



WALKER'S IRON FOUNDRY  
DIXON'S YARD  
WALMGATE  
YORK

An Assessment Report on an  
Archaeological Excavation

by  
Javier Naranjo Santana  
Ailsa Mainman &  
Patrick Ottaway

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April 2006

*Cover illustration:  
view looking south across site*

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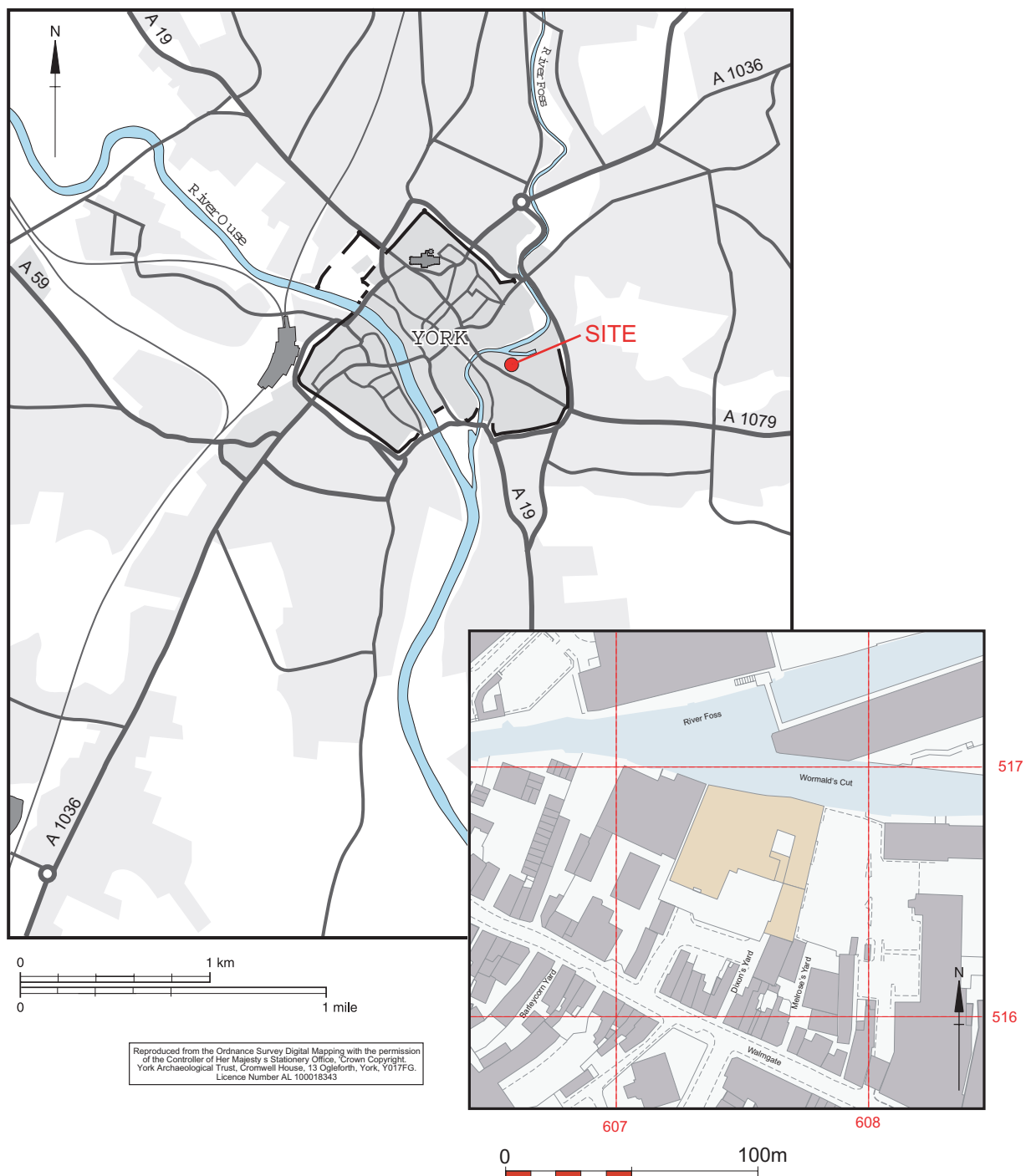


Fig. 1 Site location

## SUMMARY

In winter 2004-5 York Archaeological Trust undertook an archaeological excavation at the site of the former Walker iron foundry, Dixon's Yard, Walmgate, York (NGR SE 6075 5167) which operated in the first half of the 19<sup>th</sup> century. These excavations represent the first significant archaeological investigation of an early 19<sup>th</sup> century iron foundry in Britain.

*Remains of the foundry buildings were uncovered which can be related in general terms to the plan of the foundry shown on the 1<sup>st</sup> edition OS map of 1852. In places the walls survived up to eleven courses high. Within the walls were features associated with the processes undertaken in the foundry including a large casting pit, a sunken chamber, possibly for a pump, drains and settings related to grinding wheels.*

*Artefactual material was substantial in scale and wide-ranging in quality. Over 1000 fragments of iron objects were recovered as well as iron-working slag, fired clay crucibles, industrial pottery, animal bone and material of a more domestic character (glass bottle fragments, domestic pottery, clay pipes and various personal items). In addition, a number of structural features, including bricks, roof tile, architectural fragments and iron components of foundry structure and machinery were recovered.*

*The largest, and most useful, group of material recovered from the site is the iron (1103 fragments) which incorporates machinery components, tools, failed castings, offcuts and by-products of casting, fittings and various products or parts of products. The next largest group is the industrial earthenware pottery. Only a sample of the slag was removed from the site (c.20 kilos) for analysis. All other categories of finds were quite small in number.*

## **1. INTRODUCTION**

Between 1<sup>st</sup> November 2004 and January 28<sup>th</sup> 2005 York Archaeological Trust undertook excavations at Dixon's Yard, Walmgate on the site of the early 19<sup>th</sup> century Walker iron foundry (NGR SE 6075 5167). The excavation was undertaken to a brief from the Principal Archaeologist for the City of York, on behalf of Project Solutions, a division of Lightly and Lightly Ltd, in advance of development of the site for housing (Planning Ref. 03/02025/FUL). The excavation followed on from an evaluation of the site by On Site Archaeology in 2003.

This document contains a description of the stratigraphic sequence which forms the basis of an Assessment Report on the result of the excavations in accordance with the provisions of the brief and in line with recommended methodology in *Management of Archaeological Projects* (MAP2; DoE 1991). The report is concluded with recommendations for further analysis and publication.

## **2. METHODOLOGY**

The archaeological excavation consisted of two trenches (Trenches 4 and 5). Trenches 1-3 had been excavated in the evaluation of the site by On Site Archaeology in 2003.

Trench 4 measured 43m long (north - south) and just over 7m wide. Trench 5 measured over 25m long and 10-15m wide. Both trenches were excavated to depths of 1.2 to 2.2m below modern level. A machine was employed to break out the concrete that formed the ground surface in both trenches and removed all manifestly modern overburden deposits. Subsequently all

excavation was carried out by hand in a proper stratigraphic manner. Waterlogged deposits were encountered in both trenches, due to the proximity of the river. Foss, at around 1.7m BGL. At this depth on the north side of the site water was seen to flow into the trenches; hand baling was necessary in order to finish the excavation in these areas.

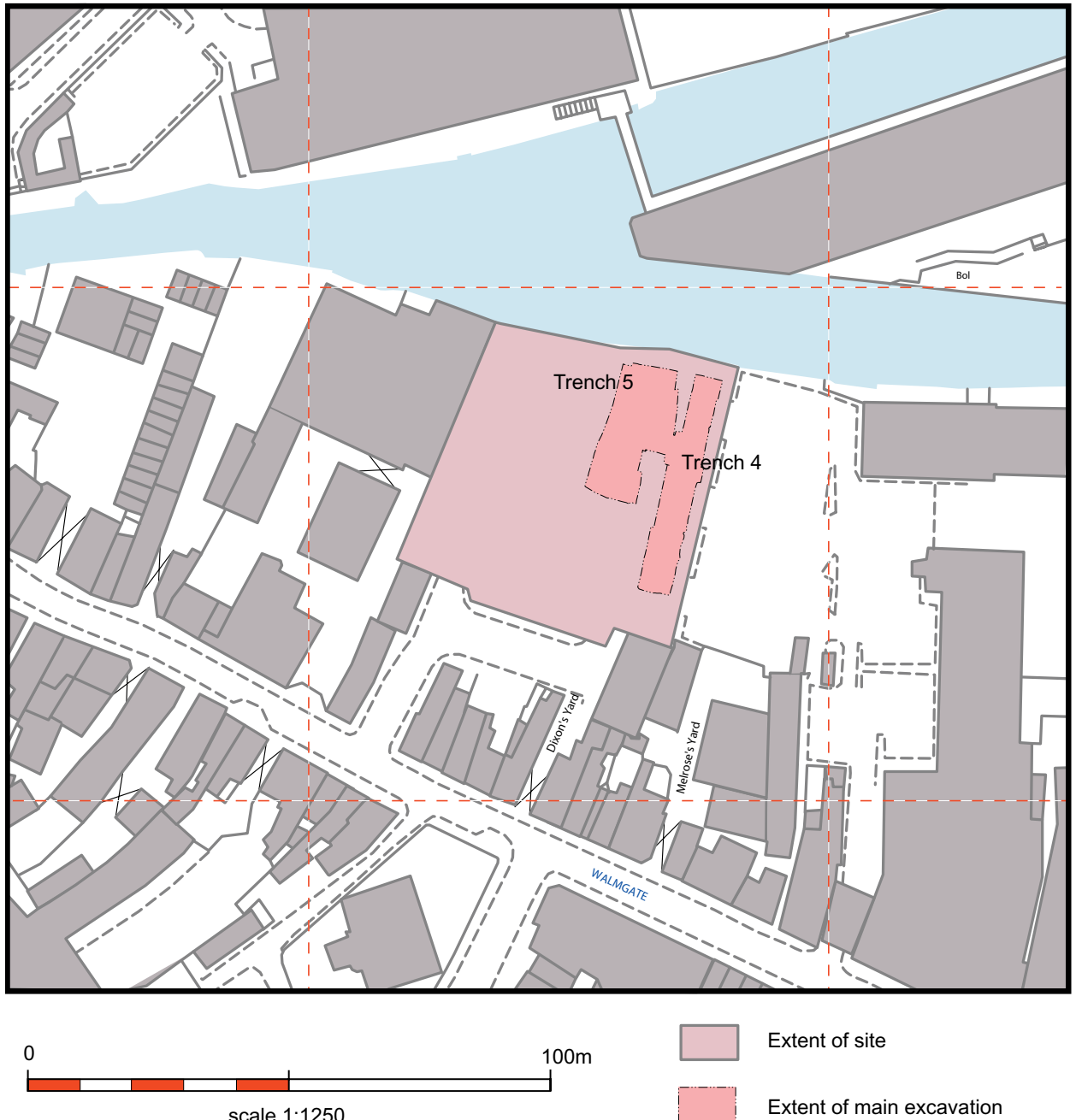


Fig. 2 Location of trenches

For purposes of archaeological recording the trenches were divided into 30 Areas based on 5m grid squares. Recording took place according to the methods described in the *YAT Site Recording Manual (2005)*. The contexts in each trench were numbered separately, those in Trench 4 given a sequence beginning with 4000, those in Trench 5 a sequence beginning with

5000. Finds were recorded by context number and in certain instances by a small finds number also. All identified contexts (stratigraphic units) were individually planned at a scale of 1:20, and described on separate pro-forma context cards. All sections and elevations were drawn at a scale of 1:10. Stratigraphic matrices for each area were constructed and continuously updated during the course of the excavation. Photographs in 35mm monochrome print and colour slide format, together with photographs in digital format, were taken of elevations, sections, and significant deposits and features throughout the course of the archaeological work. Samples taken were principally of deposits of iron slag and foundry debris.

All records and finds have the York Museum Service accession code YORYM2004.506 and are currently stored by YAT.

### **3. LOCATION, GEOLOGY AND TOPOGRAPHY**

The site was located within the medieval walled city of York, east of the river Foss, on the north side of Walmgate directly opposite the medieval church of St Denys. Walmgate which has been an important street since Anglo-Scandinavian times runs on an east-west line along a natural glacial ridge from Foss Bridge to Walmgate Bar, one of the gates through York's medieval defences.

