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# Archaeometallurgical residues from Llangors Crannog

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## Abstract

*The assemblage of possible metallurgical residues was large (538 pieces excluding various extraneous finds). There were 189 items of probable archaeometallurgical origin (slags, hearth lining, crucible), 65 items of low density fuel ash slag which may not be of metallurgical origin and 186 pieces of indeterminate fired clay. In addition there 98 items associated with the burning of coal (coal, coke, clinker), most, if not all, of which are likely to be later post-medieval in date.*

*Of the archaeometallurgical residues, most are probably associated with the working of iron. One complete and several substantial fragments of small smithing hearth cakes indicate end-use iron-working (blacksmithing). Most of the indeterminate dense slags are probably also derived from the fragmentation of similar cakes. Several small fragments of highly bloated pale grey ceramic with an external wood ash glaze may be fragments from the clay coatings applied to iron objects in order to braze them (coat or join them with a copper alloy). One sherd of crucible is also probably indicative of non ferrous metalworking, but has no visible adhering residues.*

*The large body of fired clay fragments is not particularly indicative of originating process. Some may be derived from metallurgical hearths (but lack the distinctive internal vitrified surface), others may be from domestic hearths or be fired daub. Some fragments may possibly be from moulds, but there are no pieces with clear diagnostic features of being moulds.*

*The low density fuel ash slags are abundant, but again not indicative of a particular process.*

*Materials derived from the burning of coal may be residues from domestic hearths, but it likely that the high temperature residues (clinker) derive from steam boilers.*

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## Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary, and were summarily described and recorded to a database (table 1).

## Description

### *Material of probable or possible metallurgical origin*

#### Smithing hearth cakes

Some twenty three pieces of slag were identifiable as being derived from smithing hearth cakes (SHCs). Those pieces for which a size could be estimated for the original SHC all indicated very small cakes. One example [#3082] was complete and weighed 209g. Four incomplete examples suggested original weights of between 100 and 200g. One piece [#650] was from the burr (the region of interaction between the slag cake and the hearth wall) of an SHC and weighed 128g, possibly suggesting a slightly larger original SHC weight, probably of more than 200g. The other sixteen pieces were small fragments with textures that allowed

confident attribution to SHCs, but which were too small to allow estimate of original size.

The textures seen in the SHC material varied from slag rich in charcoal inclusions, through grey slags with abundant vesicles, to material with a dense texture and a somewhat lobed surface. The larger specimens suggest that the SHCs were overall fairly dense, compact and well-formed, despite their small size.

Four of the SHC fragments came from area A (contexts 3, 15, 16 and 23). One fragment was from D6. The other eighteen pieces were from the underwater surveys.

**Indeterminate dense slag**

Approximately 94 small fragments of indeterminate dense slag were retrieved. Most of these were small fragments of dark grey vesicular slag without clear identifying features. All of the pieces were compatible with an origin in iron working. It is likely that most of this material comprises fragments of smithing hearth cakes that have become too fragmented for that origin to be recognisable with any confidence.

**Crucible**

One single small fragment of crucible was identified from the assemblage ([#5357, from corridor 42, 1-3-1.5m). The piece was a rather stout rim, from a crucible of uncertain form, with no visible slagging or other residue.

**Highly vitrified, bloated ceramic**

Ten pieces of highly vitrified, bloated ceramic with a pale grey colour were identified as being distinct from most of the assemblage of fired ceramic, although similar to some of the fuel ash slags. Two of the fragments show a green glaze (typical of a wood ash glaze).

Although such material cannot be referred to any particular process with certainty, they show some characteristics in common with the clay coatings employed to cover iron during brazing (Young in press). Such material (referred to as shrouds or wraps) typically shows a bloated pale grey quartzose ceramic, with a dimpled green glazed exterior and a rather variable internal surface, sometimes with a fabric impression and sometimes with a vesicular glassy coating. One of the present sherds [#4213] shows a slightly striated internal surface which might be a poor fabric impression.

Bloated fabrics of this kind have been recorded in other contexts however, including in furnace linings (Young 2010), so the identification of these materials as brazing shroud must remain tentative.

**Low density fuel ash/lining slags**

Sixty five pieces of low-density glassy slags were retrieved. Such slags are typically formed through the fluxing action of the fuel ash on particles of fine-grained soil or clay from the substrate into which a hearth has been cut, from impurities within the fuel or from the hearth materials. Some coarser grained, gravel-grade particles, that have been partially vitrified are also included here, and would have had a similar origin.

It is likely that this group embraces materials from a variety of different processes. Some may be pieces of clinker (resides from coal-burning) that happen to lack the diagnostic criteria of clinker (such as a black glassy matrix, a maroon surface and enclosed particles of burnt shale). Others may be genetically close to the lining slags mentioned below, but differing in having a more vesicular or a paler glass. Others again may be associated with the partial melting of small isolated derived particles within a hearth.

Fuel ash slags may be produced in metallurgical hearths, and may be particularly prominent in hearths from non-ferrous metalworking (such as the casting of copper alloys or the brazing of iron), in which, unlike the smithing of iron, the metal being worked does not (intentionally at least) directly enter the hearth.

On the other hand, fuel ash slags may also form in non-metallurgical hearths and kilns. Some described examples derive from cereal drying kilns (e.g. Young 2005, 2009), but they would also be expected to be produced in other forms of hearths and kilns.

**Vitrified hearth lining and associated lining slag**

There were sixty one fragments of fired ceramic with features (principally a vitrified surface with a dark glass) that are strongly suggestive of these being pieces of vitrified hearth lining. This material is almost all oxidised-fired, although some shows a superficial darker, possibly reduced-fired, layer. A minority of the material shows evidence for organic tempering. Most of the material bears fine sand grains but a few samples show some coarser grains that might possibly be a deliberate addition.

The dark colour of the glass (which is itself frequently rich in sand-grade quartz grains derived from the ceramic substrate) is compatible with an origin in an iron-working hearth. None of the material showed any diagnostic morphological features that would enable attribution to a tuyère or other particular hearth component.

**Indeterminate fired clay**

The assemblage includes approximately 150 fragments of oxidised fired clay, seventeen of which showed organic temper. Almost all of this material came from Area C grids A14, A15, A16, B15 and B16.

There were nine fragments of indeterminate reduced-fired clay, three of which showed fine organic temper (hair?). These pieces were in general more fired than the oxidised material, with some degree of vitrification observed in several.

There were twenty seven fragments of fired clay with variable oxidation. These mostly derived from the same area of excavation as the oxidised fired clay described above. Some of these pieces are compatible with being degraded fragments of moulds, but none is certainly so.

*Material of probable non-metallurgical origin*

**Material associated with the use of coal**

A large number of finds were identifiable as residues associated with the burning of coal. There was no confirmed association of any of this material with metallurgical activities (the fuel for which was charcoal wherever an identification could be made).

Coal is likely to have been used both as a domestic fuel from the later medieval period onwards and as a fuel for steam engines in agricultural machinery (and perhaps also in boats).

In this collection, 18 isolated pieces of coal were recorded, all but two from excavations on the crannog rather than from the underwater survey.

Some forty two pieces of coke were recovered (the precise number is uncertain because of breakage), approximately half from the excavations and half underwater. The most likely origin for this material is as an incidental residue from incompletely-burnt coal, rather than being deliberately-produced metallurgical or household coke, although the materials cannot be distinguished,

The partial melting of the inorganic component of coal generates clinker. Seven pieces of clinker were identified, and a further seven pieces were probable. Of the fourteen pieces five were recovered during excavations and nine underwater.

One particular distinctive class of material was an ashy concretionary material, containing small particles of fresh coal, but probably cemented by clinker. Twenty four particles of this class were recovered, all in a very small area. Corridor 31 yielded this material from intervals 5.3-5.7m (one piece), 6.8-7.3m (four pieces) and 7.3-7.5m (one piece). Corridor 32 had similar material from intervals 5.9-6.4m (one piece), 6.4-6.8m (five pieces), 6.8-7.3m (seven pieces) and 7.3-7.9 m (two pieces). Corridor 33 produced three pieces from interval 7.3-6.65m. This tight clustering suggests that this material may derive from a single depositional episode, probably the cleaning of a boiler on a boat.

