

# The metalworking residues from Kilkenny, Highhays (06E0122)

Paul Rondelez

Wood House, Knocknamuck, Mitchelstown, Co. Cork

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## Abstract

Excavations at Highhays (06E0122) yielded nearly 3.5kg of metalworking debris. Although a relatively small collection, the well-established stratigraphy of the site has allowed for some important insights to be gained. The material supports the documentary sources in placing the introduction of the use of coal as a fuel in Kilkenny around the early fifteenth century. There are also indications that a coal-fired smithing hearth was operated near that city's fair green somewhere between the late fourteenth and mid-sixteenth century, which has implications for the organisation of the industry as a whole in medieval Kilkenny.

## Spatial and chronological distribution of the material

The excavation consisted of five cuttings, three on the eastern area of the site and two on the western side. The bulk of the metalworking residues, 3122g, were retrieved in the eastern area, and the remaining 313g in the western cuttings. Historically, the eastern area is located at the entrance to the medieval fair green, while the western area lies closer to the location of the Magdalen leper hospital (see [insert report pages]). There are, however, striking chronological differences between the assemblages from these areas (Fig. 1). Most (255g) of the material from the western area was retrieved from garden soils dated to c. 1700 – 1900 (Period 2c), while the rest (58g), consists of copper-working waste from a gully belonging to the period c. 1550 – 1700 (Period 2b). In the eastern area these two periods were heavily under-represented (39g), with the bulk of the material either dated to c. 1300 – 1375 (Period 1, 1608g) or c. 1375 – 1550 (Period 2a, 1278g). The earlier material was mainly found in the fills of various pits, while the later remains were retrieved from garden soils. The remaining material, 229g, was found in twentieth century (period 3) contexts, mostly pit.

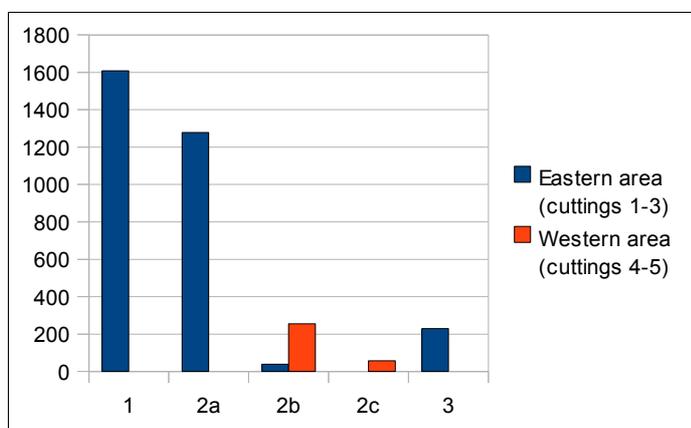


Fig. 1. Distribution and chronology of the residues at Highhays (06E0122). X-axis. Periods: 1 (c. 1300 – 1375), 2a (c. 1375 – 1550), 2b (c. 1550 – 1700), 2c (c. 1700 – 1900), 3 (c. 1900 – 2000). Y-axis: weight in grams

## Description of the material

The assemblage consists primarily of material readily recognisable as related to iron smithing: smithing hearth cakes, vitrified hearth lining/tuyere material and smaller amorphous pieces. Although most of the smithing hearth cakes weigh less than one kilogram, and are thus representative of secondary smithing, the tentative reconstructed weight of one cake was over 1.3kg (Pl. 1). If this partial cake indeed represents 50%, or less, of the original, it could indicate that bloom smithing activities took place near the Highhays excavation area. This piece was found in a pit belonging to Period 1 (c. 1300–1375).

In Europe, ceramic bellows protectors generally come in two varieties: tuyeres and perforated hearth walls, the former often showing a convex outer curve, while the latter are either concave or straight. The only piece reminiscent of tuyere material was the one piece from the western area. In the eastern area, where 44 pieces of metalworking debris were found, the period 1 material only had unspecified vitrified ceramic material, while the pieces from periods 2a and 3 contexts also include recognisable fragments of hearth lining (Fig. 3, Pl. 2).