The site also lay on the south side of Wormald's Cut, a short spur off the Foss created in 1798 and probably stands largely on land reclaimed from the King's Fish Pool which had been created c. 1100 by damming of the Foss at York Castle. The modern ground surface was fairly flat at c. 9m OD.

### **4. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND** **by Javier Naranjo Santana and Patrick Ottaway**

#### **4.1 The Site**

Since Anglo-Scandinavian times Walmgate has been the main artery of an important commercial and industrial area. Excavations along its length suggest that it was heavily built up from the time of the Norman Conquest if not before. This remained the case in the post-medieval period as is shown by the early maps of York such as that of 1610 by John Speed. Succeeding maps show both the gradual infilling of the King's Fish Pool to the north of Walmgate and the expansion of building into zones behind the street frontages. By the mid 19<sup>th</sup> century, as shown on the first edition OS map (Fig.3), these zones contained tightly packed buildings, both residential and industrial, separated by narrow alleys, courts and yards – including Dixon's Yard. A flavour of the area in the mid-19<sup>th</sup> century can be gained from Nathaniel Whittock's bird's eye view of the city (Murray 1988), although being at a distance from the point of view Walmgate and its environs are shown in a somewhat schematic form.

Amongst the more important industrial premises on Walmgate in the early 19<sup>th</sup> century was

the iron foundry associated with the name of John Walker. The excavations described below were undertaken because it was thought that they would throw light on the history and layout of the foundry and reveal details of the iron founding process in the early 19<sup>th</sup> century which is not well understood.



Fig. 3 Part of the 1852 Ordnance Survey showing the location of John Walkers' Foundry

## 4.2 John Walker: iron founder

A brief history of John Walker's career follows based on an article by John Malden (1976). In 1815 John Walker (1801-53) became an apprentice iron founder to a man named Gibson at a foundry in what is now Dixon's Yard, Walmgate adjacent to the river Foss. By 1837, after Gibson's retirement, Walker was in sole charge. At first Walker's commissions were local. For example, he made many of York's first gas lamps and the railings for St Leonard's Place and for the Minster precinct. Gates and railings for country houses in the York area soon became a speciality. In 1845-6 the foundry made the gates for Kew Gardens in London. As a result, in 1847, Walker was appointed iron founder to Queen Victoria. In 1850 Walker received his most famous commission: the gates and railings of the British Museum. The foundry on the Dixon's Yard site was sold in 1856 for £1000, and the Walker firm's work continued at the Victoria Foundry a short distance away where the Yorkshire Evening Press Office now stands. An outline plan of the Walker foundry appears on the first edition of the Ordnance Survey map of 1852 (Fig. 3). The foundry is also apparently shown in Whittock's view symbolised by a chimney.



## 5. THE EXCAVATIONS (Figure 4)

### 5.1 Introduction

The results of the excavations are presented in trench order. Within each trench description is based on the 5m square areas used for recording. The deposits and features are described in stratigraphic order. Correlation of the individual area sequences across the site such as to create a site-wide phasing has not proved easy but would benefit from further analysis. At this stage it has, nonetheless, been possible to break down the area sequences into three broad period divisions: pre-foundry, the foundry and post-foundry. The junction between the foundry and the post-foundry periods is usually somewhat uncertain. Within the foundry period subdivisions have been made in the text where appropriate in an attempt to separate primary foundry structures, principally walls, from other structural features and deposits of material accumulating within and around the buildings.

### 5.2 Trench 4 (Plate 1)



*Plate 1 General view north-east of Trench 4 with floor of stone setts 4136 / 4254 beyond north-south Wall 4238*

Trench 4 measured c 43 x 7m was divided into eighteen Areas : A to R.

#### 5.2.1 Areas A and J

*The Foundry: primary walls*

The earliest walls found in Area A, located at the south end of the trench and forming parts of

the original foundry structure, were 4280 and 4281 which were bonded together.

Wall 4280, aligned east - west, measured 2.10m long and 0.53m wide, although part lay beyond the southern edge of excavation. It had 4-5 courses of brickwork surviving. The bricks measured 0.22 x 0.12 x 0.06m and were laid as stretcher bond with light yellow mortar as bonding material. This wall was truncated to the east by a modern pipe trench (4217; see below). Wall 4281 aligned north - south was similar. Its line was continued to the north by Wall 4254 (see below Area K, 5.2.2).

On the north side of Area A was another early foundry wall (4273) which was aligned east - west. It measured 4m long x 0.24m wide. The bricks measured 0.22 x 0.11 x 0.07m and were laid in English bond; a mid yellow-white sandy lime mortar was used as bonding material.

Finally, in the north-east corner of Area A were fragments of a north - south wall (4282) which measured 0.8m long x 0.4m wide. The bricks measured 0.22 x 0.11 x 0.08m and the bonding material was a mid yellow - white sandy lime mortar. Another wall (4283) continuing the line of 4282 to the north was found in Area B (5.2.2).

#### *Foundry deposits*

In the north-west part of Area A was an east-west running brick feature (4266), which measured 2 x 0.80m and had probably been a drain (Plate 2). The bricks measured 0.22 x 0.12 x 0.06m. It had been roughly bricked up at its west end. The fill was 4268.

At the same depth and stratigraphic level, but on the east side of Area A, was another brick structure, possibly a drain (4270). It was made with re-used bricks bonded with light yellow brown sandy mortar. Filling 4270 was a compact, mid reddish grey slag and cinder deposit (4269).

Also near the east edge of the trench in this area was a robbed wall (4305), aligned north - south which measured 2.20m long x 0.40m wide. The construction trench (4304) contained the remains of the wall, three bricks long and two courses high, bonded with grey-white mortar. The bricks measured 0.22 x 0.11 x 0.07m.

The construction cut (4304) was backfilled with 4303, a compact, grey white mortar with frequent medium size slag, charcoal and building material fragments. Above 4303, 4268 and also filling 4266 was a rubble or demolition layer with broken bricks and tiles within a grey-brown sandy matrix with frequent small mortar fragments (4223). Covering 4223 was a loose, black casting sand deposit with a moderate amount of mid brownish-yellow sand flecks (4232).

On the east side of Area A and above 4232 were the remains of a brick floor (4233) with only twelve bricks surviving; a grey-yellow mortar used as bonding material. To the north of 4233



Plate 2 View west of drain 4266 (Area A)

and at the same stratigraphic level was a more extensive floor (4254) which was also found in Areas B, C and D (See 5.2.2-3). Floor 4254 consisted mostly of Elland Flag blocks or setts, with some areas in-filled with bricks. The stones on the south side were extremely worn. Also probably part of the same floor was another area of bricks (4279).

Also above 4232, but towards the centre of Area A was a compact, dark reddish grey slag deposit (4198).

Finally, above Floor 4254 was a very compacted, dark grey to black slag deposit (4020 = 4002). Above 4020 was a very compacted, mid brown sandy deposit with occasional limestone fragments (4012).

#### *Post-foundry*

In both Areas A and J, and continuing beyond the south and west edges of the excavation was a surface, unexcavated, of sandstone setts (4262) extending over an area 3.45 x 1.75m. The setts each measured c. 0.27 x 0.96 x 0.15m and the bonding material was a light yellow sandy mortar. A surface very like 4262 could be seen in the alley to the south of the site leading to Walmgate.

Cutting through 4262 was a feature of an irregular shape in plan (4278). Also cutting through 4262 was the cut for a timber post (4226), with an irregular shape in plan, a sharp break of slope at surface and vertical sides. Contained by 4226 was an upright timber post (4228), which measured 0.11m in diameter. In addition, cutting through Floor 4262 was an unexcavated construction cut (4276) for a late 19<sup>th</sup> or early 20<sup>th</sup> century ceramic drain pipe (4275). Packed around the pipe was compacted dark grey cinder and slag within a casting sand matrix containing occasional building material and broken glass fragments (4274). Above 4228, and also stratigraphically above 4274 and 4278 was a concrete packing mixed with dark grey-black sandy silt (4227).

In the south-west part of Area A, and cutting through 4198 and Wall 4280 was the cut (4217) for a modern gas pipe. Filling the cut was a firm, light greyish-brown clay sand with frequent

medium size building material fragments (4216). Above 4216 and covering walls 4280-1 was a modern, hard, grey tarmac surface (4007).

On the east side of Area A, and also above 4198 was a brick wall (4022), aligned north - south, with one course of bricks surviving in the southern part, and two courses in the northern. This wall was made mainly of half bricks. At the northern end there was a small triangular brick structure.

On the west side of Area A, and south side of Area J was a very modern cut (4149), related to the piling for the 1950s building in the area. It was rectangular in plan, measured c. 3 x 1.5m, and was filled with large concrete blocks (4148).

Above 4148, 4012, 4022 and 4007 were the modern overburden layers (4000).

### 5.2.2 *Areas B, C, K and L*

#### *Pre-foundry*

The earliest deposit found in these areas was a dark grey brown silty clay, with frequent building material fragments, mortar and charcoal flecks (4197). This type of deposit was found in different parts of the excavation below the foundry structures and it is believed to have either derived from accumulation during reclamation of the King's Fish Pool or from levelling prior to the construction of the foundry.

#### *The Foundry: primary walls*

Cutting through 4197 was a construction cut (4157), which housed one of the main north - south walls of the foundry (4156). Wall 4156 measured c. 5m long and was cut away at its south end whilst at the north there was a short return to the east. It survived up to seven courses high, and the bricks (0.24 x 0.11 x 0.04m) were laid on bed, with a grey-white mortar as bonding material. Filling the construction cut for Wall 4156 was a loose, dark brown-black sandy silt with occasional building material and mortar small fragments (4158).

Wall 4156 was probably contemporary with Wall 4238 (Area C and also D and E) which was offset slightly to the east, although a modern concrete pile interrupted the junction between the two. In some places 4238 stood up to twelve courses high above a brick foundation of three courses. The wall bricks were in stretcher bond with headers irregularly spaced throughout. The bricks measured 0.22 x 0.11 x 0.07m and were bonded with a hard, light yellowish white fine sandy mortar.

#### *Foundry deposits*

Stratigraphically above 4158 (construction trench fill for 4156) was a compact to firm, light brown

clay floor (4196). Above 4196 was a light, creamy brown clay, possibly a levelling deposit for a floor (4195). This floor was composed of a heavily compacted, light creamy-brown silty sand with occasional small fragments of building material. Above 4195 was a deposit of friable, dark grey-black ashy cinders (4193), probably an accumulation of industrial waste used to level the area. Also used as a levelling deposit, and above 4193, was a heavily compacted, dark brown silty clay (4194). Covering 4194 was a compact floor composed of large fragments of slag in a matrix of dark brown silty sand (4173).

Above 4173 were two contexts: 4192 and the floor 4254 (see above 5.2.2). Context 4192 was a firm, light yellow-brown sandy silt with frequent mortar and occasional charcoal flecks. Stratigraphically above 4192 was a firm, dark orangey brown sandy silt accumulation (4191). Above 4191 was a compacted, dark reddish grey metal slag layer (4189). Finally, above 4189 was a deposit of building rubble, 90% broken tile within a dark brown silty sand matrix with frequent grey-white mortar flecks (4190). All these deposits, 4189-92, were believed to be levelling deposits.

#### *Floor of stone setts*

In addition, above 4173, was the floor of Elland Flag blocks or setts (4254), with some areas infilled with bricks, already described in Area A (5.2.2 above). On the north side of Area C and continuing in Area M was another part of the same surface (4136).



*Plate 3 View east in Area K of Pit 4159 associated with grinding wheel and east-west Wall 4156 with return to east at top*

West of Wall 4156 was 4159, a brick structure (Plate 3), which had probably been located below a grinding wheel. It was sited within a cut (4160), visible in the north side of the evaluation trench dug by On Site Archaeology in Areas B and K, which had a gradual break of slope at surface, leading to straight vertical sides and a flat base. Housed by 4160 was a narrow structure (4159), rectangular in plan with walls on both sides and at one end, which measured c.1.60 x 0.8m. Within the cut the bricks were surrounded by a densely compacted, very clean and pure, light brownish yellow clay backfill with very occasional building material small fragments and occasional pockets of yellow-brown sandy silt (4161). The walls were two courses of bricks wide, and the bricks were laid on bed. Contained by the walls of 4159 was a very hard, dark reddish brown slag (4312) which dipped in the middle, probably as a result of the use of a wheel. Above 4312 and filling 4159 to the top was a hard, dark grey brown, mixed deposit of slag and industrial waste with pockets of clay sand (4162). Partially sealing this structure was a hard, dark grey silty slag deposit (4168).