#### Other materials

Various non-metallurgical materials were contained within the assemblage. Items identified as rock fragments have not been incorporated in the final catalogue. Other samples included building materials (brick, plaster), bitumen, a bleb of plastic, fragments of nails and more significantly at least thirteen fragments of bone.

## Interpretation

The assemblage shows considerable mixture with materials that are likely to be post-medieval, but there is a core of material indicative of light blacksmithing, of the use of non-ferrous metal (probably copper alloy casting) and possibly also of brazing.

The late 9$^{th}$ to early10$^{th}$ centuries is not a period for which there are many well-described blacksmithing residue assemblages, so there are few good comparative examples. The only blacksmithing assemblages of this date from Wales are the unpublished collections from Llanbedrgoch (Anglesey) and Abernant (Newport). Smithing residues of this period have been described from South Hook (Pembrokeshire), but are associated (Young 2010a) with primary smithing (bloom smithing) rather than secondary smithing (blacksmithing). There is also an almost complete lack of well-described smithing residue assemblages from Late Saxon England.

In general, however, small SHCs like those from Llangors, are typical of blacksmithing assemblages of earlier Romano-British age, as well as of slightly later medieval age. The blacksmithing slags of Roman age have had maximum sizes of about 820g at both Carmarthen (Crew 2003) and Marsh Leys Farm (Young 2005a), with mean weights of 230 and 330g respectively. The 12$^{th}$ century assemblages from Worcester in Mill Street (Young 2009b) and Willow Lane (Young 2007), are very similar, with maximum weights of 782g and 770g respectively and mean weights of 233g and 327g respectively.

In Ireland, 9$^{th}$ to 10$^{th}$ century smithing assemblages have been described from secular sites at Woodstown, Co. Waterford (Young 2006, 2008b, 2009a), Rochefort Demesne, Co. Westmeath (Young in press), Blackchurch,Co. Kildare (Young & Kearns 2010a) and Ballyellin, Co. Wexford (Young & Kearns 2010b). Assemblages of smithing residues probably of this age are also known from the monastic centres of Clonmacnoise, Co. Offaly (author's work in progress), Clonfad, Co. Westmeath (Young in press) and Armagh (Gaskell Brown & Harper1984). For most of these sites, it would appear that there was at least some primary smithing being undertaken, so the SHC assemblages contain much larger examples, alongside the small ones from blacksmithing. It would appear likely that iron was traded or distributed in an incompletely refined form in early medieval Ireland (Young, in press).

The production of copper alloys artefacts has been recorded in 9$^{th}$-10$^{th}$ century Ireland in the Viking centres of Woodstown (Young 2006, 2008b) and Dublin (Bayley, forthcoming), as well in Irish monastic "proto-urban" centres including Clonmacnoise (author's unpublished data and Armagh (Gaskell Brown & Harper1984). In England similar occurrences are seen, for instance, in the urban centres of York (e.g. Bayley 1992) and Hamwic, but also on other high status sites (e.g. Cheddar, Rahtz 1979). In addition, copper alloy artefacts were cast at some of the small, but high status sites in Ireland, including both elite ringforts (e.g. Rochefort Demesne mentioned above) and, perhaps more significantly, on 'royal' crannog sites, such as Lagore Crannóg, Co. Meath (Comber 1997), which provides particularly abundant evidence for both ironworking (unfortunately not yet fully described) and the casting of copper alloys.

In contrast to these high status sites, rural smithies in Ireland, including Ballyellin and Blackchurch mentioned above, together with the slightly younger smithies at Coolamurry, Co. Wexford (12$^{th}$ century?; Young 2008a) and Garryleagh, Co Cork (14$^{th}$ century; Young 2009b), appeared to have worked solely with iron.

Brazing has not been widely recognised in early medieval Ireland. Dublin (Bayley forthcoming) is the only site in Ireland where the brazing is of certainly of 9$^{th}$ – 10$^{th}$ century date. In Scandinavia, brazing has been more widely recognised at this period (e.g. Gustafsson 2005; Soderberg & Holmquist Olausson 1997), mostly on high status and proto-urban sites.

In summary, although the assemblage is small, there are parallels with metalworking evidence from other high status sites of the period. The tentative identification of residues from brazing adds to the very small number of early medieval sites in Britain and Ireland on which this activity has been recognised.

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*Table 1. Summary catalogue by residue class. Blue tone indicates material appearing in more than one category.*