A similar pattern emerges as we look at the fuel inclusions. The material from the eastern area included 24 pieces which either contained coal or charcoal (Fig. 4). The material belonging to Period 1 (c. 1300–1375) either had charcoal or no fuel inclusions, while some of the pieces dated to Period 2a (c. 1375–1550) and Period 3 (20<sup>th</sup> century) also contained coal. Some of the Period 2a (c. 1375–1550) material also included several pieces with impressions of exceptionally large charcoal fragments (Pl. 3). Significantly, three of the four pieces of slag with hearth lining also had coal inclusions. The broadly similar composition of the Period 3 material, both when considering vitrified ceramic material and fuel inclusions, would suggest this is likely made up of redeposited material from Period 2a.

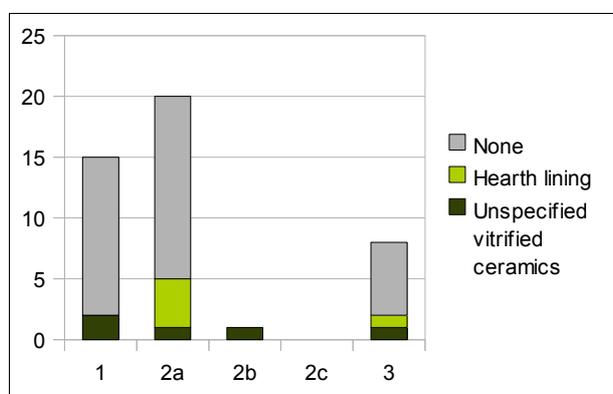


Fig. 3. Vitrified ceramic material adhering to the metalworking residues from the eastern area at Highhays (06E0122). X-axis: See Fig. 1. Y-axis: number of pieces

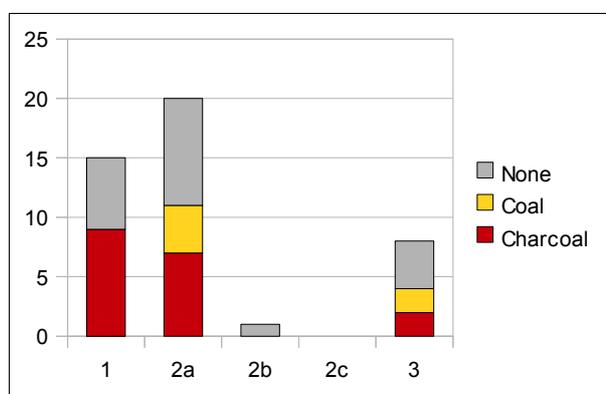


Fig. 4. Fuel inclusions in the metalworking residues from the eastern area at Highhays (06E0122). X-axis: See Fig. 1. Y-axis: number of pieces

The Highhays material also includes some evidence for copper working. A dense droplet of copper alloy was present in the Period 2a (c. 1375–1550) assemblage. All three pieces belonging to Period 2b (c. 1550–1700), retrieved from a gully in the western area, were also related to copper working. This included two pieces of slag with copper staining and a flat fragment of vitrified ceramic material with adhering copper, possibly part of a largish crucible (Pl. 4).

## **Discussion and conclusion**

In the late medieval period (Periods 1 and 2a, c. 1300–1550) debris from metalworking, almost all iron smithing, was deposited in the eastern area, closest to the old fair green. Subsequent Period 2b (c. 1550–1700) was almost exclusively represented by copper-working residues from a gully in the western area. During the following period (2c, c. 1700–1900), only tiny amounts of ironworking material were deposited in that same area. Finally, likely disturbance of Period 2a layers led to the re-deposition of material from that period in the twentieth century (Period 3).

There are marked differences between the material from the late medieval period dated before and after c. 1375. The early assemblage (Period 1, c. 1300–1375) consists of slag with unspecified vitrified ceramic material and exclusively charcoal as fuel, while the later group (Period 2a, c. 1375–1550) has recognisable hearth-lining fragments adhering and coal fragments included. The hearth lining would imply at least some kind of semi-permanent smithing installation, with the smoothed edges of some pieces perhaps indicating a waist-high forge.