Stratigraphically above 4168, and 4171-2 was a heavily compacted dark grey black slag (4167), which continued beyond the west edge of the trench. Above 4167 was a compact, orangey dark grey slaggy sand with very frequent slag fragments (4130). These deposits also continued beyond the west edge of the trench. Deposits 4130 and 4167 were partially removed by machine during the initial clearance of the site

#### *Post-foundry*

In the north-western part of Area C, above Floor 4254, there was a firm, dark grey silty sand levelling deposit (4186). This deposit was probably the same as 4182 in Area L, which disappeared beyond the west edge of the excavation.

Cutting through 4186 and 4182, was a construction cut (4170) for a pipe. It was aligned east - west, and measured 2 x 0.20m, with a gradual break of slope at the surface, gently sloping sides, and a concave base. Contained by 4170 was a thin iron pipe (4169), with a diameter of 0.04m, which was possibly a gas pipe. Also contained by 4170 and above 4169, was a loose, dark grey-black sandy silt backfill (4171).

Post-dating Floor 4254 was the iron grill cover of a drain (4172). The drain itself (unexcavated) was not visible, as it was located under a hard layer of slag but it was presumed to run east - west. The cover was square, c. 0.48 x 0.48m and 0.02m thick and was composed of two sets of grills. Also above Floor 4254 was a loose, reddish grey silt with small fragments of building material, frequent iron slag and occasional copper alloy fragments (4180). This was probably a levelling deposit. Above 4180 was a heavily cemented, dark grey black slag (4002), another deposit used to level off, and possibly patch the area to provide a surface even with the stone setts (4254). Cutting through Floor 4254 was a cut for a drainpipe (4174), unexcavated due to time constraints.

Above 4254 on its west side was a compact, dark red-grey slag (4189). Cutting through it was a construction cut for a drain or water pipe (4163). It was aligned north – south, with a gradual break of slope at the top, sloping sides and a concave base. Housed by 4163 was a brick and cement structure (4165). Two courses of brick lay on a bed of cement, and encased an iron pipe (4166) packed with more cement. This metal pipe was 0.11m in diameter and only a few millimetres thick, and it was probably for gas. Filling 4163, and above 4166 was a loose, dark grey silty slag (4164).

Stratigraphically above 4002, 4164, 4174 and 4190 was an east - west construction cut for a late 19<sup>th</sup> century or early 20<sup>th</sup> century drain (4174) lined with bricks (4175) and covered with a flat sheet of iron (4178). Above 4178, and covering it completely, was a spread of friable, dark brown sandy silt with frequent slag inclusions (4147).

#### *Evaluation Trench*

Cutting through 4002, 4164, 4174 and 4190 was 4073, one of the evaluation trenches dug by On-Site Archaeology. It was L-shaped and measured 2.80 x 3m and 0.78m deep. Filling 4073 was a firm, dark to mid grey sandy silt with frequent building material and mortar fragments, iron working debris and occasional concrete big blocks (4074).

Above 4074, 4147, 4130 and 4148 was the modern overburden (4000).

### **5.2.3 Areas D and M: Test Pit 1**

Test Pit 1, 2 x 1.2m and 0.8m deep after removal of modern overburden, was dug to the west of Wall 4238 in order to identify the earliest foundry deposits.

#### *Pre-foundry*

The earliest deposit found in Test Pit 1 was a firm, mid brown grey clay with very occasional mortar and brick fragments inclusions (4384). This was interpreted as levelling for the area prior to the construction of the foundry.

#### *The Foundry: Primary Wall*

Cutting through 4384 was 4238, one of the main north-south walls of the foundry (also recorded in Areas C, E and in F as 4034, see 5.1.8)

#### *Foundry Deposits*

Stratigraphically above 4384 was a firm, mid yellow green sand (4394), seen only in the east facing section of the test pit. Above 4394 was a firm, mid reddish pink sandy lime mortar with very occasional limestone fragments (4383). This thin deposit was interpreted as a possible

floor surface. Above 4383 was a friable, mid greenish yellow sand (4382). Above 4382 was a compact, mid brown grey sandy clay with a moderate amount of brick fragments and occasional crushed mortar (4387). Above 4387 was a hard, mid orange brown sandy silt with a moderate amount of medium size slag fragments (4386). Also above 4382 was a firm, mid pinkish white sandy lime mortar with very occasional crushed brick fragments (4381). Covering 4381 and 4386 was a friable, bright yellow sand accumulation (4378).

Above 4378 was a loose, dark grey-black coal dump (4400), possibly waste from the foundry. Above 4400 was a compact to firm, mid pinkish white, mottled with light yellow white, sandy silt with very occasional crushed mortar and occasional broken brick fragments (4375). Also above 4378 was a loose, mid green-black dump of coal fragments (4379) that covered an area 1.5m east-west x 0.5m north-south. Above 4379 was a soft, mid green brown accumulation of sand (4376).

Above 4375 was a soft, black casting sand accumulation (4401). Above 4401 and 4376 was a firm, mid grey brown clay with very occasional broken brick fragments, mortar and grit flecks, and occasional sand inclusions (4374). This was clearly a mass of waste material, probably used to level the area. Above 4374 was a friable, mid blue-black sand accumulation (4373). This thin deposit was probably used as a bedding layer for a partially preserved mortar floor (4534), not recorded in plan but seen in south section of the test pit. Above 4534 was a loose to hard, mid black brown sandy silt with very frequent slag fragments (4402).

Deposit 4402 was excavated at the same time as 4308, 4371 and 4401-7, thin laminations which may be described as follows. 4371 was a compact, mid brown yellow sandy silt with occasional crushed mortar and limestone inclusions. Above 4371 was a hard, mid brown red sandy silt with frequent slag inclusions (4399 = 4404). Above 4399/4404 was a soft, dark grey-black casting sand accumulation 4397 = 4407). Above 4397/4407 was a soft, mid grey black sand accumulation with very occasional mortar flecks (4398 = 4404). Above 4398/4404 was a hard, mid black brown sand dump with very frequent slag fragments inclusions (4396 = 4405). Above 4396/4405 was a loose, mid orange brown sand dump with very frequent slag fragments 4395 = 4406) which was succeeded by a solid, mid to dark red black-brown iron slag (4308) used to make a floor surface.

Above 4308 was a compact, mid brown black sandy silt deposit with very occasional mortar flecks, occasional crushed coal, casting sand and metal working debris, and frequent slag fragments (4361). This was excavated in two spits. Above 4361, the last deposit within the test pit was a compact, mid black brown sandy silt deposit (4325).

#### **5.2.4 Areas D: Test Pit 2**

Test pit 2, measuring 2 x 2m, was dug to the east of wall 4238 in order to identify the earliest foundry deposits.

### *Pre-foundry*

The earliest deposit in the test pit was a mid blue grey clay deposit with very occasional charcoal and mortar flecks (4438).

### *Foundry : primary wall and blocked doorway (Plate 4)*

Cutting through 4438 was the north-south wall 4238 (see above) in which there had been a doorway, later blocked. Above 4438 was a compact, mid orange brown slag layer (4437), probably used to level and raise the ground level, prior to the insertion of 4412 and 4417 (see below) into Wall 4238. Stratigraphically above 4437 was a friable, mid red brown sandy silt accumulation (4436). After this deposit had accumulated the threshold of doorway was raised and two sandstone blocks (4417) with sockets for a door frame put in place.



*Plate 4 Test Pit 1 (Area D) view east showing Wall 4238 and blocked doorway*

Subsequently the doorway was blocked with a brick wall (4416), measuring 1.45m north-south and 0.22m east-west. Each brick measured 0.22 x 0.11 x 0.07m and the bonding material was a hard, light yellowish white sandy lime. Immediately north of the was an area of sandstone slabs (4412), which measured 0.6 x 0.5m; each slab measured 0.2 x 0.3m, and they may have been contemporary with Floor 4411 (see below).

### *Foundry deposits*

Above the stone slabs (4412) was a soft, light brown grey casting sand (4415) which provided an even base for a brick floor (4411), cut away in several places, which measured 0.45 x 0.3m; each brick measured 0.2 x 0.11 x 0.07m. Above 4411 was a friable, mid-red brown accumulation of silty sand with very occasional slag fragments (4413). Above 4413 was a

hard, light orange brown sandy silt with frequent slag fragments and occasional hard, black vitrified material (4409). Above 4409, adjacent to Floor 4136 (see below) and Wall 4238, was a firm, dark grey brown, sandy silt accumulation with occasional small stones and gravel and very occasional charcoal flecks inclusions (4408). This was the last deposit in the test pit.

#### *Surface of stone setts*

Above 4408 was the surface of stone setts 4136 described below (5.2.6).

#### *Post-foundry*

Above the wall blocking 4416 (see above) was a mid grey modern concrete lump (4343).

### **5.2.5 Areas D: Test Pit 3**

Test Pit 3, 2 x 2m, was dug on the east side of Area D in order to identify the earliest foundry deposits.

#### *Foundry deposits*

The earliest deposit found in the test pit was a very thin spread of light pink mortar (4511). Also at a similar depth but to the south of 4511, was a loose to friable, dark grey-black cindery slag deposit (4487).

Above 4511 on the west side of the test pit was a compact, mid-yellow brown clay with frequent medium sized building material and mortar fragments and charcoal flecks (4492). Also above 4511, but on the east side of the test pit, was a very heavily compacted, mid orangey sand (4483). Cutting through the middle of Deposit 4511 was a slot (4502) aligned north-south. It was rectangular in plan, measuring 0.40 x 0.20m, with sharp break of slope at surface, vertical sides and sharp break of slope at base, ending in a flat base. Filling 4502 was a compact, dark brown silty sand (4498). Above 4498 and also filling 4502 was a firm, mid brown silty sand with small building material fragments (4497).

In addition, close to 4502, and cutting through 4511 was a shallow pit (4496), which measured 1 x 0.80m and had an irregular shape in plan, sharp break at surface, sloping sides with gentle break of slope at base and a concave base. Filling 4496 was a firm, dark brownish black clayey silt with frequent flecks of white mortar (4495). Also filling 4496, above 4495, was a firm, black cindery clay (4494). Sealing Deposits 4483, 4487, 4492, 4494 and 4497 was a layer of firm, dark brown-black silty clay cindery charcoal (4467).

Cutting through 4467 was a shallow pit (4470), with sloping sides and a flat base. Filling 4470 was a moderately compacted, mid grey silty clay with a moderate amount of chalk and charcoal flecks (4466).

### 5.2.6 Areas D and E (other than in Test Pits 1-3) (Plates 5 - 11)

#### *Pre-foundry*

At the north end of Area E, pre-dating the chamber (see below) was a mid blue black organic clay (4114).

#### *The Foundry: Primary Walls and Chamber*

Running through Areas D and E was the north-south wall 4238 (described above 5.2.2) which also formed the west side of a chamber, measuring c.3.1 x 2.2m internally and c.1.3m deep, located at the north end of Area E. The other three sides of the chamber were built out of brick walls as follows. The south side was formed by the east-west wall 4239 (see below) which abutted 4238 at its west end. The north side was formed by Wall 4240 (just in Area F), and the east side by Wall 4242. The chamber probably housed an item of machinery, perhaps a pump, used in the foundry.

On the south side of Wall 4239 a small test pit measuring 1 x 1m was dug in which the earliest context was the unexcavated construction cut (4250) for the wall. Stratigraphically above 4239 and filling 4250 was a loose, soft creamy white mortar. Above it was a firm, dark greyish-brown silty clay floor, with occasional building material fragments (4253). This deposit was probably the same as 4486 and 4512 (see below). Wall 4239 itself was 3.45m long and 0.48m wide. The bricks measured c. 0.22 x 0.12 x 0.08m and were mainly in stretcher bond with several irregular headers. A hard, mid yellow-white sand lime mortar was used as bonding material.

The east-west wall 4240, forming the north wall of the chamber, was 3.45m long and 0.48m wide. It was butted to the north end of Wall 4238. At least ten courses of Wall 4240 survived. The bricks measured 0.23 x 0.11 x 0.06m and were bonded with hard mid yellow white sandy lime mortar.

Wall 4242, the eastern wall of the chamber, measured 2.20 x 0.40m. The bricks measured 0.23 x 0.11 x 0.06m and were bonded with hard mid yellow white sandy lime mortar. In the centre of the west side of Wall 4242 was a short projection. Subdividing the chamber into eastern and western halves was a north – south wall 4241, 2.20m long, three bricks wide and again ten courses deep. The bricks measured 0.23 x 0.11 x 0.06m and were bonded with firm whitish yellow sandy lime mortar. There was a niche in the brickwork on the north side of the wall.