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| **group 1 : materials derived from the burning of coal** | | | | | | | |
| LC 89 | 6 | Area A, context 6 | | 1 | 2 | clinker | fuel ash slag with white vesicular bloated clast coated in melt - probably clinker |
| LC 90 | 2172 | Area C, Grid B8 | | 2 | 1 | clinker | black hard material - coke/Mn and small rounded slag fragment |
| LC 90 | 2305 | Area P, Grid 11 | | 1 | 26 | clinker | large block of clinker with tiny fragment of pale green FAS |
| LC 90 | 2339 | Area P, US | | 1 | 100 | clinker | large ball of clinker with coal shale |
| LC 92 | 4046 | corr. 32, 6.4-6.8m | | 2 | | clinker | 1 piece clinker, 1 piece of iron slag (check the ceramic section too) |
| LC 92 | 4326 | corr. 31, 4-6.6m | | 1 | + | clinker | slightly clinkery-looking FAS |
| LC 92 | 4448 | corr. 33, 7.3-7.8m | | 2 | 1 | clinker | 1 piece oxidised fired ceramic with irregular glass layer, small fragment of partially burnt coal shale |
| LC 92 | 4668 | corr. 42, 2.0-2.3m | | 1 | 1 | clinker | fuel ash slag bleb with chocolate-brown surface - possibly clinker? |
| LC 92 | 4763 | corr. 32, 0.0-0.3m | | 1 | + | clinker | 1 piece stone, 1 piece clinker (vitrified shale with maroon surface) |
| LC 92 | 4829 | corr. 34, 5.4-6.0m | | | | clinker | fuel ash slag with slight maroon surface |
| 34 | 4839 | corr. 34, deep search | | | | clinker | 3 pieces of stone, 1 piece of clinker |
| LC 92 | 5070 | corr -2, 4.2-4.5m | | 1 | 10 | clinker | large piece of vesicular iron slag, small piece of FAS with small area of maroon on surface |
| LC 92 | ? | corr. 37, 2.8-3.7m | | 1 | 2 | clinker | highly vesicualr orange bloated glassy material, probably vitrified pebble |
| LC 92 | ? | corr. 31, 7.3-7.5m | | 3 | 5 | clinker & coal concretion | smallest piece is low density FAS. Medium piece is clinker, large piece is cemented clinker and coal dust. |
| 2004.56h | 8618 | b1 | 7062 | | | clinker & coke | one piece of coke, one piece of FAS with slightly maroon surface, variegated pale/grey |
| LC 92 | 4305 | corr. 34, 7.5-8.0m | | | | coal | coal |
| LC 92 | 5613 | corr. 37, 2.6-2.8m | | | | coal | coal |
| 2004.56h | 8047 | m6 | | | | coal | coal |
| 2004.56h | 8576 | a10, sw | 7005 | | | coal | 4 pieces of coal |
| 2004.56h | 8602 | e1, se | 7240 | | | coal | coal |
| 2004.56h | 8722 | a3 | 7011/7013 | | | coal | 2 pieces of coal |
| 2004.56h | 8734 | m6 | | 6 | | coal | 6 pieces of coal |
| 2004.56h | 8763 | a3, nw | 7010 | 2 | | coal | 2 pieces of coal |
| LC 92 | 4023 | corr. 31, 5.3-5.7m | | 2 | 2 | coal concretion | 1 piece vesicular iron slag, 2nd piece is concreted ash and coal fragments |
| LC 92 | 4043 | corr. 32, 5.9-6.4m | | 1 | + | coal concretion | indurated coal dust and clinker |
| LC 92 | 4047 | corr. 32, 6.4-6.8m | | 5 | 21 | coal concretion | 5 pieces from a slightly clinker-bound conglomerate of coal particles, 1 bleb of fuel ash slag |
| LC 92 | 4052 | corr. 32, 6.8-7.3m | | 7 | 5 | coal concretion | coal , coal shale and some grit bound by pale fuel ash slag, some shale fragments coated with more typical maroon clinker, clinker also occurs as spheroids |
| LC 92 | 4055 | corr. 32, 7.3-7.9m | | 3 | 3 | coal concretion | 2 pieces of clinker binding coal residue, 1 stone |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | 4441 | corr. 31, 6.8-7.3 | | 5 | 2 | coal concretion | 1 piece of bone, plus 4 pieces (broken?) of cemented clinker and coal dust |
| LC 92 | 4449 | corr. 33, 7.3-6.65m | | 3 | 4 | coal concretion | pale fuel ash slag binding coal fragments |
| LC 90 | 1447 | Area C, Area A5, upper deposit | | 1 | + | coke | 1 stone, plus 1 lump oxidised fired clay plus one coke fragment |
| LC 90 | 2041 | Area C, Grid A7 | | 1 | 4 | coke | coke |
| LC 90 | 2099 | Area C, Grid A8 | | 1 | 2 | coke | coke |
| LC 90 | 2163 | Area C, Grid D1 | | 3 | 44 | coke | broken large block of very low density black FAS or more likely coked remains of coal |
| LC 90 | 2212 | Area C, Grid B7 | | 1 | + | coke | 2 pieces of ?fired clay and 1 piece of coke |
| LC 90 | 2284 | Area C, Grid B4, upper layer | | 1 | 3 | coke | coke |
| LC 90 | 2324 | Area C, Grid B10 | | 1 | 4 | coke | coke? |
| LC 90 | 2379 | Area C, grid B10 | | | | coke | coke |
| LC 90 | 2400 | Area C, Grid B (?) | | 1 | 1 | coke | coke |
| LC 91 | 2909 | Area C, Grid A14, contexts 4/2 | | 2 | 4 | coke | 1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface |
| LC 90 | 3272 | Area C, Grid B5 | | 1 | + | coke | Very glassy, black, slag or coke |
| LC 92 | 4011 | corr. 30, 5.0-5.5m | | 1 | - | coke | coke |
| LC 92 | 4016 | corr. 30, 6.15-6.5m | | 1 | + | coke | 1 piece of coke 1 piece of charcoal or coke |
| LC 92 | 4477 | corr. 31, 0.1-1.0m | | 3 | + | coke | 1 piece of coke, 1 piece of dense iron slag |
| LC 92 | 4499 | corr. 33, 7.3-6.65m | | 2 | 1 | coke | 2 pieces of FAS plus 1 piece coke |
| LC 92 | 4518 | corr. 32. 1.8-2.0m | | 1 | 60 | coke | part of shc, plus block of coke (9g) |
| LC 92 | 4582 | corr. 33, 3.7-4.1m | | 2 | + | coke | coke |
| LC 92 | 4599 | corr. 34, 1.3-1.9m | | 2 | + | coke | coke |
| LC 92 | 4606 | corr. 34, 1.9-2.3m | | 2 | 1 | coke | 1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth |
| LC 92 | 4706 | corr. 34, 3.0-3.6m | | 1 | + | coke | coke |
| LC 92 | 4726 | corr. 38, 2.3-2.6m | | | | coke | coke |
| LC 92 | 4902 | corr. 39, 6.0-6.5m | | 1 | + | coke | coke |
| LC 92 | 5157 | corr. 45, 1.4-1.7m | | 1 | + | coke | coke |
| LC 92 | 5241 | corr. 39, 4.8-5.2m | | 3 | 2 | coke | 1 piece of coke, 1 piece of fuel ash slag, 1 piece of eroded iron slag |
| LC 92 | 5359 | corr. 38, 4.9-5.1m | | 1 | 7 | coke | coke |
| LC 92 | 5374 | corr. 46, 4.0-4.3m | | | | coke | coke |
| LC 92 | 5455 | corr. 38, 2.6-2.9m | | 2 | + | coke | 1 piece of coke , 1 piece possibly weathered slag |
| LC 92 | 5462 | corr. 36, 5.1-7.8m | | 2 | + | coke | coke (now 5) |
| LC 92 | 5467 | corr. 35, 5.8-6.3m | | 1 | + | coke | (? Not seen) |
| 2004.56h | 7029 | a7 | | | | coke | coke |
| 2004.56h | 8015 | f7 | | | | coke | coke |
| 2004.56h | 8139 | a4 | 7014/7016 | | | coke | coked material |
| 2004.56h | 8171 | b1 | 7065 | | | coke | large piece of coke and smaller fragment of pale/grey FAS with local grey smooth surface |
| 2004.56h | 8538 | b3 | 7073 | | | coke | coke |
| 2004.56h | 8735 | M6, trench 8 | | 1 | | coke | coke |
| LC 92 | ? | corr. 34, 3.0-3.6m | | 1 | 1 | coke | coke |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | ? | corr. 35, 3.0-3.9m | | 1 | + | coke | coke |
| LC 92 | ? | corr. 36, 2.3-3.0m | | 1 | 2 | coke | coked organic residue |
| LC 92 | ? | corr. 36, 4.1-4.6m | | 2 | + | coke | coke with granular texture (or possibly coal?) |
| **group 2 : other fuel ash slags** | | | | | | | |
| LC 90 | 1436 | Area C, Grid A4, Upper deposit | | 1 | 1 | FAS | FAS in complex bleb |
| LC 90 | 2079 | Area C, Grid A3 upper layer | | 2 | 1 | FAS | sandy fuel ash slag with green glass, soft clay lump and several stone fragments |
| LC 90 | 2159 | Area C, Grid A2, upper deposit | | 3 | 4 | FAS | 3 FAS and 1 stone, 2 of the 3 FAS pieces have blue glass |
| LC 90 | 2244 | Area C, Grid A6 | | 1 | 3 | FAS | sandy ceramic rather irregularly transformed into FAS |
| LC 90 | 2305 | Area P, Grid 11 | | 1 | 26 | FAS | large block of clinker with tiny fragment of pale green FAS |
| LC 90 | 2366 | Area C, Grid B5 | | 2 | 16 | FAS | 1 piece of fired clay passing into lightly vitrified front, 1 large crude prill of fuel ash slag |
| LC 91 | 2533 | corr. -1, 4.0m | | 1 | 24 | FAS | dense sandy fuel ash in crude prill |