Regarding the fuel, the charters for Kilkenny (Munby and Tyler 2005:199) are of particular interest; whereas only charcoal is mentioned in the 1375 murage grant, which was repeated in 1382 and 1394, the mention of “coals of any kind” in the 1420 charter, repeated in 1441, likely indicates the use of mineral coal in Kilkenny in that period. A broadly similar time frame, introduction of coal for ironworking around the early fifteenth century, is also reflected in the Highhays material.

The frequency of pieces containing both coal and having adhering hearth lining would then suggest a coal-fired smithing installation, potentially a waist-high hearth, operating near the old fair green between the late fourteenth to mid-sixteenth century. This is especially notable as this is broadly the period for which we have evidence for the existence of a forge inside the city walls, at the old market place, which was rented out on a yearly basis and thus undoubtedly had a monopoly position on smithing activities (unpublished doctoral research by the author). The Highhays material suggests that this ironworking monopoly did not extend outside the city walls.

**Bibliography:** Munby J. and Tyler R. 2005 *Kilkenny City Walls Conservation Plan*. Dublin, The Heritage Council.

## Catalogue

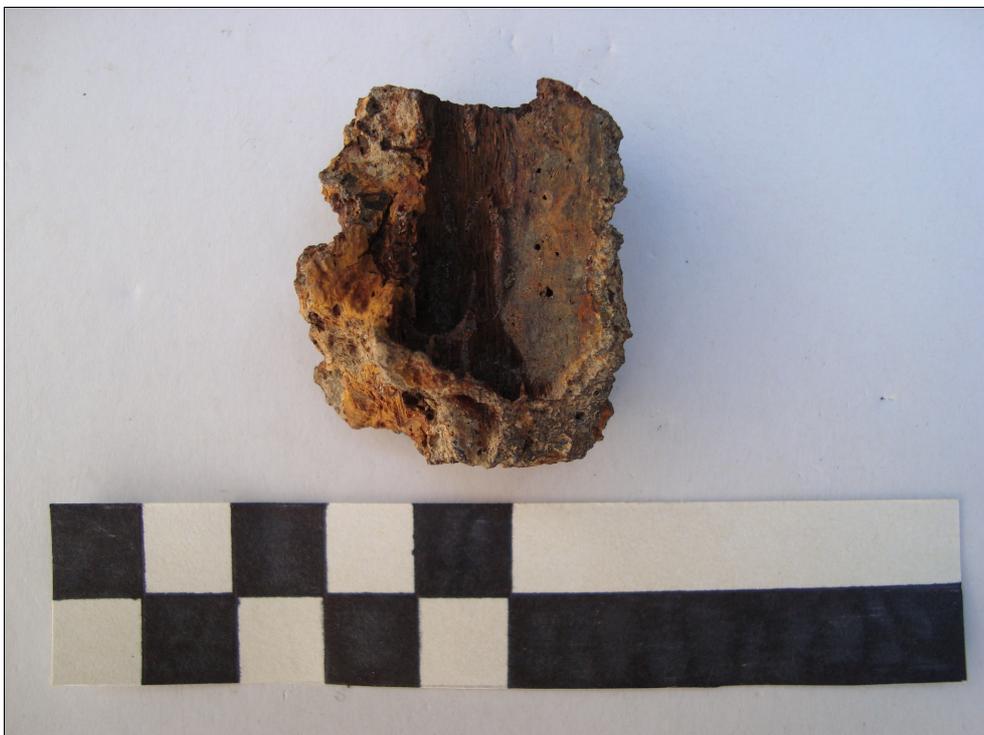
Cut	Find no.	Type	Cutting	Stratigraphy	Period	Description	Weight (g)
009	009:44	Cut	1	Above 105, below 101	3	Small lump of rather dense slag with numerous charcoal impressions	68
NA	011:3	Deposit	1	Above 013, 014, 021, below 015, 0101	3	Unusual piece of metallic slag with a smooth grey outer surface	41
NA	029:084	Deposit	1	Above 105, below 015, 016	2a	Small piece of drippy slag with adhering vitrified ceramic material	8
NA	102:1195	Sod horizon	1-3	Above 135, 143, below 106	2a	Small lump of rather dense drippy slag with coal inclusions. One side has greyish vitrified clay adhering. Possible hearth lining.	37
NA	102:1196	Sod horizon	1-3	Above 135, 143, below 106	2a	Lump of grey-pinkish vitrified ceramic material with adhering drippy slag. The slag contains coal. The ceramic material shows a straight smoothed edge. Hearth wall or lining material.	20
NA	102:1208	Sod horizon	1-3	Above 135, 143, below 106	2a	Small irregular droplet of rather light slag	7
NA	102:1209	Sod horizon	1-3	Above 135, 143, below 106	2a	Small piece of rather dense dark metallic slag	14
NA	102:1212	Sod horizon	1-3	Above 135, 143, below 106	2a	Fragment of dark grey black metallic slag	11