On the west side of Wall 4241 and bonded to it and to 4238 was an east – west wall 4243 which measured 1 x 0.5m and was at least nine courses deep. The bricks measured 0.23 x 0.11 x 0.06m and were bonded with yellowish white sandy lime mortar. This wall divided the space west of Wall 4241 into two halves.

In the eastern half of the chamber, post-dating the walls described above, was a firm, mid yellowish, white, sandy lime mortar surface with occasional broken bricks and mid brown clay inclusions (4111). This was the bedding for a brick floor (4110), measuring 0.5 x 0.49m, in which the bricks measured 0.25 x 0.13 x 0.07m and were roughly laid, one course deep. Fairly soft, yellowish white sandy mortar was used as bonding material. Some ironwork remained *in situ* on the brick surface. This surface was located to the east of two large timbers (see below) and possibly provided a solid base for the machinery in this chamber.



Plate 5 Area E: view south of timber beams 4112 and 4113 in chamber; Wall 4242 on left with structure 4087-8 left of scale

Above 4110 was a pair of timber beams (4112 and 4113) lying north – south, 0.40m apart (Plate 5). Both timbers measured a maximum of 2m long x 0.17m wide and 0.13m thick. They passed under the walls on the north and south sides of the chamber (4239 and 4240) in which there were small slots to accommodate them. In addition, there was also a slot built into the base of the eastern wall (4242) possibly to hold part of this machinery in place.

Both timbers had iron fittings attached to them. Timber 4112, on the west, had an upright fitting 0.65m from the south wall and a socket for a missing iron fitting 0.75m from the north wall. Timber 4113, on the east had an upright iron fitting 0.65m from the south wall and a flat protruding iron fragment at 1.05m from the north wall.

Butting up to Wall 4242 on its east side were four low brick walls 0.8m long which continued beyond the east edge of the trench. The two outer walls (4244 and 4247) were more substantial being 0.4m wide whilst the two inner (4245-6) were c. 0.2 and 0.3m wide. Together they appear to define three channels, possibly drains or flues.

#### *Infilling of the chamber*

Above the timbers was a firm, black - brown silty clay deposit with occasional broken bricks,

coal and wood fragments (4089). This was 0.4m thick and the first of a series of dumps of material used to backfill the chamber once it went out of use. Above 4089 in the north-east corner of the chamber. was a soft, mid yellow brown sandy silt with occasional brick and coal fragments (4093). Above 4093 was a moderately loose, dark grey brown clay silt with frequent coal fragments inclusions (4082). Above 4082 was a compact, mid brownish white sandy silt mottled with mid grey brown sandy silt, containing occasional broken bricks, coal flecks and mid yellowish white, soft sandy lime mortar (4081).

Above 4081 was a sandstone slab (4088) measuring 0.5m square and 0.04m thick, which was used as the base for a brick pillar (4087). It measured 0.22 x 0.25 x 0.46m, with individual bricks measuring 0.11 x 0.22 x 0.07m bonded with a pale yellow - white sandy lime mortar (4087). This brick pillar was butted up to the adjacent westwards projection of Wall (4242) to the south, with similar mortar used in the joint between them.

Above 4087 was a soft mid-yellowish brown silty casting sand and fine silt (4080). Covering 4080 was a firm, mid brown-grey silty clay dump with occasional broken brick fragments and mortar flecks (4079). Above 4079 was a soft, dark brown black fine casting sand (4058). Above 4058, was a firm, mid brown grey clayey silt, with very occasional crushed mortar and tile fragment inclusions (4057). Covering 4057 was a moderately firm, mid-black-grey silty sand dump, with occasional mortar lenses concentrated to the west, and very occasional mortar flecks and broken bricks inclusions (4054). This deposit ran up to the chamber walls on the north, east and west, but did not quite reach the south wall (4239). Above 4054 was a soft, dark brownish black casting sand dump with occasional iron fragments (4045) which ran up to the walls on all sides of the chamber. Covering 4045 was a firm, mid yellowish white sandy lime mortar, with occasional broken bricks fragments, and very occasional limestone fragments, clay flecks and roof tile fragments (4019). This layer was interpreted as a dump of demolition debris. Above 4019 was a firm, dark brown sandy silt accumulation or dump deposit, with occasional coal dust and a moderate amount of slag fragments (4017 = 4018).

#### *Foundry deposits above 4253 (Area E)*

Above 4253 (see above) and also above 4486 = 4512, was a hard, blackish grey slag layer with occasional building material fragments (4431), probably a make-up layer to raise the level of this area prior the construction of the brick floor (4139; see below).

In addition, cutting through 4253 (and also 4486 = 4512) was a pit circular in plan (4472), with sharp break of slope at surface, gently sloping sides and concave base. Filling 4472 was a large amount of brick and tile fragments within a mid brown sandy matrix with frequent small fragments of mortar (4471).

Above, 4431-2, 4458 and 4471 was a loose to hard, reddish grey brown slag deposit within a reddish brown silty sand matrix, with frequent mid to large building material fragments,

occasional medium limestone fragments and very frequent slag fragments (4427). This was probably a dump to raise the level prior the construction of the brick floor (4139; see below).

#### *Drain in Area D*

A brick-lined drain (4306 = 4309; Plate 6) running east-west passed through north-south Wall 4238 and was contemporary with it. This probably connected with Drain 4219-4230 in Areas E and N (see below, 5.2.7) and Drain 5187 in Areas Z and AB (see below, 5.2.8).

East of Wall 4328, cutting through 4253, the drain (4306), aligned east-west, was 3.30m long and 0.40m wide. It was not fully excavated (the construction trench was numbered 4340). The drain was lined with two walls consisting of a single line of bricks, bonded with white-yellowish mortar. Filling the construction cut around the walls was 4452, a loose, mid to dark brown sandy silt with occasional building material and mortar fragments (4451). Covering the drain were three iron sheets acting as lids (4453). The smallest one measured 0.60 x 0.30m and it was located under Wall 4238 (see above). The other two measured 1.20 x 0.30m and both had a central circular ring handle on their east edge. The three sheets were 0.04m thick and very corroded.



*Plate 6 Area D: view west of Drain 4306 showing iron covers 4451-2 and north-south Wall 4238 top*

West of Wall 4238, Deposits 4308 and 4333 were cut by the drain 4309, 1.5m long, and curving towards the north-west. The drain was lined with brick walls (4314-5), 0.8m thick and 0.85m in height. They survived up to eight courses high and the bricks measured 0.22 x 0.11 x 0.07m with hard, light grey white sandy lime mortar as bonding material. Covering the channel and bonded to Walls 4314-5 was a group of Elland Flag stone slabs (4296). At the west end it seemed that the slabs had collapsed and the covering was repaired by the addition of extra bricks, however the exact relationship was obscured by the limit of the excavation in this area. At the east end was a firm, mid yellowish white sandy lime mortar (4328) which was probably

the original internal surface/floor. It was fairly patched due to weathering and trampling. Filling the drain was a soft, mid grey brown sandy silt with very occasional broken bricks and small brick fragments (4310-1).

Also filling 4309, above 4310-1 and 4328, was a series of waterlain deposits. The first of these was a firm, dark grey black clayey silt accumulation with occasional charcoal flecks (4327). Above 4327 was a friable, dark brown grey silt, with very occasional broken brick and occasional charcoal fragments (4320). Above 4320 was a friable, pale brown grey silt with very occasional broken bricks and sand inclusions (4319). Above 4319 was a very similar deposit, but slightly lighter and with no inclusions (4317). Finally, the last fill of Drain 4309 was a loose to soft, mid-brown grey sandy silt with very occasional slag small fragments, limestone fragments and occasional casting sand inclusions (4316).

Above 4296, the drain cover, was a line of bricks, possibly a small wall (4295). This was aligned east - west and measured 1m long and 0.15m wide. The bricks measured 0.22 x 0.11 x 0.07m and the bonding material was a compact, mid grey brown sandy silt. The significance of this wall was unknown, but it was possibly a thin, internal dividing wall.

#### *Foundry deposits : Area D*

In the southern part of Area D the earliest deposit was a compact, dark grey-brown mortar floor (4514). Cutting through 4514 was a shallow pit (4515), not completely excavated. Filling 4515 was a firm, dark grey brown sandy silt with occasional charcoal and cinders inclusions (4516). Also cutting through 4514 was another shallow pit (4517), which was an irregular shape in plan, almost sub-circular. It had a sharp break of slope at surface, with steep sides and ending in a concave base. Filling this pit was a loose to friable, mid grey brown sandy silt with occasional large cobbles and frequent medium building material fragments (4518). Above 4518 and 4516 was a firm, dark greyish-brown silty clay floor, with occasional building material fragments (4486 = 4512)

In addition, another test pit (3) was dug in the north-east part of Area D; the earliest context found in it was a partially excavated shallow cut (4490), with rectangular shape in plan, sharp break of slope, sloping sides and flat base. It measured 1.20 x 0.50m. Filling 4490 was a loose, mid grey-brown sandy silt with frequent mortar flecks and building material fragments (4489).

#### *Floor of stone setts (Area D), floor of bricks (Area E), and stone bases (Area E)*

In Area D above 4486 was the continuation of the floor of stone setts with some patches of bricks and cobbles (4136 = 4254) already described above in Area C (5.2.2). The blocks measured c. 0.31 x 0.46 x 0.30m, the largest, to 0.24 x 0.10 x .012m the smallest.



*Plate 7 Area D: view east of brick-built structure 4522 set in stone sett floor 4136*



*Plate 8 Area E: view west of stone settings 4137-8*



Plate 9 Areas D, E, M and N: view east showing north-south wall 4238 running left to right (centre) with Drain 4306/4309 (as 4306 centre foreground, as 4309, centre top) with iron sheets (4451-2) used as cover. Chamber in Area E is top left, left of Wall 4239. Lower left, east-west Wall 4229 and brick drain lining 4219. Left of centre top: stone settings 4137-8 after excavation of brick floor 4139



Plate 10 Area E: view south of chamber with Wall 4240 at base, walls 4241 and 4243 on right and Wall 4242 left of scale

Built into 4136 was a brick structure appearing as a small chamber (4522; Plate 7). It was square in plan, with two courses of surviving bricks. It measured 1.25 x 1.40m, with two possible entrances, one in its west wall and the second in its south wall. The bricks measured 0.22 x 0.11 x 0.07m and were bonded with pink-orange mortar.

Cut into 4253 (see above) was a slot (4421) for a stone base 4137 (related to 4138, see below; Plates 5 and 9). Within 4421 was a packing deposit (4481) composed of brick fragments with no bonding material. Above 4481 was a large, irregularly shaped, Elland Flag stone block (4137), which measured 0.95 x 0.43 x 0.31m and had two sockets in top and two linear grooves. Filling 4421 and post-dating the stone block was loosely to moderately compacted, dark brown-black sandy silt, with frequent small to medium stone and ceramic building material fragments inclusions (4420). Cutting through 4420, and probably associated with 4137 was a stake-hole (4477), with rectangular shape in plan and measuring 0.05 x 0.03 x 0.30m deep. Block 4137 was related to and contemporary with 4138 see below. Following deposition of some further material described below the brick floor 4139 was laid around 4137-8.

Cutting through 4420 was a small pit circular in plan (4418), which measured 0.50 x 0.30m and had a sharp break at surface, steep sides and a concave base. Filling 4418 was a heavily compacted yellow-orange sand with frequent iron slag and occasional building material fragments (4414).

Above 4427 (see above) was a loose to firm, mid grey-brown sandy silt, with occasional medium building material fragments, including some large tile fragments and occasional medium to large cobbles (4426). Above 4426 was a loose to firm, mid brown sandy silt, with occasional medium building material fragments and occasional cobbles (4424). This probably a levelling/bedding for Floor 4139 (see below).

Also above 4426, on the west side of Area E, was a loose, dark grey casting sand spread (4419). Cutting through 4426 was a pit rectangular in plan (4423), with sharp break of slope at surface, vertical sides and flat base, measuring 0.70 x 0.30 x 0.10m deep. Filling 4423 was a moderately compact, pink-red mortar with frequent white limestone flecks (4425). Above 4425, and also filling 4423 was a loose mix of charcoal and dark grey cinder, with small building material fragments (4422). In addition, above 4426 towards the south-west was a small spread of compact, dark brown-black casting sand with small yellow silty lenses and occasional medium size building material fragments (4410).