| LC 92 | 4008 | corr. 30, 4.5-5.0m | | 1 | + | FAS | low density FAS |
| LC 92 | 4030 | corr. 31, 6.0-6.3m | | 1 | 1 | FAS | fuel ash plus clay piece (v small) |
| LC 92 | 4033 | corr. 31, 6.3-6.8m | | | | FAS | stone with one tiny fuel ash slag fragment |
| LC 92 | 4037 | corr. 32, 5.0-5.7m | | 1 | + | FAS | irregular pale low density FAS |
| LC 92 | 4068 | corr. 32, 9-9.3m | | 1 | + | FAS | sandy fuel ash slag |
| LC 92 | 4151 | corr. 31, 5.3-5.7m | | 1 | + | FAS | FAS |
| LC 92 | 4364 | corr. 32, 8.3-9.5m | | 2 | 2 | FAS | one small fragment of fuel ash slag, one small piece of reduced fired ceramic with possible hair temper |
| LC 92 | 4497 | corr. 33, 6.3-6.65 | | 3 | 3 | FAS | 2 pieces of oxidised fired sandy ceramic with glassy vitrified layer, third piece is reduced fired poorly vitrified FAS, grey sandy |
| LC 92 | 4499 | corr. 33, 7.3-6.65m | | 2 | 1 | FAS | 2 pieces of FAS plus 1 piece coke |
| LC 92 | 4606 | corr. 34, 1.9-2.3m | | 2 | 1 | FAS | 1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth |
| LC 92 | 4634 | corr. 40, 3.5-3.7m | | 1 | + | FAS | low density FAS probably attached to fired clay |
| LC 92 | 4650 | corr. 41, 3.6m | | 2 | 2 | FAS | 1 fuel ash , very sandy bound by blue glass, 1 small dense slag scrap |
| LC 92 | 4674 | corr. 42, 2.3-3.0m | | 4 | 2 | FAS | 1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb |
| LC 92 | 4683 | corr 29/30, 3.0-3.5m (inside palisade) | | 1 | 2 | FAS | vesicular fuel ash slag with large crystals (?olivine) |
| LC 92 | 4721 | corr. 36, 7.6-7.9m | | + | 42 | FAS | ?one piece (broken into many), highly vesicular low density FAS shattered, also burnt pig tooth |
| LC 92 | 4791 | corr 29/30, 3.0-3.5m (inside palisade) | | 3 | 3 | FAS | 1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS |
| LC 92 | 4845 | corr. 35, 3.4-4.1m | | 1 | 6 | FAS | pale, sandy FA or lining slag |
| LC 92 | 4851 | corr. 35, deep search | | 1 | 15 | FAS | dark FAS with charcoal clast |
| LC 92 | 4872 | corr. 34 deep search | | 1 | 47 | FAS | large block of FAS with hollows presumably from fuel |
| LC 92 | 4877 | corr. 38, 5.8-6.3 | | 1 | 1 | FAS | grey fuel ash slag (*2nd bag with same number has 2 greenish slag blebs with charcoal inclusions*) |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | 4883 | corr. 38, 6.3-6.8m | | 2 | 11 | FAS | one large piece of fuel ash slag |
| LC 92 | 4911 | corr. 43, 2.3-2.7m | | 2 | 7 | FAS | large piece 6g possibly weathered slag, small piece 1g is highly vesicular fuel ash |
| LC 92 | 4922 | corr. 36, 3.6-4.2m | | 1 | 1 | FAS | slightly gravelly FAS |
| LC 92 | 4993 | corr. 43, 0.0-1.0m | | 1 | 1 | FAS | sandy fuel ash slag |
| LC 92 | 5002 | corr. 43, 1.6-2.0m | | 2 | 3 | FAS | 1 piece vesicular iron slag, 1 piece of low density FAS |
| LC 92 | 5141 | corr. 44, 4.1-4.7m | | 1 | 5 | FAS | Blue tinge, pale, FAS, vesicular low density |
| LC 92 | 5190 | corr -2, 2.3 - 3.5m | | 2 | 3 | FAS | 2 pieces of lining slag or FAS |
| LC 92 | 5227 | corr. 39, 4.0-4.2m | | 1 | + | FAS | low density FAS |
| LC 92 | 5232 | corr. 39, 4.2-4.5m | | 1 | 1 | FAS | pale FAS |
| LC 92 | 5257 | corr. 40, 5.0-5.6m | | 1 | + | FAS | dark FAS with small patches of blue glass |
| LC 92 | 5269 | corr. 40. 6.1-6.3m | | 5 | 14 | FAS | large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag |
| LC 92 | 5429 | corr. 35, 5.1-5.3m | | | | FAS | dark fuel ash or lining slag |
| LC 93 | 5921 | corr. 49, 2.3-2.6m | | 1 | 1 | FAS | Fuel ash with one coarsely crystalline end - ? vitrified pebble |
| LC 93 | 5986 | corr. 49, 2.0-2.3m | | 1 | 1 | FAS | highly vesicular pale FAS bleb |
| 2004.56h | 8001 | d4 | | | | FAS | fuel ash slag with pale green glass |
| 2004.56h | 8171 | b1 | 7065 | | | FAS | large piece of coke and smaller fragment of pale/grey FAS with local grey smooth surface |
| LC 2004 | 8178 | Grid F8 | | 1 | 0.6 | FAS | 1 small fragment lining, 1 small piece FAS |
| LC 2004 | 8185 | Grid B7 (SW) context 7089 | | 1 | | FAS | Very dark; curved, convex outer surface, internally pale FAS - probably just a FAS piece not crucible |
| LC 2004 | 8191 | Grid A12 | | 1 | | FAS | weathered FAS? |
| 2004.56h | 8271 | b8, ne | 7091 | 1 | | FAS | moderately dense FAS with pale body colour and pale green glass |
| LC 2004 context 7240 | 8603 | Grid E2 (SE) | | 1 | 0.2 | FAS | dark slag fragment, vesicular - not a dense Fe-slag |
| 2004.56H | 8675 | C12 | | 1 | | FAS | moderately dense FAS with pale body colour |
| ? | ? | Area C, Grid A15, Context 5 | | 1 | + | FAS | curious material - possibly blue fuel ash slag, very fine grained (possibly lake marl?) |
| LC 90 | ? | Area C, Grid B8 | | 3 | 5 | FAS | one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining |
| LC 92 | ? | corr. 30, 6.5-6.9 | | 1 | + | FAS | 1 piece FAS, 1 piece stone |
| LC 92 | ? | corr. 31, 7.3-7.5m | | 2 | 6 | FAS | low density slag fragments - one with large platy olivine plus large piece of material with iron oxide crust |
| LC 92 | ? | corr. 36, 3.8-5.1 | | 1 | 1 | FAS | sandy FAS |
| LC 92 | ? | corr. 35, 7.3-7.6m | | 1 | + | FAS | sandy FAS with blue glass |
| LC 92 | ? | corr. 37, 4.0-6.6m | | 2 | 2 | FAS | 1 piece FAS, 1 dark prill of glassy slag with green colour (lining or FAS?) |
| LC 92 | ? | corr. 31, 7.3-7.5m | | 3 | 5 | FAS | smallest piece is low density FAS. Medium piece is clinker, large piece is cemented clinker and coal dust. |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| **group 3a: ceramic materials with variable reduction - possibly mould fragments** | | | | | | | |
| LC 90 | 2142 | Area C, Grid A4 | | 1 | | mould | reduced fired clay with neatly rounded surface - could be mould... |
| LC 91 | 3119 | Area C, Grid B15, context 2? | | 3 | | mould | 3 pieces mainly oxidised fired clay, one piece with mottled reduction - and could therefore be mould |
| LC 91 | 3277 | Area C, Grid B14, Lower 2/6 | | 1 | | mould | pale fired clay with darkened surface - could be mould fragment but not diagnostic |
| LC 91 | 3277 | | | 20 | | mould | c20 variably fired clay, 4 pieces show mottled reduction so could be mould debris |
| LC 92 | 4819 | corr. 33, 8.9-9.3m | | 1 | | mould | quite likely to be mould, reduced fired |
| LC 93 | 5968 | corr. 52, 2.6-3.0 | | 1 | + | mould | very fine grained fired clay, half oxidised half reduced, end has coarse organic inclusion ?straw (possibly mould?) |
| **group 3b: ceramic materials - crucible** | | | | | | | |
| LC 92 | 5357 | corr. 42, 1.3-1.5m | | 1 | | crucible | stout rim with no visible residues |
| **group 3c: ceramic materials - indeterminate oxidised-fired clay** | | | | | | | |
| LC 90 | 1447 | Area C, Area A5, upper deposit | | 1 | + | ox | 1 stone, plus 1 lump oxidised fired clay plus one coke fragment |
| LC 90 | 2212 | Area C, Grid B7 | | 1 | + | ox | 2 pieces of ?fired clay and 1 piece of coke |
| LC 90 | 2271 | Area A, Grid C9, context 8 | | 1 | | ox | highly fired clay |
| LC 91 | 2909 | Area C, Grid A14, contexts 4/2 | | 2 | 4 | ox | 1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface |
| LC 91 | 3232 | Area C, Grid A16, context 9 | | 8 | | ox | 8 rounded lumps of oxidised fired clay |
| LC 90 | 3253 | Area C, Grid B2, upper deposit | | 1 | + | ox | probably fired clay |
| LC 92 | 4015 | corr. 30, 6-6.15m | | 3 | 6.1 | ox | 2 pieces of fired lining with buff interior, 1 piece of grey fired clay |
| LC 92 | 4030 | corr. 31, 6.0-6.3m | | 1 | 1 | ox | fuel ash plus clay piece (v small) |