NA	102:1215	Sod horizon	1-3	Above 135, 143, below 106	2a	Fragment of rather dense slag with some large charcoal impressions (25 x 20 mm)	75
NA	102:1216	Sod horizon	1-3	Above 135, 143, below 106	2a	Rather dense lump of slag with oxidised surface and charcoal inclusions	68
NA	102:1217	Sod horizon	1-3	Above 135, 143, below 106	2a	Small piece of relatively light slag with charcoal impressions	2
NA	102:1218	Sod horizon	1-3	Above 135, 143, below 106	2a	Small piece of rusty slag with impressions of relatively large pieces of charcoal on two sides (30 x 20 mm)	17
NA	102:1219	Sod horizon	1-3	Above 135, 143, below 106	2a	Small piece of slag with large charcoal impressions	5
NA	102:1220	Sod horizon	1-3	Above 135, 143, below 106	2a	Small rusty, rather dense piece of slag with many charcoal impressions.	43
NA	102:1221	Sod horizon	1-3	Above 135, 143, below 106	2a	Piece of dark grey drippy slag with coal inclusions. On one side is a flat surface of vitrified clay, likely hearth wall/lining.	70
NA	102:1222	Sod horizon	1-3	Above 135, 143, below 106	2a	Small piece of rather dense slag. On one side a concave crust of vitrified clay is attached which could imply hearth wall or lining.	45
NA	102:1227	Sod horizon	1-3	Above 135, 143, below 106	2a	Lump of rather dense dark grey slag.	107
NA	102:1228	Sod horizon	1-3	Above 135, 143, below 106	2a	Fragment of rather dense slag with oxidised outer surface	38
NA	102:1229	Sod horizon	1-3	Above 135, 143, below 106	2a	Small rather dense smithing hearth cake with rusty outer surface. Some charcoal impressions	204
NA	102:1256	Sod horizon	1-3	Above 135, 143, below 106	2a	Lump of rusty slag. Probably small smithing hearth cake	118
NA	106:128	LM sod horizon	1-3	Above 102, below 101 [17 <sup>th</sup> C]	2b	Dark grey/black rather light slag with adhering pinkish vitrified ceramic material.	39
NA	109:9	Man-hole cover	3	Above 106, 102, below 101	3	Piece of rather dense, dark grey drippy slag with charcoal impressions	68
NA	132:1346	LM Sod horizon	1-3	Above 141, below 579, same as 102	2a	Small pieces of slag with coal inclusions	18
NA	132:1367	LM Sod horizon	1-3	Above 141, below 579, same as 102	2a	Small elongated droplet of copper	1
NA	132:1369	LM sod horizon	1-3	Above 141, below 579, same as 102	2a	Roughly 50% of a rather dense smithing hearth cake	270
NA	142:6-7	Deposit	2	Above 143, below 106	1	Two nodules of heavily weathered slag	33
NA	158:57	Deposit	2	Above 105, below 189, 156, 155, 292, 166	1	Small lump of dense, highly crystalline dark grey to black slag. Charcoal impression.	93