Above 4410, 4422, 4419 and 4424 was a brick floor (4139); the bricks were laid on bed, showing some small patches of grey-white mortar, suggesting a mortar layer/surface on top of the bricks. Some areas showed a high level of disturbance, perhaps due to the presence of heavy machines. As noted above the floor appeared to have been laid around the stone blocks 4137 and 4138.

Above 4139 was a perfectly even and flat, highly compacted, dark brownish-black iron slag surface (4014), probably used as a very tough floor, able to resist the movement of heavy machinery within the area.

On the east side of Area E was a structure composed of stone blocks (4138), presumably functionally related to 4137 (see above). The construction cut (4433) had a roughly circular shape in plan and measured c. 2 x 1.20m. It had a sharp break of slope at surface, slightly concave sides but it was not fully excavated. Within 4433 was a compact, white-grey mortar with some brick fragments (4482), used as packing or foundation for the structure above. Above 4482 was the structure (4138), made of several Elland Flag blocks with a central slot (Plate 8). There were sockets in the stones on either side of the slot, probably to support an above-ground structure. Filling construction cut 4433 was a heavily cemented mixed deposit of mid-orange yellow clay with a loose, mid to dark sandy silt with frequent building material, slag and limestone fragments (4432). Contained by the slot in Structure 4138 was a friable, mid orangey brown silty sand (4509). Above it was a compact, mid orangey brown silty sand with frequent laminated chunks of coal (4508 = 4459). Above 4508, and still contained in the slot in 4138 was a friable, mid brown sand with frequent mortar, broken tiles and brick fragments (4458).

Taken together 4137 and 4138 were possibly the base for a grinding wheel and associated equipment.

#### *Post-foundry*

Above Wall 4295 (see above) was a firm, light yellow brown sandy silt with occasional broken bricks fragments and crushed mortar flecks (4297). Cutting through 4297 was a modern construction cut, semicircular in plan (4329), which was unexcavated. It was full of concrete, and was possibly part of the foundations for a mid 20<sup>th</sup> century building in the area. Above 4329 was a soft to friable, dark brown black, sandy silt dump, with occasional broken brick fragments and casting sand and very occasional slag fragments (4298). Above 4298 was a modern, flat concrete surface (4143 = 4013) that extended for 5m next to the west edge of the trench.

Above 4296 and 4325 (see 5.2.3 above) was a firm, mid brown black silty sand dump, with occasional casting sand, broken bricks and slag fragments (4307). To the south, and cutting through 4307 was a U-shaped cut for modern concrete (4345), which measured 1.80 x 0.80 m. Filling 4345 was a firm, dark brown black silty sand with a moderate amount of broken bricks fragments (4344), possibly a bedding for the modern concrete (4343) above it.

Also cutting through 4307 was a shallow cut, square in plan (4346), with rounded corners and flat base, measuring 0.4 x 0.4m. Filling 4346 was pale yellow grey concrete, possibly packing for a modern post. In addition, cutting through 4307 was a cut, T-shaped in plan (4349), which measured 0.8m east-west and 0.4m north-south, and 0.25m deep. It had a gentle break of

slope at top, almost vertical sides and a flat base. Filling 4349 was a friable, mid grey brown, sandy silt with occasional organic material inclusions (4348). This was most likely dumped waste material or rubbish.

Finally, again cutting through 4307 was a cut for a modern drain aligned north-east / south-west (4324). This cut was truncated on all sides; it measured 2.20 x 0.4m and had a U-shaped profile in section. Filling Cut 4324 was a firm, light yellowish grey sandy silt with occasional mortar fragments (4338). Above 4338 were two brick walls (4331-2) housing a modern drain. This structure was aligned north-east / south-west and measured 1.85 x 0.25m. The bricks measured 0.22 x 0.11 x 0.07m. Between the walls was a modern pipe (4339) around which was a friable, mid-black brown sandy silt (4330). Finally, above Walls 4331-2, and 4330 was a series of limestone and Elland Flag blocks (4323), of variable dimensions, most likely re-used, roughly placed using no mortar and acting as a drain cover.

Above 4014 (see above) was a concrete and mortar floor (4013), with some gravel content and with a small gully cut into the surface running north - south. This was possibly a post-foundry floor, as the use of concrete suggests an early 20<sup>th</sup> century construction.

Above 4013, 4316, 4143, 4323, 4343, 4347 and 4348 was the modern overburden (4000).

#### *Post-foundry over chamber*

Deposit 4017-8 (see above) was cut by a construction trench (4016) for an east-west service pipe which measured 1.5m long x 0.6m wide with a concave base. Contained by 4016 was a terracotta service pipe (4015) which had a diameter of 0.14m tapering to 0.098m, and was filled with water borne silt. Filling Cut 4016 and above 4015 was a firm, mid grey-maroon sandy silt with occasional crushed mortar (4010). Above 4010 was a loose, mid yellowish white sandy lime mortar with frequent brick fragments and some occasional complete bricks (4005 = 4056). This deposit extended over some of the walls in this area, and was used as levelling deposit. Subsequently there was a firm, mid grey brown sandy silt accumulation, with occasional coal dust, iron slag and crushed bricks and mortar fragments (4008). This was succeeded by modern overburden (4000).

#### *5.2.7 Areas N and E (to the west of north-south Wall 4238)*

##### *Pre-foundry*

In these areas the earliest deposit excavated was a soft, dark brownish-grey clayey silt, with occasional charcoal flecks, clay lenses and small brick fragments (4222 north of a modern drain, 4200, and 4075, south of the drain).

*Foundry deposits and features*

Above 4075 was a moderately compact, light yellowish white, fine crushed mortar deposit, with very small brick fragment inclusions (4070). This very thin deposit (0.01m thick) was interpreted as the remains of a floor surface. At this point in the sequence the main north-south wall of the foundry (4238) was constructed (see above 5.2.2). Also above 4075, to the east, but separated from 4070 by Wall 4238 was a loose, mid yellowish white sandy lime mortar (4056). Cutting through 4070 were five stake-holes, sub-circular in plan with vertical sides. The first (4061) had a diameter of 0.15m. The cut was backfilled with a soft, dark brownish grey clayey silt (4060). The second stake-hole (4063) had a depth of 0.30m and diameter of 0.15m. The backfill of 4063 was soft, dark brownish-grey clayey silt (4062). The third (4065) and fourth (4067) were similar and both were backfilled with a similar type of deposit (4064 and 4066 respectively). The fifth stake-hole (4069) was different from the other four. It was a sub-oval shape in plan, with a sharp break of slope with concave sides and flattish base. It was also slightly bigger than the rest, measuring 0.2 x 0.3 x 0.2m, and was backfilled with a soft, dark brownish grey clayey silt (4068).

Because of the location and proximity of these five stake-holes it is suggested that they were used to support a structure of some sort.

Above the stake-holes was a moderately compact, dark blackish brown mixed deposit of clayey silt and slag fragments (4051). Above 4051 was a soft, light brownish yellow clayey sand with frequent crushed mortar and occasional brick and tile fragment inclusions (4043). Above 4043 was a soft, mid-brown-grey silty sand with occasional slag fragments (4041). This layer appeared to have accumulated gradually in a shallow depression north of 4043. Cutting through 4041 was a pit (4036) rectangular in plan, 1m east-west, 0.4m north-south and 0.15 to 0.2m deep with a sharp break of slope and concave sides ending in a flat base.

Pit 4036 was backfilled with a soft, dark brownish grey sandy silt with occasional tile and brick fragments and a moderate amount of casting sand and charcoal inclusions (4035). Above 4035 was a soft, dark grey-black silty sand dump or destruction deposit with occasional small mortar fragments and small iron and slag fragments (4033). Covering 4033 on its northern side was a compact, mid-dark orangey-brown levelling equally composed of coarse sand and iron waste slag (4030). Above 4030 was a friable, dark sand deposit, with occasional building material fragments, occasional mortar flecks and frequent slag and coal flecks (4021).

Above 4222 was a friable, bright pink silty mortar. This deposit was given two different numbers (4221 and 4224) due to being cut by a drain (4200, see below). Above 4221 and 4224 was a firm to soft, mid grey black silty sand accumulation (4201 and 4202), most likely casting sand waste that was also cut by 4200.

Cutting through 4201, 4202, 4221 and 4224 was a linear cut, aligned east – west, U-shaped in

cross-section (4200). It measured 0.6m north - south, and 0.8m east - west. It was probably a cut for a drain which was subsequently removed. Backfilling 4200 was a soft, mid grey black silty clay, with occasional slag and a moderate amount of rubble (4199). Cutting through 4199 was a small linear cut, with a sharp break of slope at top and gradual break of slope at base, ending in a U-shaped base (4220). Filling 4220 was a moderately firm, mid brown grey silty clay with a moderate amount of broken bricks and occasional crushed mortar flecks inclusions (4218). Above 4218 was a small area of brick floor (4225) which measured 0.9m north-south and was truncated to the east and west. The bricks measured 0.12m x 0.11m x 0.08m and were bound with mid yellowish white mortar.

#### *Drain*

Above 4225 was a spongy, mid grey blue clay (4231). Cutting 4231 was a brick-lined drain (Plate 11) 2.5m long x 0.15m wide x 0.46m deep, probably linked to 4309 (see above 5.2.6). It was cut through Wall 4240 at its north end beyond which it was truncated by a service pipe cut. The lining 4219 and 4230 stood seven courses high, and the walls were one course wide, but two courses wide at the north end. The bricks were of various dimensions: the most typical measuring 0.13 x 0.12 x 0.07m, the biggest 0.22 x 0.13 x 0.07m, and the smallest 0.10 x 0.09 x 0.05m. The bonding material was soft, light brown sandy lime mortar and a small amount of crushed concrete.



*Plate 11 Areas E, F, and N: view north-east with the chamber (Area E) in centre, east-west Wall 4240 running down the centre, and room defined by Walls 4034 and 4215 at top left. Drain lining Walls 4219 and 4230 centre foreground*

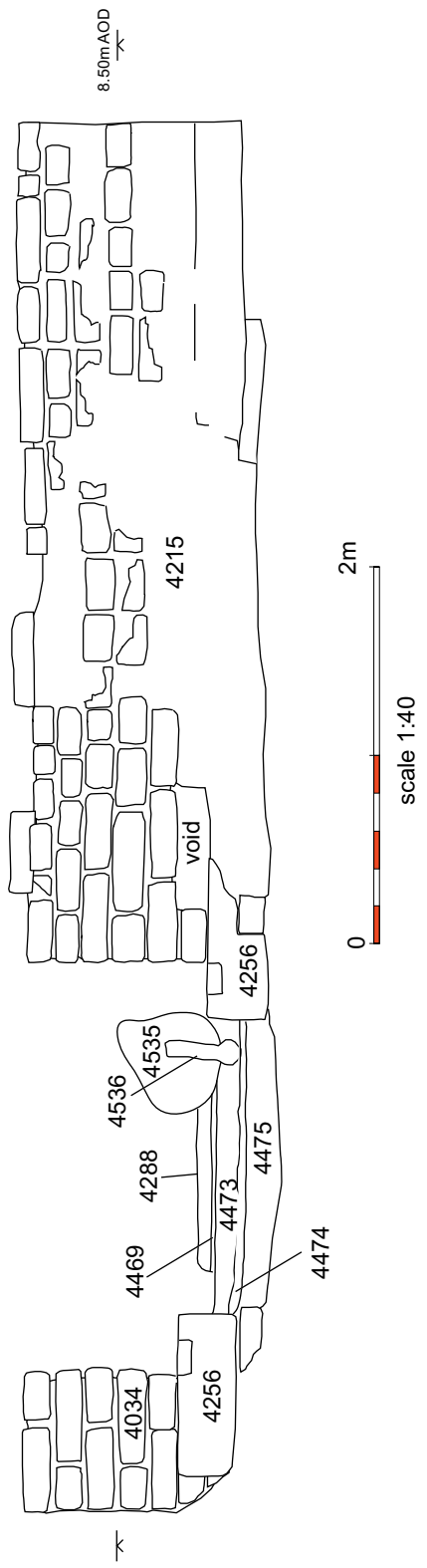


Fig. 5 South facing elevation, Wall 4215

The earliest backfill of this drain was a firm, mid grey brown clay silt with a moderate amount of broken bricks (4140). Above 4140 was a firm, mid grey brown clay silt with occasional broken bricks, slag and mortar flecks inclusions (4132 = 4134). This deposit was given two different context numbers due to a service pipe cutting through it (4126 see below). Above 4132/4

Also above 4231 and to the west of the drain was a firm, mid grey-brown clay silt with occasional slag and broken bricks (4135). Also above 4231 and to the east of the drain was a soft, light grey brown silty sand with very occasional mortar flecks (4144). Above 4144 was a firm, mid brown grey clay silt with occasional slag fragments, mortar flecks and broken bricks (4131 = 4133). This deposit was given two different context numbers due to a service pipe cutting through it (4126 see below).

