Planned completion date: Dependent on whether the project does not proceed beyond the assessment phase both the physical and digital archive will be sent for archiving in May 2021, if however the project proceeds to full analysis and publication archiving will take place after this second phase of work (January-Feb 2022).

Product number: P3
Product title: Peer-reviewed journal article
Purpose of the Product: Dissemination of the results of the project to a wider audience
Composition: Report
Derived from: Project results
Format and presentation: Article in peer reviewed journal
Allocated to: Maria Medlycott, Mark Landon and Jake Morley-Stone
Quality criteria and method: Peer-reviewed journal
Person/group responsible for quality assurance: Editor
Person/group responsible for approval: Editor
Planned completion date: Draft text submitted to peer-reviewed journal 2022

Product number: P4
Product title: Lectures
Purpose of the Product: Dissemination of the results of the project to a wider audience
Composition: Lectures
Derived from: Project results
Format and presentation: Lectures
Allocated to: Mark Landon and Jake Morley-Stone
Quality criteria and method: Conference organiser
Person/group responsible for quality assurance: Conference organiser
Person/group responsible for approval: N/A
Planned completion date: 2022-23

7.7 BUDGET AND TASKS

7.7.1 Budget

Task	Officer	Day rate	Days	cost
Project Manager	Maria Medlycott (ECC)			
Coin mould analysis	Mark Landon			
Small Finds	Laura Pooley			
Illustration	Colch Arch Trust			
Petrological analysis	Jake Morley_Stone			
SEM analysis	Jake Morley_Stone			
Trapped pellet metallurgical analysis	Jake Morley_Stone			
Trapped pellet SEM analysis	Jake Morley_Stone			
Illustration	Iain Bell			
Sub-total				
25% Overheads	ECC staff			
10% overheads	specialists			
Total Staff costs				
Conservation costs x-ray etc				
Storage costs				
ADS digital archive (estimated at £1,500), funded directly by HE				
Boxes				
Mileage				
Sub total				
Total excluding VAT				

7.7.2 Tasks

Task	Officer					Total
Project Management	MM					
25% overheads						
Coin mould analysis - Mark Landon		**Unit**				
Collect data	ML	Bag				
Enter data and analyse	ML	Day				
Write report	ML	Day				
Record cards	ML	per 1000				
Photography	ML					
Scan record cards	ML	Day				
Sub Total						
Petrological and metallurgical		**Unit**				
Thin Section Preparation		Sample				
Petrological Study		Day				
SEM Sample Preparation		Day				
SEM Analysis (including EDS)		Day				
Data Evaluation and Analysis		Day				
Write Report		Day				
Sub Total						
Metallurgical analysis of trapped pellets within fragments						
SEM Sample Preparation		Day				
SEM Analysis (including EDS)		Day				
Data Evaluation and Analysis		Day				
Write Report		Day				
sub total						

Colchester Arch Trust small find report and conservation						
Small find report						
illustration						
Sub total						
Report production						
Site text preparation	MM					
Integration of specialist results	MM					
Overall Discussion	MM					
Editing following circulation to specialists	MM					
Editing following EH comments	MM					
Preparation of article for publication	MM					
Sub total						
Illustration for project report and coin moulds	IB					
Other costs						
Conservation (x-ray, conservation, transit)						
ADS digital archive (estimated at £1,500), funded directly by HE						
Storage costs (Herts Museum)						
Boxes						
Mileage						
Total excluding VAT						

7.8 PROJECT TIMETABLE

We have translated the Method Statement and consultation process into a work programme for the project. It includes provision for meetings with the client team and stakeholders. Additional time has been allowed within the programme for the collation of data from stakeholders in case of delays in supply from external bodies (see Risk Log). We confirm that we have the resources and can undertake the work within the time-scale described following the programme illustrated below.

7.8.1 Gantt Chart

Tasks	**2021-2022**									
Month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Task 1: Project Management	!------	------	------	------	-------	-------	-------	-------	-----	----!
Task 2: Coin mould assessment	!-----	------	---------	--------	---------	--------	---------	------!		
Task 3: SEM-EDS analysis	!-----	------!								
Task 4: Petrological analysis			!--------!							
Task 5: Metallurgical analysis				!---------	---------	--------!				
Task 6: Small Finds Assessment	!-------	------!								
Task 7: Report preparation				!---------	---------	---------	---------	------!		
Task 8: Article preparation									------!	
Task 9: Archive deposition										!-----!

NB - Dates are dependent on start date of project

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