179	173:51	Pit	2	Above 179, below 102	3	Small piece of likely fuel ash slag	4
NA	196:197	Deposit	2	Above 200, 197, below 132	1	Relatively dense, irregular drippy piece of copper	11
245	241:162	Pit	2	Above 243, 245, below 242	1	Piece of weathered smithing hearth cake (c. 60%). Charcoal impressions	249
245	241:172	Pit	2	Above 243, 245, below 242	1	Small lump of light blueish grey slag	2
251	214:19	Pit	2	Above 251, below 132, 292	1	Fragment of rather dense smithing hearth cake (c. 50% ?). Charcoal impressions	668
251	214:20	Pit	2	Above 251, below 132, 292	1	Fragment of rather light, dark greyish brown slag with a rusty outer surface. Charcoal impressions	23
294	295:44	Modern gully	1-2	Above 105, 132, (And others) below 308, 295	3	Irregular lump of rather dense slag with rusty outer surface. Possibly small smithing hearth cake	89
NA	329:41	Deposit	2	Above 345, below 327	1	Small piece of dense metallic grey slag with rusty outer surface	39
340	341:73	Pit	2	Above 340, below 132	1	Weathered fragment of dense smithing hearth cake. Some charcoal impressions	186
480	481:7	Pit	1	Above 485, below 473	1	Small lump of rather dense slag with rusty outer surface. Charcoal impressions	44
509	516:4 [same as 510]	Pit	3	Above 509, below 102, 578	1	Small piece of slag adhering to yellowish vitrified clay	6
509	516:5 [same as 510]	Pit	3	Above 509, below 102, 578	1	Small rather dense fragment of dark grey/black slag with a rusty outer surface. Some charcoal impressions.	40
509	516:6 [same as 510]	Pit	3	Above 509, below 102, 578	1	Fragment of black rather dense slag with rusty outer surface. Charcoal impressions	48
553	555:23	Pit	3	Above 553, 565, below 554, 535	1	Fragment of a dense smithing hearth cake	151
579	131:030 [same as 170]	Cut/Deposit	2	Above 579, below 137	3	Fragment of dark grey drippy slag with charcoal inclusions	19
579	170:31	Cut/Deposit	2	Above 579, below 137	3	Small lump of vitrified clay with adhering slag. Slightly concave surface of clay could indicate hearth wall or lining. The slag has coal included.	4
579	170:32	Cut/Deposit	2	Above 579, below 137	3	Small lump of vitrified clay with adhering slag	4
580	271:128	Pit	2	Above 269, below 270	1	Lump of light grey vitrified ceramic material with small bit of slag adhering	14
580	271:130	Pit	2	Above 269, below 270	1	Tiny slag nodule. Charcoal impressions	1
2003	2010:28	PM gully	5	Above 2003, below 2005, 2002	2b	Small lump of rather light grey slag with some greenish parts. Possible copper-working debris.	24
2003	2010:29	PM gully	5	Above 2003, below 2005, 2002	2b	Flat piece of dense copper-containing slag. One side consists of vitrified ceramic material. Possibly a fragment of a large crucible.	29
2003	2010:30	PM gully	5	Above 2003, below 2005, 2002	2b	Small slag fragment with copper-staining	5
NA	2009:928	PM garden soil	5	Above 2011, 2005, 2012, 2015, 2014, 2007, 2010, 2016, 2004, below 2001, 2002	2c	Piece of dark grey drippy slag with coal inclusions	29
NA	2009:933	PM garden soil	5	Above 2011, 2005, 2012, 2015, 2014, 2007, 2010, 2016, 2004, below 2001, 2002	2c	Piece of dark grey slag with coal inclusions	11
NA	2009:981	PM garden soil	5	Above 2011, 2005, 2012, 2015, 2014, 2007, 2010, 2016, 2004, below 2001, 2002	2c	A fragment of heavily vitrified clay reminiscent of tuyere material	13
NA	2009:982	PM garden soil	5	Above 2011, 2005, 2012, 2015, 2014, 2007, 2010, 2016, 2004, below 2001, 2002	2c	Drippy piece of rather light slag	11
NA	2024:20	PM planting bed	5	Above 2009, below 2001	2c	Rather dense lump of slag. Likely small smithing hearth cake, c. 80% preserved.	191
Total							3435

## Plates



Pl. 1. Partial smithing hearth cake, from [241] fill of pit [251] (period 1, c. 1300–1375)



Pl. 2. Slag with large charcoal impressions, from sod horizon [102] (period 2a, c. 1375–1550)



Pl. 3. Slag with adhering smoothed, straight ceramic material, likely hearth lining, and coal inclusion (central) from sod horizon [102] (period 2a, c. 1375–1550)



Pl. 4. Copper slag adhering to vitrified ceramic, possibly crucible material, from [2010], fill of gully [2003] (period 2b, c. 1550–1700)