Sitting above 4231 was a small brick wall (4229) which stood three courses high on a foundation of bricks, one course deep. The wall was made with complete and broken bricks. The whole structure measured 1.3 long x 0.13 thick x 0.32m high. The bricks were c. 0.23 x 0.12 x 0.08m and bonded with mid yellow-white sandy lime mortar.

#### *Post-foundry*

Cutting through 4021, east of the brick-lined drain was a modern construction cut, with vertical sides and flat base (4059). It measured 1.6m east - west and 0.95m north - south. This cut may have once housed some sort of timber support for a structure. Contained within 4059 was a moderately compact, dark grey brown sandy silt with frequent complete brick inclusions (4006). This deposit also contained fragments of large timbers, however it was machined out during the initial clearing of site. Above 4006 was a series of modern deposits under the definition of overburden (4000).

Cutting through 4132 and 4135 west of the brick-lined drain was a service pipe construction cut (4016 = 4126) aligned east - west and 0.6m wide. Housed by 4016 = 4126 was a terracotta service pipe (4125 = 4015) running east-west and curving south at the west end. This pipe had a diameter of 0.14m and it was filled with waterborne silt showing prolonged use.

Above 4015 = 4125 and filling construction cut 4016 = 4126 was a firm, mid grey brown with maroon tinge sandy silt deposit (4124-4010). Sealing these features was a firm, mid grey brown sandy silt deposit with occasional coal dust, iron slag, broken bricks and mortar flecks (4123). This deposit also received context number 4008 in Area E and 4181 in Areas O and F.

Above 4006, 4008, 4123, 4181 and 4229 were modern deposits and overburden (4000).

### 5.2.8 Area F between Walls 4240 and 4215

#### *The Foundry : primary walls*

There are three primary walls to be noted here which define the space to be described.

Running east-west was Wall (4215) which was two courses wide and had six surviving courses of bricks (Fig. 5). The bricks were laid vertically and horizontally on bed, measured 0.23 x 0.11 x 0.06m, and were bonded with greyish white mortar.



*Plate 12 Area F: view north, Wall 4215 foreground and Wall 4034 left and stone block 4205 at top*

Running north from 4215 was the north – south wall 4034, a continuation of Wall 4238 (see 5.2.2) which continued into Areas F, G and H. It measured approximately 15m long, and it survived up to a maximum of eleven courses. Like Wall 4238, it had a wider brick foundation that was three courses high. The bricks were in stretcher bond with several irregular headers. The bricks measured 0.23 x 0.11 x 0.07m, and were bonded with greyish white mortar.

At the junction of 4034 and 4215 there was a doorway (Plate 12). There was no specific threshold, but a floor (4475; 5.2.10 below) which continued into the room to the north was found. On each side of the door way built into the walls were sandstone blocks (4256) with sockets in the upper faces which would have supported a door frame. Probably prior to the raising of the ground level within the room (see 5.2.10 below) the doorway was blocked.

On the south side of Area F was Wall 4240 which formed the south side of the chamber (see 5.1.6, Area E above).

### *Foundry deposits and features*

South of the area walled by 4034 and 4215, the earliest deposit was a compact, whitish to red mortar surface (4353), the reddish brown staining in some places was due to the brick surface above it. Above it was a hearth (4357) which consisted of burnt bricks, black ash and casting sand forming an uneven surface. At the same stratigraphic level, and probably part of this hearth was a floor surface (4356 = 4352), which measured 1.6 m north - south and 1.1m east - west. Each brick measured 0.23 x 0.11 x 0.08m, the bricks were mortared to the mortar surface below (4353), but not to each other. This structure was either part of the base of the hearth, or represented a floor surface. The eastern extent of the context appeared to be the original limit, as did the southern extent. All other extents were unknown as it was highly disturbed. Above 4356 = 4352 was a thick layer of light brownish white mortar (4355), possibly the remains of a mortar floor on top of the brick surface.

Directly above Hearth 4357 was a loose, light whitish grey ash and charcoal accumulation (4155). Above it was a soft, dark greyish brown clayey silt with grey mortar fragments (4154). This was succeeded by soft, dark greyish brown clayey silt with a moderate amount of small brick fragments and occasional gravel inclusions (4153). Covering 4153 and 4355 was a loose, mid reddish brown sandy silt with occasional mortar and building material small fragments (4152).

### *Brick Channel*

On the east side of Area F and continuing north of Wall 4215 (see below 5.2.10) was a brick-lined drain (4485), aligned north – south. The brick-lining stood two courses high and one brick wide with a very thin clay lining. The bricks measured 0.24 x 0.11 x 0.07m and were bonded with lime mortar and sand temper. South of Wall 4215 the drain was covered with iron plates (4478), severely corroded, which measured c. 0.50 x 0.50 x 0.02m thick. Above 4478 was a soft, mid greyish brown clayey silt (4484) succeeded by a grey-brown cinder and coke layer (4476).

### *Brick surfaces*

Located directly to the west of Drain 4485 was a brick wall (4491) aligned north - south; it stood three courses high and measured 1.90 x 0.40m, with whitish yellow mortar as bonding material. The earliest of a series of floors in this area which butted up to Wall 4491 was a rough brick surface (4506), made of un-bonded bricks and brick fragments. The bricks measured 0.24 x 0.11 x 0.06m with gaps filled with a loose, mid brown sandy silt. Mortar residue on some of the bricks suggests re-use. This floor was one course deep and measured 1.2 x 1.8 x 0.08m. Above 4506 was a rough brick floor surface (4505), un-bonded and with gaps between bricks filled with mid brown sandy silt. This floor measured 1.2 x 1.8 x 0.08m and the bricks measured 0.24 x 0.11 x 0.06m. Directly above it was a soft, mid greyish brown sandy silt (4504). Above

4504 was another brick floor surface (4501), made of un-bonded complete bricks and frequent brick fragments (Plate 13). This floor measured 1.2 x 1.8 x 0.07m and the complete bricks measured 0.24 x 0.11 x 0.06m. The next floor (4493) in the series was pretty similar to 4501.

The following floor or surface (4359) in the sequence was better made than the others; it had a layer of mortar bonding on the upper surface. The floor measured 1.8 x 1.8 x 0.08m and the bricks measured 0.24 x 0.11 x 0.06m. This surface of this floor was at the same level as the top of Wall 4491.



*Plate 13 Area F: view east of brick floor surface 4501*

Finally, above 4359 and also above Wall 4491 was another brick floor surface (4360), constructed from yellowish brown bricks measuring 0.24 x 0.11 x 0.07m, bonded with mortar. A very thin layer of mortar covered the surface of the bricks.

#### *Brick structure*

To the west of Floor 4360, immediately to the north of Wall 4240, and cutting through 4358 was a cut irregular in plan (4435). It measured c. 0.75 x 0.4 x 0.08m, with sharp break of slope on top, straight sides and flat base. Filling 4435 was a small brick and mortar structure (4430); it was made of complete and half bricks, two courses high with a very compact and solid mortar. It had an unknown purpose but it may have been related to the patched up hole in the north face of Wall 4240, which it butts. Above 4430 and filling construction cut 4435 was a loose, mid greyish brown sandy silt (4434).

*Foundry deposits and features*

Cutting through 4434, and also through Floor 4360 was an east-west trench (4258), 0.8m long x 0.2m wide. It had a sharp break of slope, straight to concave sides and flat base. This had possibly been dug to extract a piece of machinery or other feature built into the foundry floor. Filling 4258 was a loose, mid reddish pink silty sand with occasional small brick fragments (4151).

On the south side of Area F, occupying most of the area between Walls 4240 and 4215, and cutting through 4152 and 4151, was a demolition pit (4150), which measured 1.75m north-south and almost 3m east-west, with sharp break of slope in places, straight sides and a very flat base. This cut was presumably dug to be filled with demolition material, probably when the iron foundry was facing changes and expansions from its original layout. Filling 4150 was a loose, light to mid yellowish grey sand and crushed mortar with very frequent brick and tile medium size fragments (4145).

On the west side of Area F and also the east side of Area O, cutting through 4145, 4302 and 4290 was a pit (4203), aligned east – west, which measured 4 x 1.60m and had a sharp to gradual break of slope, slightly concave sides and flat base. Filling 4203 was a loose, mid brownish grey silty clay and mortar thin deposit (4188). Above it, and still contained by 4203, was a loose, mid brownish grey mortar and silty clay, with occasional medium size brick fragments and frequent grey cement and mortar medium size fragments (4187).

Also cutting 4290, was a small pit or post-hole (4293) oval in plan, with a sharp break of slope, concave sides and concave base. It measured 0.45m north - south, 0.4m east - west and 0.35m deep. Filling this pit was a soft, mid dark brownish grey sandy silt with occasional slag fragments (4292).

Above 4292 and 4187 was a loose, dark greyish black coal, coke, and casting sand deposit with occasional small slag fragments (4142). This deposit butted walls 4034, 4215 and 4240, and it was probably associated with a dump of loose, dark grey black casting sand (4141) above it.

Cutting through 4142 was a post-hole (4286), circular in plan, with sharp break of slope, straight sides and flat base. It measured 0.5 x 0.35 x 0.03m. Housed by this post-hole was a rectangular slab of Elland Flag (4285), which measured 0.30 x 0.20 x 0.06m. This was either a support for a post, or possibly for a piece of machinery. Filling 4286 and above 4285 was a loose, light whitish brown silty mortar, with frequent brick and tile small fragments (4284).

Also above 4142 and 4236 was a loose, mid yellowish grey silty sand demolition layer, with occasional building material fragments and frequent crushed mortar (4181).

*Post-foundry*

Above 4181 was the modern overburden (4000).

5.2.9 *Areas F and O (west of Wall 4034)*

*Foundry : primary wall*

On the south side of Area O there was a continuation of the east – west wall 4240 the line of which was continued in Trench 5 by Wall 5106.

*Test Pit 4*

Test Pit 4 was dug on the east side of Area O, to the west of Wall 4034, to examine the earliest deposits in this part of the foundry. It measured 2 x 1m. The following deposits were found.

*Pre-foundry*

The earliest deposit found within the test pit was a soft, light mid-yellowish brown sandy silt with very occasional crushed lime mortar fragments (4524).

*Foundry deposits and features*

Cutting through 4524 was a cut of unknown purpose (4523), which measured 1.05m north - south and 1m east - west. This cut had gradual break of slope, straight sides and flat base. Filling cut 4523 was a soft, mid brownish grey clayey silt with a moderate amount of broken tiles and occasional limestone fragments (4521).

Above 4521 was a loose, light whitish brown sandy crushed mortar with very occasional construction building material fragments (4520). Above 4520 was a soft, dark greyish brown sandy silt (4519). Finally, the latest deposit found in Test Pit 4, above 4519, was a loose, light brownish white mix of sandy silt and crushed mortar, with very occasional construction building material and mortar fragments (4513).

Above 4513 and to the north of Test Pit 4 was a loose, mid reddish pink crushed mortar and sand dump with occasional mortar fragments (4335). Also above 4513, but to the south of Test Pit 4, was a soft, mid brownish grey silty clay dump or levelling, with very occasional mortar fragments and construction building fragments (4377 = 4507 = 4358).

Above 4377 was a soft, dark greyish brown clayey silt, with occasional building material small fragments, and gravel inclusions (4366). Cutting through 4366 was a cut rectangular in plan (4372), aligned north - south, with fairly sharp break of slope, straight sides and concave base, running alongside and to the west of Wall 4034. The purpose of this cut was unknown.

Filling 4372 was a loose, mid yellowish brown sandy silt with occasional small building material fragments (4367).