| LC 91 | 6057 | Area C, Grid A15, layer 8 | | 6 | | ox | 6 tiny scraps of mainly oxidised |
| LC 91 | 6098 | Area G, grid A13, context 2 | | 2 | | ox | 2 tiny scraps of oxidised fired clay |
| LC 91 | 6105 | Area C, grid B15, probably c7 | 4mm sieve | 20 | | ox | c20 rounded pieces of oxidised-fired clay |
| LC 91 | 6108 | Area C, grid B15, context 2 | | 29 | | ox | 1 large lump of reduced fired clay, c28 tiny rounded pieces of oxidised fired clay |
| LC 91 | 6113 | Area C, grid A16, context 5 | | 8 | | ox | 6 rounded pieces of oxidised fired clay, 2 pieces half reduced |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 91 | 6123 | Area C, grid B13, context 2 | | 4 | | ox | 4 pieces of buff fired clay, one small pebble of red sandstone |
| LC 91 | 6133 | AreaC, grid B16, context 18 | | 10 | | ox | 10 pieces of fired clay, variably fired ranging from pale grey to pale orange |
| LC 91 | 6138 | Area C, grid A16, context 8 | 4mm sieve | 5 | | ox | 5 pieces of probable oxidised fired clay |
| LC 91 | 6158 | Area C, grid A16, context 2/7 | | | | ox | 1. tiny concretion around iron fragment, 2. possible fired clay |
| LC 91 | 6174 | Area C, grid A13, context 1 | | 2 | | ox | 2 tiny rounded pieces of oxidised fired clay |
| LC 91 | ? | Area C, Pit (11.9.91) | | 3 | | ox | 3 oxidised fired clay fragments |
| LC 91 | ? | Area C, Grid A15, context 5 | | 3 | 11 | ox | 10g fired clay, + fragment of stone |
| LC 90 | 2184 | Area C, Grid B5, Upper layer | | 1 | | ox | buff coloured fired clay pellet |
| **(with organic temper)** | | | | | | | |
| LC 89 | 127 | Area A, context 17 | | 1 | | ox org | oxidised fired clay lump with organic temper |
| LC 90 | 2372 | Area C, grid B5 | | 3 | | ox org | 3 tiny scraps of fired clay, oxidised, some organic temper |
| LC 91 | 3371 | corr. 18, 6.1m | | 2 | | ox org | fine grained clay, variable oxidised reduced, larger piece has small hole through (ex organic temper). Could be lining or mould |
| LC 92 | 4857 | corr. 36, 3.6-4.2m | | 1 | | ox org | oxidised fired pale clay with organic temper? |
| LC 91 | ? | Area C, grid A16, context 5 | 15/09/1991 | | | ox org | 11 pieces of fired clay with organic temper, 2 pieces of burnt bone, 1 piece of iron slag with charcoal |
| **group 3d: ceramic materials - indeterminate reduced-fired clay** | | | | | | | |
| LC 92 | 4026 | corr. 31, 5.7-6.0m | | 1 | | red | broken rounded bleb of reduced fired clay |
| LC 92 | 4038 | corr. 32, 5.0-5.7m | | 1 | 2 | red | vesicular hard but fissured pale grey ceramic |
| LC 92 | 4066 | corr. 32, 8.3-9.0m | | 2 | 3 | red | fired grey clay with indurated almost pelletal texture |
| LC 92 | 4140 | corr. 30, 6.5-6.9m | | 1 | + | red | dark sandy lining or fuel ash slag |
| LC 92 | 4194 | corr. 32, 7.9-8.3m | | 2 | 2 | red | slightly vesicular hard fired pale grey clay, plus sandstone fragment? |
| LC 92 | 4252 | corr. 29, 5.8-6.0m | | 1 | 3 | red | Abraded, discoloured vitrified clay, highly vesicular grey-dark on outside, buff less vitrified inside |
| **(with organic temper)** | | | | | | | |
| LC 92 | 4014 | corr. 30, 5.8-6.0m | | 2 | + | red org | probably hard fired and fissured pale grey ceramic, apparently with organic temper |
| LC 92 | 4364 | corr. 32, 8.3-9.5m | | 2 | 2 | red org | one small fragment of fuel ash slag, one small piece of reduced fired ceramic with possible hair temper |
| LC 90 | ? | Area C, Grid B8 | | 3 | 5 | red org | one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| **group 3e: ceramic materials - reduced-fired clay +/- bloating +/-green glaze (possible brazing shroud)** | | | | | | | |
| LC 92 | 1447 | Area C, Grid A5, Upper Deposit | | 1 | | braze | probably not crucible. Grey fired clay with green glaze - might be brazing? |
| LC 92 | 4054 | corr. 32, 7.3-7.9 | | 3 | | indet. clay | 1 piece of brazing shroud, 1 piece of indeterminate fired clay, 1 other possible brazing shroud fragment |
| LC 92 | 4060 | corr. 32, 8.3-9.0m | | 2 | | braze | 1 piece of deeply vitrified clay (cf. brazing shroud). Larger arcuate piece similar, might just be crucible but inconclusive |
| LC 92 | 4213 | corr. 28, 4-5.5m | | 1 | | braze | grey fired clay - just possibly brazing shroud with fabric impression? |
| LC 92 | 4020 | corr. 31, 4.0-5.3m | | 1 | | red bloat | reduced fired clay starting to bloat, organic temper |
| LC 92 | 4054 | corr. 32, 7.3-7.9m | | 1 | + | red bloat | 3 fragments of vesicular fired ceramic - possibly fuel ash slag or even possibly from brazing shroud - bloated. |
| LC 92 | 4888 | corr. 39, 2.7-3.3m | | 1 | | red bloat | just possibly brazing shroud - pale grey, slightly buff in places, bloated - vesicular |
| LC 92 | - | Corr. 29, 4.5-6.3m | | 1 | + | red bloat | grey bloated reduced fired clay - cf. Brazing material |
| **group 3f: ceramic materials - vitrified material, probably hearth lining** | | | | | | | |
| LC 89 | 53 | Area A, context 23 | | 2 | 3 | lining | oxidised fired fine clay with rather thin external vitrified and vesicular layer |
| LC 90 | 1414 | Area C, Grid B4, upper deposit | | 1 | + | lining | 1 piece reduced fired clay with thin dark glassy surface, 1 piece of the fragmenting grey partly vitrified clay, third piece is probably stone , but might be FAS |
| LC 90 | 1421 | Area C, Grid A6 | | | | lining | oxidised fired ceramic with very thick vesicular glass layer |
| LC 90 | 2239 | Area C, Grid A10 | | 1 | 2 | lining | oxidised fired ceramic with thick highly vesicular external glass |
| LC 90 | 2253 | Area C, Grid B3, upper deposit | | | | lining | small fragment of hearth lining with larger piece of blebby pale material that might just be stone |
| LC 90 | 2297 | Area C, Grid A5, upper deposit | | 1 | + | lining | decomposed sandy lining slag with blue glass |
| LC 90 | 2366 | Area C, Grid B5 | | 2 | 16 | lining | 1 piece of fired clay passing into lightly vitrified front, 1 large crude prill of fuel ash slag |
| LC 91 | 2909 | Area C, Grid A14, contexts 4/2 | | 2 | 4 | lining | 1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface |
| LC 91 | 3078 | corr. 17, 6.43m | | 1 | 2 | lining | oxidised fired fine clay with very black glass externally |
| LC 92 | 4015 | corr. 30, 6-6.15m | | 3 | 6.1 | lining | 2 pieces of fired lining with buff interior, 1 piece of grey fired clay |
| LC 92 | 4321 | corr. 30, 4.0-6.6m | | 1 | + | lining | tiny fragment of fine, hard oxidised fired ceramic with external dark vesicular glass |
| LC 92 | 4497 | corr. 33, 6.3-6.65 | | 3 | 3 | lining | 2 pieces of oxidised fired sandy ceramic with glassy vitrified layer, third piece is reduced fired poorly vitrified FAS, grey sandy |
| LC 92 | 4623 | corr. 39, 7.1-7.4m | | 2 | 2 | lining | large piece is of typical fired oxidised clay with dark glass surface, smaller piece has very fine clay with organic temper passing into dark vitrified layer |
| LC 92 | 4674 | corr. 42, 2.3-3.0m | | 4 | 2 | lining | 1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb |
| LC 92 | 4791 | corr 29/30, 3.0-3.5m (inside palisade) | | 3 | 3 | lining | 1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS |
| LC 92 | 4805 | corr. 33, 0.6-1.0m | | 1 | + | lining | small fragment of hearth lining with oxidised fired clay and external black glass |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | 4859 | corr. 36, 4.1-4.6m | | 1 | 8 | lining | well oxidised, deeply vitrified and slagged lining |
| LC 92 | 4860 | corr. 36, 4.5-5.0m | | 1 | 7 | lining | coarse gravelly vitrified lining, 5mm thick black vitrified layer |