Above 4367 was a compact, mid brownish grey silty clay levelling deposit, with occasional mortar and building material fragments and very occasional charcoal fragments (4365). Directly above 4365 was a compact, light yellowish white crushed mortar floor (4364). This floor contained two impressions; possibly where heavy objects placed on the floor had caused damage. One of the impressions was rectangular in plan, it was aligned north - south and measured 0.80 x 0.20m; the second impression was also aligned north - south, it had an irregular shape in plan, and measured 1.20 x 0.60m. Cutting through it was a feature rectangular in plan (4363), aligned north - south with sharp break of slope, straight sides and flat to concave base. It measured 1.5 x 0.3 x 0.05m deep. This was possibly the construction cut for a thin wall, which had been removed. This cut was on the same alignment as Wall 4334 (see below) and was of a similar size. Filling 4363 was a loose, mid brownish yellow mortary sand with occasional mortar and building material fragments (4362).

Above 4362 was a firm, brownish grey silty sand with frequent medium sized building material and occasional mortar fragments (4350). In the south-east part of Area O, and cutting through 4350 was a pit (4342), oval in plan, with sharp break of slope, straight sides and slightly concave base. It measured 1.10m east - west, and 0.85m north-south. Filling this pit was a soft, mid brownish grey clayey silt, with occasional building material, mortar and charcoal small fragments (4341). Also filling 4342 and above 4341 was a loose, mid yellowish grey sandy silt with occasional brick and mortar small fragments (4340).

Covering and sealing Pit 4342 was a soft, mid brownish grey silty clay levelling deposit with occasional brick and mortar small fragments (4336). Cutting through it was a cut (4321), with an irregular shape in plan, and steep, straight and concave sides and a flat base. This cut measured 2.9m north-south, 2.9m east-west and 0.3m deep. Filling 4321 was a soft, dark brownish grey casting silty sand with frequent slag fragments and occasional bricks small fragments (4313 = 4322) which was also used to level the area.

On the east side of Area O, and also cutting through 4350 (see above) was a flimsy north - south wall (4334). The construction cut (4337) had a gradual break of slope, straight sides and concave to flat base. It contained a firm, yellowish brown sand deposit (4318 = 4326). Above it were the remains the wall composed of three complete bricks aligned north-south and bonded together with grey clay. Two of the bricks measured 0.16 x 0.08 x 0.07m, and the third one measured 0.23 x 0.10 x 0.08m. Above 4334 was a soft, dark to mid reddish brown sandy silt with occasional building material fragments (4301). Above 4301 and 4313 = 4322 was a loose, light orangey yellow sand with occasional brick and mortar small fragments (4300).

Also above 4350 was a moderately compact, mid greyish brown to yellow silty sand (4302), this deposit received also context number 4235.



*Plate 14 Area F: view south of the brick walled structure 4237 with Wall 4240 above*

Cutting through 4350 in the south-west corner of Area F was a square brick box-like structure (4237; Plate 14). It had a shallow construction cut (4255) with sharp break of slope, straight sides and flat base. It measured 0.8m east-west, 0.6m north-south and 0.08m deep. The brick structure (4237) was four courses high and measured 0.60 x 0.40 x 0.25m. It was mostly made of brick fragments crudely mortared together. This feature was possibly a fireplace or chimney base but could also have been used for storage. Packed around the bricks was moderately compact, dark brownish grey sandy silt with occasional mortar, slag and brick and tile small fragments (4248). Within the structure was a loose, dark blackish grey coke deposit (4236).

#### 5.2.10 Area F within Walls 4034 and 4215

##### *The Foundry : Primary Walls*

At the north end of Area F two sides of a room within the foundry were defined by Walls 4034 (east – west) and 4215 (north – south), for description see 5.2.8 above (Plate 12). The room which they defined clearly continued beyond the eastern edge of the excavation and the northern edge of Area F, continuing into Area G (below). At the north end of Wall 4215 where it joined Wall 4034 was a doorway as described in 5.2.8.

##### *Brick-lined pit and drain.*

The earliest feature within the room was a probable well or brick lined pit (4526) of which about half was seen in the excavation. The feature was not excavated but the wall lining the feature consisted of a double line of bricks. The fill of the feature was a soft, dark brown grey sandy silt (4527). This feature was cut on its south side by the brick-lined drain (4485; Plate 15) which as noted above (5.2.8) continued to the south of Wall 4125. The bricks (4499) covering the

drain measured 0.24 x 0.11 x 0.07m and had a whitish lime mortar as bonding material.

#### *Foundry deposits and features*

On the west side of the room was a floor of compact, light pinkish white crushed mortar floor, with very occasional yellow-brown sand inclusions (4475). Above it was a compact, mid brownish grey silty clay levelling deposit, with occasional building material and small mortar fragments (4474). Above 4474 was an extremely thin and rough, compact, light pinkish white crushed mortar surface, with very occasional building material fragments (4473). Above 4473 was a fairly compact, light to mid greyish brown silty clay levelling deposit, with occasional building material and mortar small fragments (4469).



*Plate 15 Area F: view west of drain 4485 (base) and Wall 4526*

Above the drain 4485 and the possible well 4526 and 4469 was a further build up of deposits which probably represented deliberate raising of ground level. Above them was a large sandstone block, of which the south-west corner was damaged, that measured 1.10 x 1.10 x 0.40 m (4205; Plate 12). It had four small round holes in each corner of the upper face. Its use is unknown, but it may have been a base or support for some form of industrial machinery. Contemporary with this block and immediately to the west of it was a short piece of brick wall 4287, aligned north - south, that was five courses (0.45m) high and two bricks wide (0.24m). The bricks measured 0.23 x 0.12 x 0.06m and were bonded with mortar and chalk.

Covering 4205 and Wall 4287 was a layer of casting sand (4261). Above 4261 was a compact, orangey black slag layer, with a moderate amount of casting sand patches (4260). This was a very thin deposit, up to a maximum of 0.05m thick. Above 4260 was a soft, dark grey sand deposit with occasional small fragments of slag (4210). This was a levelling deposit of casting sand that continued beyond east edge of the trench, and underneath 4184 and 4185.

Above 4210 in the north-east of the area was a single course of bricks aligned north- south, lying on bed, with no mortar or any other type of bonding material filling the gap between the

bricks (4213). This structure was possibly a floor or a small wall of unknown use. Above 4213 were the remains of another wall (4212), with only two courses high, aligned north - south, with bricks laying on bed and with no bonding material. This wall had no construction cut or backfill; it was just overlying 4213.

Directly above 4212 was a dump of firm to friable, brownish grey silty sand with occasional chalk fragments, charcoal and mortar flecks and a moderate amount of slag and construction building material fragments (4204). This deposit continued beyond the east edge of the trench. Also above 4210 on the north side of the area was a compact, greyish white silty sand with very occasional mortar flecks and very frequent crushed chalk surface (4211). This was a very thin deposit, up to a maximum of 0.08m that continued under the slag surface (4184 and 4185).

To the west of 4211, and cut into 4210, was a cut (4209) an irregular shape in plan. On the east side it had a sharp break of slope at top, with moderate to steep sides. On the north side it had a sharp break of slope at top with almost vertical sides ending in a slightly concave base. Filling 4209 was a loose, dark grey sandy silt, with occasional coal fragments, mortar flecks and with small fragments of construction building material (4208).

Covering 4208, 4211 and 4204 was a strongly compacted orangey-grey slag surface with a moderate amount of casting sand in small patches (4184). This slag surface was very similar to 4185 (see below) and it was not excavated.

Above 4184, to the north-east, was a small wall, aligned east-west with only one course of bricks surviving (4214). It had no mortar or any bonding material. The bricks measured 0.23 x 0.11 x 0.09m. Neither a construction cut nor a construction backfill were visible. Above 4214 was a firm to friable, brownish grey sandy silt dump deposit, with frequent chalk fragments and occasional construction building material fragments inclusions (4183). Cutting through 4184 was a stake-hole (4207), square with rounded corners in plan. It had a sharp break of slope at the top, almost vertical sides and a slightly concave base. It measured 0.03 x 0.025 x 0.043m. The stake-hole was dug against the south side of the limestone block 4207 (see above). Filling 4207 was a loose, dark grey sandy silt, with occasional coal and chalk fragments, and mortar flecks inclusions (4206).

Covering 4206 and 4183 was a strongly compacted, orangey-grey slag surface (4185). This surface extended also into Areas G, O, and P, and it was not excavated. 4185 covered by various layers of overburden (4000).

#### *5.2.11 Area G*

##### *Pre-foundry*

The earliest deposit found in Area G was a compact, mid brown clayey silt with frequent

charcoal, mortar and building material flecks (4046 = 4091).

*Foundry: primary walls*

Cutting through 4046 was the north-south brick wall 4034 (also recorded in Areas F and H). set in the construction cut (4050). In Area G Wall 4034 had seven surviving courses (standing 0.66m high) and was three bricks wide (0.36m). The bricks measured 0.23 x 0.12 x 0.05m were bonded with grey-white mortar. The construction cut was backfilled with a friable, light brownish yellow sandy mortar with a moderate amount of building material fragments and flecks (4049). Bonded to the north side of Wall 4034 was a short stub of east-west wall (4129). Its line was continued in Trench 5 by 5022 (Area P) and 5039 (Areas T/U)

*Foundry deposits and features*

Above Wall 4034 and to the west of it was a loose, crushed brick deposit with limestone fragments (4090). This was a possibly a make-up deposit associated with the construction of the wall. Above 4090 was a loose, fine-grained, black casting sand deposit (4072), bounded by Wall 4034 to the east and continuing beyond the edge of excavation to the west.

Above 4072 were Deposits 4053, 4052 and 4044. 4053 was a firm to friable, light greyish to mid brown silty sand deposit, with frequent mortar flecks and metal working debris, and occasional building material fragments. 4052 was a very loose, dark grey-black casting sand deposit with very occasional building material fragments. 4044 was a friable, mid reddish-brown silty sand with occasional building material fragments, a moderate amount of mortar flecks and frequent large slag fragments. This last deposit extended 5m north - south, ran up against Wall 4034 to the east and continued beyond the edge of the trench to the west. Above 4044 and 4052-3 was a friable to loose, dark grey brown silty sand deposit (4040).

Above 4049 (backfill of construction trench for 4034) was a friable, black cinder make up layer, with frequent slag fragments (4078). Cutting 4078 was a wall (4026) aligned north-south, parallel to Wall 4034, and 1.4m to the east of it (which continued into Area H). It was made of re-used brick fragments, mostly half bricks. The wall had two courses of surviving bricks and was two bricks wide. It had no visible construction cut and appeared to have been set straight onto the ground surface. The bricks did not have an obvious bond type and were mortared with light grey lime mortar.

Also cutting through 4078, between Walls 4026 and 4034, was the construction cut (4077) for a hearth. It was not completely excavated, hence the shape in plan was not clear, however it had an abrupt break of slope at top, with straight sides and a flat base. Contained by 4077 was a deposit of friable, crushed bricks and mortar with frequent slag fragments (4076), possibly a bedding layer for the hearth. Also contained by 4077 and above 4076 was the hearth (4032), square in plan, which measured 1.70 x 1.35m (Plate 16). This feature was made with re-used

bricks, many of them just half bricks, mortared with mid-greyish yellow sandy mortar, and some limestone fragments. Some of those limestone fragments had evidence of discoloration due to heating/burning.



Plate 16 Area G: view north of Hearth 4032, Wall 4026 (right) and Wall 4034 (left)

Above Wall 4026, to the west of it, was a pit cut (4048) of which only a part was seen. It had near vertical sides and a flat base. Filling pit 4078 was loose, dark brownish red slag in a grey sandy silt matrix (4047).

#### *Post-foundry*

Stratigraphically above 4040, 4047 and 4032 was the modern overburden (4000).

### 5.2.12 Area H

#### *Pre-foundry*

The earliest context found in Area H. was an unexcavated pit (4116) at the north end. Filling this pit was a firm, light brown clayey silt with occasional charcoal flecks and building material in small fragments, and a moderate amount of mortar flecks (4115). Above 4115 was a friable, light brown sandy silt with a moderate amount of charcoal flecks, building material in small fragments and occasional mortar fragments inclusions (4103). Cutting through 4103 was a stake-hole (4098) which measured 0.10 x 0.14m and 0.13m deep. This stake-hole was filled with a loose, dark grey silty sand with a moderate amount of building material flecks (4097).

Sealing 4097 was a very compact, light grey silty clay with very frequent mortar and charcoal flecks, and frequent small building material fragments (4092). This deposit was cut by 4084, 4028, 4117, 4118 and 4119 (see below).

Foundry : primary wall

Cutting through 4092 was the north-south aligned brick wall (4034), also recorded in Areas F and G, which in Area H was three bricks wide, with seven courses surviving, the bricks lying on bed. Mortar was used as bonding material and the bricks measured 0.23 x 0.12 x 0.05m.