| LC 92 | 4866 | corr. 36, 6.6-7.0m | | 1 | 1 | lining | oxidised fired sandy clay passing outwards into rather bleached surface vitrified layer which bears a dark (pebble?) inclusion |
| LC 92 | 4867 | corr. 37, 6.1-6.5m | | 1 | + | lining | lining, not particularly diagnostic |
| LC 92 | 4868 | corr. 37, 6.9-7.3m | | 1 | 4 | lining | oxidised fired sandy clay passing out into thick pale vesicular layer |
| LC 92 | 4906 | Corr. 42, 3.0-3.9m | | 1 | 4 | lining | oxidised fire ceramic passing out into thick vesicular glassy layer (stone already discarded) |
| LC 92 | 4907 | corr. 42, 3.0-3.9m | | 1 | 43 | lining | small lining slag mass attached to wall |
| LC 92 | 4910 | corr. 42, 8.0-10.4m | | 1 | 7 | lining | reduced fired ceramic with small pebbles, broken into fragments and pellets roofed by dark glass surface layer - which has local patches of blue glass |
| LC 92 | 4912 | corr. 43, 0-1.0m | | 1 | + | lining | tiny chip of oxidised fired ceramic with glass vitrified layer |
| LC 92 | 4947 | corr. 37, 6.9-7.3m | | 1 | 1 | lining | 1 dense brown weathered grain, 1 small fragment of q-rich lining slag |
| LC 92 | 4974 | corr. 39, 6.0-6.5m | | 2 | 47 | lining | 2g small pale vesicular lining slag, 45g SHC fragment |
| LC 92 | 5079 | corr. -3, 2-2.3m | | 1 | 28 | lining | small amount of glass binding gravel and ceramic fragments - sloughed lining |
| LC 92 | 5081 | corr. 3, 2.0-2.3 | | 1 | 6 | lining | hearth lining with thick vesicular sandy glass on remnant of oxidised fired ceramic |
| LC 92 | 5209 | corr. 31, 8.3-9.5 | | 2 | 39 | lining | hearth lining, reduced to grey/buff with attached mass of low density FAS |
| LC 92 | 5292 | corr. 42, 1.5-1.8m | | 1 | 2 | lining | black vesicular glassy lining slag |
| LC 92 | 5310 | corr. 42, 4.8-5.0m | | 1 | 6 | lining | ball of sandy lining slag |
| LC 92 | 5348 | corr. 45, 1.7-2.0 | | 1 | + | lining | weathered hearth lining oxidised with moderately coarse quartz, very thin dark vitrified layer |
| LC 92 | 5356 | corr. 41, 4.2m | | 1 | 6 | lining | well-fired hearth lining, oxidised rear face and thick black glassy slag |
| LC 92 | 5358 | corr. 42, 1.3-1.5m | | | | lining | oxidised sandy lining with black vitrified surface |
| LC 92 | 5360 | corr. 44, 0.7-1.5m | | | | lining | slagged and vitrified oxidised hearth lining with dark glass |
| LC 92 | 5378 | corr. 46, 4.3-4.5m | | 1 | 4 | lining | oxidised fired clay passing out into very thick irregular black glassy layer |
| LC 92 | 5384 | corr. 46, 4.5-5.1m | | 1 | + | lining | very coarse grained quartz in oxidised ceramic with black glass surface |
| LC 93 | 5810 | corr. 52, 2.6-3.0m | | 1 | + | lining | hearth lining oxidised with thin dark vitrified surface |
| LC 93 | 5899 | corr. 51, 3.0-3.5m | | 2 | 4 | lining | 2 piece of vitrified hearth lining, one with slightly larger sand grains than typical |
| LC 93 | 5959 | corr. 49, 2.6-3.0m | | 1 | 2 | lining | reduced fired lining with vesicular black glass on very coarsely sandy ceramic |
| LC 93 | 5975 | corr. 52, 3.5-3.7m | | 1 | 7 | lining | oxidised fired sandy ceramic with very thick black vesicular sandy glass |
| LC 93 | 6000 | corr. 49, 1.5-2.0m | | 1 | 2 | lining | hearth lining oxidised with thin dark vitrified surface |
| LC 93 | 6027 | corr. 51, 3.5-3.8m | | 1 | 2 | lining | hearth lining oxidised with thin dark vitrified surface |
| LC 93 | 6030 | corr. 49, 2.3-2.6m | | 1 | 7 | lining | very deeply vitrified. Some organic temper. Green colour on surface seems to be ?chlorite vesicle fill |
| LC 2004 | 8178 | Grid F8 | | 1 | 0.6 | lining | 1 small fragment lining, 1 small piece FAS |
| LC 2004 context 7004 | 8663 | Grid A1 | | 1 | 8.3 | lining | oxidised fired lining with deep dark vitrified vesicular surface |
| 2004.56h | 8721 | b14, ne | 7115 | | | lining | oxidised fired sandy hearth lining with pale bleached glassy surface |
| LC 2004 | 8771 | Grid F12 | | 1 | 2.6 | lining | oxidised fired lining with deep dark vitrified vesicular surface |
| ? | ? | ? 0.6-1.3 | | | | lining | vitrified hearth lining, deep dark glassy surface. Oxidised |
| ? | ? | lc+ | | | | lining | small fragment of oxidised fired vitrified hearth lining |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 90 | ? | Area C, Grid B8 | | 3 | 5 | lining | one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining |
| LC 92 | ? | corr. 31, 9.3-9.5m | | 1 | + | lining | oxidised fired wall with deep vitrified layer to 8mm |
| LC 92 | ? | corr. 42, 1.1-1.3m | | | | lining | small fragment of oxidised fired vitrified hearth lining |
| LC 92 | 30.8.92 | corr. 44, 3.9-4.1m | | | | lining | oxidised vitrified lining, 3-4mm glass. Possible hair temper. |
| **group 4a: fragments of smithing hearth cakes (SHCs)** | | | | | | | |
| LC 89 | 37 | Area A, context 3 | 91.4m/s | | | SHC | slag, probably part of very small SHC |
| LC 89 | 50 | Area A, context 15 | | 1 | 34 | SHC | lobed slag, dense, dark and coarse, flowed but viscous - probably top of an SHC |
| LC 89 | 131 | Area A, context 23 | | 1 | 7 | SHC | Small SHC with little lining attached. Deeply etched broken surface. Charcoal inclusions in top. Some tubular vesicles. |
| LC 89 | 650 | Area A, context 16 | | 1 | 128 | SHC | Well -formed burr with 10mm olivine in adjacent slag. Shows blue FAS inclusions in lining above burr |
| LC 91 | 3082 | corr. 17, 7.47m | | 1 | 209 | SHC | Complete small SHC with pale slab top and smaller, dark, prilly bowl with charcoal moulds - almost classifiable as a tongue |
| LC 92 | 4518 | corr. 32. 1.8-2.0m | | 1 | 60 | SHC | part of shc, plus block of coke (9g) |
| LC 92 | 4642 | corr. 40. 4.2-4.6m | | 1 | 73 | SHC | 73g, roughly 50% of small SHC, 4g small dense prill fragment |
| LC 92 | 4657 | corr. 41, 6.2m | | 3 | 15 | SHC | 1 burnt bone, 1 fragment probably SHC crust, 1 amorphous vesicular slag fragment |
| LC 92 | 4932 | corr. 36, 6.6-7.0m | | 2 | | SHC | 2 small pieces of dark slag. Large piece of vesicular fired pale grey clay - probably from top of burr of small SHC |
| LC 92 | 4945 | corr. 37, 6.1-6.5m | | 1 | 48 | SHC | open honeycomb-textured slag with large olivines. Not clear if simply weathered or a draw-down texture. |
| LC 92 | 4948 | corr. 37, 7.3-7.7m | | 1 | 14 | SHC | angular vesicular slag fragment, possibly from SHC crust |
| LC 92 | 4974 | corr. 39, 6.0-6.5m | | 2 | 47 | SHC | 2g small pale vesicular lining slag, 45g SHC fragment |
| LC 92 | 4977 | corr. 39, 6.5-6.9m | | 1 | 11 | SHC | fragment broken from SHC crust - 15mm thick |
| LC 92 | 5027 | corr. 42, 8.0-10.4m | | 1 | 96 | SHC | most of small SHC, has coarse platy olivine near top |
| LC 92 | 5263 | corr. 40, 5.6-6.1m | | 1 | 119 | SHC | large part of small SHC, very dense, has lining slag encroaching on upper surface |
| LC 92 | 5367 | corr. 45, 6.3-6.55m | | 5 | 56 | SHC | grey fine vesicular iron slag, probably SHC fragments |
| LC 92 | 5569 | corr. 37, 4.6-4.9m | | 1 | | SHC | just over 50% of small SHC, has up to 15mm lower dense section, upper has charcoal moulds but still dense, biconvex, |
| 2004.56h | 8448 | d6 | | 1 | | SHC | fragment from large boulder with various organic overgrowths, also small piece of small SHC |
| LC 92 | ? | corr. 38, 2.3-2.6m | | 1 | 126 | SHC | part of small SHC. Has small speck of blue glass on base. |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| **group 4b: fragments of indeterminate dense slag (probably iron slag)** | | | | | | | |
| LC 90 | 2086 | Area C, grid A9 | | 1 | 3 | slag | dense iron slag bleb |
| LC 90 | 2172 | Area C, Grid B8 | | 2 | 1 | slag | black hard material - coke/Mn and small rounded slag fragment |
| LC 91 | 3105 | Area C, Grid B15, context 5 | | 2 | 1 | slag | small slag fragment? attached to pebble, plus small stone fragment |
| LC 92 | 4023 | corr. 31, 5.3-5.7m | | 2 | 2 | slag | 1 piece vesicular iron slag, 2nd piece is concreted ash and coal fragments |
| LC 92 | 4046 | corr. 32, 6.4-6.8m | | 2 | | slag | 1 piece clinker, 1 piece of iron slag (check the ceramic section too) |
| LC 92 | 4049 | corr. 32, 6.4-6.8m | | 1 | 14 | slag | small rounded bleb of vesicular grey slag |
| LC 92 | 4056 | corr. 32, 7.9-8.3m | | 1 | 14 | slag | fragment of grey vesicular slag - probably a smithing slag |
| LC 92 | 4135 | corr. 30, 6.15-6.5m | | 1 | 3 | slag | iron slag fragment |
| LC 92 | 4388 | corr. 33, 6.65-6.8m | | 1 | + | slag | small bleb of iron slag |
| LC 92 | 4426 | corr. 33, 5.5-5.8m | | 1 | 7 | slag | vesicular grey slag |
| LC 92 | 4458 | corr. 33, 7.8-8.3m | | 1 | 2 | slag | small dense dimpled prill (green mentioned by PC superficial) |
| LC 92 | 4477 | corr. 31, 0.1-1.0m | | 3 | + | slag | 1 piece of coke, 1 piece of dense iron slag |
| LC 92 | 4492 | corr. 33, 5.5-5.8m | | 1 | + | slag | iron slag fragment |
| LC 92 | 4509 | corr. 34, 6.0-6.4m | | 1 | + | slag | small dimpled slag prill |
| LC 92 | 4650 | corr. 41, 3.6m | | 2 | 2 | slag | 1 fuel ash , very sandy bound by blue glass, 1 small dense slag scrap |
| LC 92 | 4791 | corr 29/30, 3.0-3.5m (inside palisade) | | 3 | 3 | slag | 1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS |
| LC 92 | 4815 | corr. 33, 8.3-8.6m | | 2 | 4 | ? | (? Not seen) |
| LC 92 | 4836 | corr. 34, 6.4-7.0m | | 1 | 2 | slag | blebby slag piece with dimples |
| LC 92 | 4848 | corr. 35, 4.35-4.8m | | 1 | 15 | slag | vesicular grey slag, with charcoal, 2 pieces, weathered |
| LC 92 | 4862 | corr. 36, 5.0-5.4m | | 1 | 3 | slag | probably weathered iron slag |
| LC 92 | 4897 | corr. 39, 5.2-5.5m | | 3 | 15 | slag | 2 dimpled grey slag blebs, 1 grey slag fragment (from smithing?) |
| LC 92 | 4911 | corr. 43, 2.3-2.7m | | 2 | 7 | slag | large piece 6g possibly weathered slag, small piece 1g is highly vesicular fuel ash |
| LC 92 | 4929 | corr. 36, 5.8-6.2m | | 1 | 2 | slag | iron slag fragments |
| LC 92 | 4931 | corr. 36, 6.2-6.6m | | 2 | 23 | slag | 2 dense slag pieces with charcoal dimples |
| LC 92 | 4947 | corr. 37, 6.9-7.3m | | 1 | 1 | slag | 1 dense brown weathered grain, 1 small fragment of q-rich lining slag |
| LC 92 | 4992 | corr. 41, 6.9m | | 1 | | slag | iron slag - tiny fragment |
| LC 92 | 5002 | corr. 43, 1.6-2.0m | | 2 | 3 | slag | 1 piece vesicular iron slag, 1 piece of low density FAS |
| LC 92 | 5005 | corr. 43, 2.0-2.3m | | 4 | 31 | slag | Large piece of slag grading from indurated sand through into honeycomb olivine, others similar |
| LC 92 | 5017 | corr. 38, 8.2-9.5m | | 1 | 32 | slag | slightly lobate charcoal rich slag fragment - probably a smithing slag |
| LC 92 | 5031 | corr. 43, 7.3-10.5m | | 2 | 20 | slag | 1 dense slag lump, 1 piece with slag binding gravel |
| LC 92 | 5034 | corr. 44, 0-0.7m | | 1 | | slag | weathered slag |
| LC 92 | 5057 | corr. -2, 0-1.7m | | 1 | 34 | slag | 34 g vesicular dense slag fragment. Large piece of ORS has pinhead growths of secondary malachite (i.e. Not of archaeological significance) |
| LC 92 | 5070 | corr -2, 4.2-4.5m | | 1 | 10 | slag | large piece of vesicular iron slag, small piece of FAS with small area of maroon on surface |
| LC 92 | 5085 | corr. -3, 3.6-3.7m | | 3 | 9 | slag | dense grey vesicular slag as below |
| LC 92 | 5102 | corr. -3, 0-4.1m | | 1 | 4 | slag | probable small dense vesicular prill |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | 5146 | corr. 44, 7.2-10.5m | | 1 | 35 | slag | slightly curved dense slag sheet, smooth very slightly lobate base, probable charcoal moulds on top |
| LC 92 | 5160 | corr. 45, 2.0-2.5m | | 2 | 15 | slag | very weathered slag fragment |
| LC 92 | 5170 | corr. 45, 2.8-3.3m | | 1 | 6 | slag | rounded grey vesicular slag lump, |
| LC 92 | 5215 | corr. 37, 6.5-6.9m | | 3 | | slag | 3 tiny specks of slag, plus stones |
| LC 92 | 5241 | corr. 39, 4.8-5.2m | | 3 | 2 | slag | 1 piece of coke, 1 piece of fuel ash slag, 1 piece of eroded iron slag |
| LC 92 | 5252 | corr. 40, 3.3-3.5m | | 1 | 9 | slag | eroded flat based flow lobe cf. tap slag |
| LC 92 | 5263 | corr. 40, 5.6-6.1m | | 5 | 1 | slag | iron slag fragment, probably one piece broken, vesicular |
| LC 92 | 5269 | corr. 40. 6.1-6.3m | | 5 | 14 | slag | large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag |
| LC 92 | 5277 | corr. 41, 5.2m | | 1 | 57 | slag | worn lump of vesicular charcoal-rich slag - probably a smithing slag |
| LC 92 | 5283 | corr. 41, 6.2m | | 1 | 4 | slag | well worn vesicular dense iron slag fragment |
| LC 92 | 5301 | corr. 42, 4.2-4.5m | | 1 | 6 | slag | small fragment of grey vesicular iron slag |
| LC 92 | 5317 | corr. 43, 3.7-4.1m | | 1 | 17 | slag | either slag or a concretion containing slag |
| LC 92 | 5322 | corr. 43, 4.1-4.5m | | 1 | 1 | slag | dense iron slag |
| LC 92 | 5329 | corr. 43, 4.5-4.9m | | 1 | 5 | slag | charcoal fragment and small dimpled slag fragment with ceramic infilling some lobes |
| LC 92 | 5332 | corr. 43, 5.3-5.7m | | 3 | 11 | slag | several pieces of very weathered probable slag and one slag dense prill |
| LC 92 | 5336 | corr. 44, 0.7-1.8m | | 1 | | slag | small slag fragment, rounded |
| LC 92 | 5341 | corr. 45, 3.1-3.9m | | 1 | 3 | slag | vesicular iron slag |
| LC 92 | 5353 | corr. 40, 5.6-6.1m | | 2 | + | slag | chips of olivine rich pale slag |
| LC 92 | 5383 | corr. 46, 4.5-5.1m | | 2 | 4 | slag | small fragment of vesicular dark slag and small piece of burnt bone |
| LC 92 | 5390 | corr. 46, 6.5-6.8m | | 2 | 28 | slag | 2 pieces of dense slag, larger brownish bearing very large platy olivine, smaller is grey vesicular slag |
| LC 92 | 5433 | corr. 35, 5.1-5.3m | | 1 | + | slag | small bleb of probable dark slag, with a thin sheet from slag bubble |
| LC 92 | 5455 | corr. 38, 2.6-2.9m | | 2 | + | slag | 1 piece of coke , 1 piece possibly weathered slag |
| LC 93 | 5826 | corr. 49, 1.0-1.6m | | 2 | 6 | slag | 2 fragments of slag, gradational from sandy lining slag into grey iron-slag |
| LC 89 | 6090 | Area B, random bucket sample | | 1 | 29 | slag | amorphous angular fragment of vesicular dark grey slag |
| 2004.56h | 8171 | b1 | 7062 | 1 | | slag | large piece of vesicular slag with large platy olivines, small piece of stone |
| LC 2004 | 8178 | Grid F8 | | | 1 | ? | (does not appear to have been seen) |
| 2004.56h | 8219 | b4, sw | 7077 | 1 | | slag | vesicular iron slag |
| 2004.56h | 8252 | b7 | 7088 | 1 | | slag | vesicular iron slag |
| 2004.56h | 8591 | c12 | | 1 | | slag | fragment of vesicular iron slag |
| 2004.56h | 8676 | c12 | | 1 | | slag | iron slag, highly vesicular |
| 2004.56h | 8699 | i3 | | 1 | | slag | iron slag, vesicular |
| LC 91 | ? | corr. 16, 1.25m | | 1 | 72 | slag | worn lump of dense dark vesicular slag - probably a smithing slag |
| LC 91 | ? | Area C, grid A16, context 5 | 33496 | | | slag | 11 pieces of fired clay with organic temper, 2 pieces of burnt bone, 1 piece of iron slag with charcoal |
| LC 92 | ? | corr. 35, 5.3-5.7 | | 1 | 1 | slag | small dark slag fragment |
| LC 92 | ? | corr. 35, 6.3-6.8m | | 2 | 11 | slag | 2 small blebs of dense dark vesicular slag |
| LC 92 | ? | corr. 41, 8.6-10.0m | | 1 | 5 | slag | possible slag prill |
| LC 92 | ? | corr. 40, 4.6-5.0m | | 1 | | slag | coarse grained weathered slag |

| Year | SF No | Area/ | notes | P | Wt (g) | class | Comment / other material |
|---|---|---|---|---|---|---|---|
| LC 92 | ? | corr. 31, 7.3-7.5m | | 1 | 40 | ? | (does not sem to have been seen - could it be incorporated in above) |
| LC 92 | ? | corr. 38, 5.4-5.8m | | 1 | + | ? | ?compare with 4877 |
| | | | | | | | |
| **group 6: other materials** | | | | | | | |
| **cuprite?** | | | | | | | |
| LC 92 | 4004 | corr. 25, 5.2-6.0m | | 1 | | copper? | marked cuprite - looks like haematite |
| **bitumen** | | | | | | | |
| LC 89 | 3 | Area A, layer 4 | | | | bitumen | ? bitumen and painted surface |
| LC 89 | 58 | Area A, layer 20 | | | | bitumen | ? bitumen again (smell) |
| **bone** | | | | | | | |
| LC 92 | 4085 | corr. 32, 7.9-8.3m | | 1 | + | bone | bone? |
| LC 92 | 4346 | corr. 29/30, 0-1.0m | | 1 | 2 | bone | probably bone |
| LC 92 | 4434 | corr. 33, 5.8-6.3 | | 1 | + | bone | bone |
| LC 92 | 4940 | corr. 37, 5.6-6.1m | | | | bone | bone |
| LC 92 | 5521 | corr. 41, 5.6m | | | | bone | bone |
| LC 92 | 5599 | corr. 35, 5.5-5.8m | | | | bone | one bone and one stone with rusty surface marks |
| 2004.56h | 8022 | f7 | | | | bone | bone and broken tooth |
| 2004.56h | 8526 | a10, nw | 7039 | | | bone | possible burnt bone - coked organic matter |
| LC 92 | 4441 | corr. 31, 6.8-7.3 | | 5 | 2 | bone | 1 piece of bone, plus 4 pieces (broken?) of cemented clinker and coal dust |
| LC 92 | 4606 | corr. 34, 1.9-2.3m | | 2 | 1 | bone | 1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth |
| LC 92 | 4674 | corr. 42, 2.3-3.0m | | 4 | 2 | bone | 1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb |
| LC 92 | 4721 | corr. 36, 7.6-7.9m | | + | 42 | bone | ?one piece (broken into many), highly vesicular low density FAS shattered, also burnt pig tooth |
| LC 92 | 5383 | corr. 46, 4.5-5.1m | | 2 | 4 | bone | small fragment of vesicular dark slag and small piece of burnt bone |
| **brick?** | | | | | | | |
| LC 92 | 4048 | corr. 33, 6.4-6.8m | | 2 | | brick? | 2 pieces of pellet buff ceramic- possible modern brick, one with adhering coal dust |
| **charcoal** | | | | | | | |
| LC 92 | ? | corr. 35, 1.3-3.0m | | 1 | + | charcoal | charcoal |
| **Fe-Mn ore?** | | | | | | | |
| LC 91 | 3385 | corr. 18, 4.9m | | 2 | 1 | ore | small stone fragment, possible Fe-Mn ore fragment with botryoidally overgrown stalactites |
| LC 92 | 4750 | corr. 31, 1.5-1.8m | | 1 | 3 | ore | possible low grade iron ore - possible botryoids arranged as stalactites? + sandstone frag |

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|---|---|---|---|---|---|---|---|
| **Plaster** | | | | | | | |
| LC 90 | 2317 | Area C, Grid square A2, Victorian pit | | | | plaster | plaster moulding & fixing hole |
| **Plastic** | | | | | | | |
| LC 92 | ? | corr. 42, 1.1-1.3m | | | | plastic | melted plastic...??? |
| **Iron** | | | | | | | |
| LC 90 | 3249 | Area C, grid B2 | | | | iron | stone with adhering corroded ?nail |
| LC 92 | 5269 | corr. 40. 6.1-6.3m | | 5 | 14 | iron | large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag |
| LC 92 | 5591 | corr. 38, 1.0-2.3m | | | | iron | iron fragments, including planar piece with nail/rivet through? |
| LC 91 | 6158 | Area C, grid A16, context 2/7 | | | | iron | 1. tiny concretion around iron fragment, 2. possible fired clay |

GeoArch

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