East of Wall 4034, was Wall 4026 (see Area G, 5.1.11 above )

#### *Foundry deposits and features*

The construction trench for Wall 4034 in Area H was filled with a firm, light brown clayey silt with occasional building material fragments, mortar and charcoal flecks (4083 = 4049).

To the east of Wall 4034, and above 4083, was a compact, yellowish brown sandy mortar floor (4086). Similar to this mortar floor was 4085 to the west of Wall 4034, thought to be another floor. Above 4086, was a firm, dark grey silty sand with very occasional slag fragments and a moderate amount of building material fragments, charcoal and mortar flecks, and coal fragments (4055). Cutting through 4055 was a feature rectilinear plan (4117) aligned roughly north - south, with sharp break of slope on top and a flat base. Also cutting through 4055 was a group of three stake-holes (4118-20) forming the ends of a 'Y'. Stake-hole 4118 had a square shape in plan with rounded corners, was 0.3m in depth and ended in a flat base. Stake-hole 4119 was similar to 4118. Stake-hole 4120 was slightly different. It had a circular shape in plan and measured 0.25m in depth. It may well be the case that these stake-holes supported some sort of machinery or structure.

#### *Post-foundry*

Also cutting through 4055 was the construction cut for a modern drain (4028). This cut was aligned north-west to south-east and it was not completely excavated. Contained by 4028 was a ceramic drain pipe (4027). Filling 4028, and above 4027 was a firm, brownish grey clayey silt with occasional mortar flecks, limestone and building material fragments, a moderate amount of charcoal flecks and occasional burnt clay (4042). Also filling 4028 and above 4042 was a compact to firm, greenish grey clayey silt with a moderate amount of plaster fragments and occasional limestone, building material and mortar fragments (4029). Above 4029 and filling Stake-holes 4118-4120, and also filling Cut 4117 was a very soft, dark grey silty casting sand with rounded cobbles and a moderate amount of mortar, slag and building material fragments (4011). This was a very thick deposit, up to 0.53m in some areas.

Above 4011 was a dump of soft, brown-greyish casting sand with very occasional limestone

and mould fragments (4001). Also above 4085, probably contemporary with 4001 on the west side of Area H, was a compact to firm, dark grey silty sand deposit, with very frequent charcoal flecks, coal and slag fragments (4071). Context 4071 was sealed by 4000, modern overburden.

### *5.2.13 Areas I and R*

#### *Pre-foundry*

The earliest deposit found in this area was a compact, mid brown, clayey silt make-up or levelling deposit, with charcoal, building material and mortar flecks (4101). This deposit was probably the same as 4046 and 4091 in Area G, and it was probably part of a thick deposit of material used to build up the ground level next to the riverbank prior the construction of the foundry.

#### *Foundry walls*

The north-south wall (4034) was cut away by a modern feature at the junction of Areas H and I. Cutting through 4101 was the construction cut (4105) for a brick wall (4107) aligned east – west, 0.60m wide, of which five courses of surviving bricks (0.22 x 0.09 x 0.05m) laid on bed and bonded with creamy white mortar survived. The foundations stepped out to the north and south. The construction trench (4105) was filled with a firm, crushed mortar and small building material fragments (4104).

Wall 4107 was cut by a modern pipe (4099, see below) at its east end. To the east of the pipe the Wall 4107 continued as Wall 4106 for c. 1.60m before going beyond the eastern edge of the trench.

Contemporary with Walls 4106 and 4107 was Wall 4109, of which only the south end was recorded, as it disappeared beyond the north edge of the trench. This wall was also made of bricks bonded with a light cream-grey mortar. It survived up to five courses high and the bricks measured 0.23 x 0.11 x 0.07m.

Above 4104 and Wall 4109 was a brick floor (4031), with the bricks laid on bed and bonded with white - yellowish mortar. It was mostly made with half bricks, which measured 0.11 x 0.12 x 0.05m, and with four levels of floor surviving. Above (4031) was a friable, black casting sand layer (4102), possibly used to level the ground surface.

#### *Post-foundry*

Cutting through 4102 was the construction cut (4100) for a 19<sup>th</sup> century sewer pipe running towards the river. This cut was also found in Area H, but here it was on a slightly different

alignment. Filling 4100 was a compact dark brown sandy silt with frequent mortar and charcoal flecks, occasional building material and 19<sup>th</sup> century sewer pipe fragments (4099). Also cutting through 4102 was another cut for a pipe trench (4121). This one was not excavated completely, and hence the relationship with 4100 remains unclear. However both pipe trenches contained a very similar fill. Filling 4121 was a compact dark brown sandy silt with frequent mortar and charcoal flecks and occasional building material and 19<sup>th</sup> century sewer pipe fragments (4122).

Above 4099 and 4122 was the modern overburden 4000.

### 5.3 Trench 5

Trench 5 measured c. 28 x 15m (10m wide to the south), and it was divided into seventeen areas based on the 5m grid squares used for recording. (Plate 17).



Plate 17 General view north of part of Trench 4 (right) and Trench 5, the figure in the pale jacket (top centre) stands in the Casting Pit 5116

#### 5.3.1 Areas O, P, S and T.

##### *Pre-foundry*

The earliest deposit found in this area was a compact, brown clayey silt (5253).

##### *Foundry: primary wall*

In Area S, and cutting through 5253, was an east - west aligned brick wall (5106) which

was part of the original foundry structure and continued the line of Wall 4240 in Trench 4. It measured 3.60m long and 0.40m wide. It was three bricks wide with seven surviving courses. The bricks were bonded with grey white coarse mortar. At the west end, butted up to Wall 5106 was a later extension (5155). It was seven courses high and two brick courses wide, with white mortar bonding the bricks. Butted to Wall 5106 on its north side was another short brick wall (5201) made with fragments of re-used masonry and bricks. It was not regularly coursed and had light yellow mortar bonding the bricks.

In Area P there was a short stretch of east – west brick wall (5022) which continued the line of 4129 (Area G) and was continued again by 5039 (Areas T/U).

#### *Casting pit and other pits*

Cutting through 5253 was a large pit circular in plan (5116), (Plate 18), 4m in diameter and 1.68 deep. It had sharp break of slope at the top, vertical sides, a sharp break of slope at the base which was flat. This was probably the principal casting pit for the foundry and may have had a chimney standing above it of which no trace has survived. A ventilation shaft or flue (5254) was found on the north - west side, near the bottom. This had a brick lining, and an arched top. It was almost 2m long, but the complete length could not be estimated due to a collapse inside the flue. At the base of Pit 5116 was a flat iron platform (5251) mounted on a base of bricks. The brick structure was square in shape and five courses high.



*Plate 18 View south-west of Casting Pit 5116 with east-west Wall 5106 (top)*

Above 5251 and filling Pit 5116 was 5115, a soft, dark brown casting sand, with lenses of slag on top of the fill, occasional slag fragments and occasional building material fragments becoming more frequent towards the base of the pit.

Cutting through 5115 was a pit, rectangular in plan (5168) which measured 2 x 1.20m. It had an abrupt break of slope, with vertical sides and a flat base. Filling 5168 was mid bluish grey coke in a matrix of soft black casting sand (5081). Above 5081 and still filling 5168 was a soft black casting sand with frequent slag fragments (5080).

Also cutting through 5253 in Area S was a pit (5030), roughly 0.80m square in plan, and not completely excavated. Filling 5030 was a soft, black casting sand (5029). Cutting through 5029 was another small pit (5028), roughly square in plan with a sharp break of slope at the top, gently sloping sides and flat base. Filling 5028 was a soft, black casting sand (5027).

Finally, in Area T and also cutting through 5253 was a pit oval in plan (5056) with gently sloping sides and a concave base. The top of the cut was unnoticed within the casting sand. Filling 5056 was a soft, black casting sand (5055).

#### *Foundry deposits and features*

Stratigraphically above Wall 5201, was a compact, light brownish yellow mortar deposit (5189), interpreted as a floor make-up. Above it was a compact, mid grey clayey silt floor (5188). Covering 5188 was a soft, mid grey casting sand (5186). Above 5186 was a densely packed deposit of broken ceramic vessels within a mid yellow sand matrix (5031). The vessels existed in a number of possible industrial forms (see Section 8.2 below). Above 5031 was a deposit of red brick and fragments of mortar and micaceous sandstone (5144) filling a niche in Wall 5106.

Towards the centre of Area S, and cutting through 5186 was a pit (5172), square in plan, 2 x 1.90m with a sharp break of slope, vertical sides and flat base. Filling 5172 was a compact, crushed brick and mortar deposit (5179), which seemed to be a make up for a surface. Above it, and also filling 5172, was a compact, white to mid yellow chalk fragmented surface (5178). This was highly compacted, and it seemed a surface that lined the pit. It is also interesting to notice that this was the only chalk deposit found on site. Finally, also filling 5172, and above 5178, was a soft, black casting sand (5171).

Cutting through 5171 was a small pit (5005), semicircular in plan, which measured 0.80 x 0.40m and had a sharp break of slope at the top, with gradual and gently sloping sides, ending in an irregular base. Filling 5005 was a friable, light brownish red cinder, with metal chipping and slag and one fragment of shaped limestone (5004). In addition, some leather straps were found within the backfill.

### *Post-foundry*

Stratigraphically above 5144, and covering 5027, 5055, 5004, 5080 and most of Trench 5 was 5001, a soft, dark black casting sand with occasional slag fragments and cinder on its west side, but reasonably pure on its east. It covered some of the walls, which suggested that was dumped after the foundry went out of use.

In Area S and above 5001 was a very fine, light grey-yellow clayey sand (5113). Above it was compacted and thin layer of mid red to orange sand (5110). Above 5110 was a soft to firm, dark brown-black casting sand, with patches of white grey mortar and frequent building material flecks (5111). Above 5111 was a loose to soft, mid dark grey-black fine casting sand with frequent small building material fragments (5019). Above 5019 were the modern overburden layers (5000).

### *Evaluation Trench*

Cutting through the overburden was one of the archaeological evaluation trenches (5011) dug by On-site Archaeology. It measured 3 x 2m.

## **5.3.2 Area U (and including Wall 5132)**

### *The Foundry: primary walls*

Wall 5132 lay immediately west of Area U and was recorded in Areas AD, W, X and Y (Plates 20-3). It was aligned north – south, with eight to nine courses of surviving bricks. It was usually two bricks wide, but five bricks wide in Area X, this addition of bricks was a clear reinforcement of the wall, probably related to the concrete base (5021) located to the west of it (see 5.3.4 below). The wall measured approximately 15m long, and the bricks measured 0.24 x 0.11 x 0.05m, with yellowish white mortar used as bonding material. Filling the construction cut 5142 was a compact, dark brown silty clay (5141).

Wall 5039 lay immediately south of Area U. It was aligned east - west, with five to six courses of surviving bricks. It was two bricks wide and it measured 4.30 x 0.40m. The bricks measured 0.24 x 0.11 x 0.05m, with yellow-white mortar used as bonding material.

As a result of an addition to the foundry plan Walls 5039 and 5132 came to form the west and south sides of a small room at the north end of the foundry (Plate 19). Walls 5079 and 5195 (described below) formed the other two sides of the room.

### *Test pit 5*

A test pit (6) measuring 2m x 2m was dug in the south-east corner of Area U, to locate the earliest foundry deposits.



*Plate 19 Area U: view south-east of room defined by Walls 5039, 5132 (right), 5079 and 5195. Top of the concrete base (5021) on right of Wall 5132*

The earliest deposit found within this test pit, was a light grey white sandy lime mortar floor (5182). It butted Wall 5132 to the west and Wall 5039 to the south. Above 5182 was a soft, mid greenish grey silty sand accumulation with occasional crushed brick and mortar (5166). Above it were the remains of a brick structure (5167), possibly an original brick floor surface, at some stage partially removed. It measured 0.3m x 0.8m, and the bricks measured 0.11 x 0.22 x 0.07m. Covering 5167 was a firm, light greyish purple silty sand with frequent small coal fragments (5165). This was likely to have been used to level the ground and was then used as a floor surface. Deposit 5165 was the latest in the test pit, but also extended to the west of it.

#### *Walls for small room*

With the addition of Walls 5195 and 5079 to 5039 and 5132 a small room c. 4 x 2m was constructed at the north end of the foundry.

Cutting through 5165 was the east-west brick wall 5195 2.54m long and 0.4m wide built into construction cut (5196). The bricks measured 0.22 x 0.11 x 0.07m and a pale yellow-white sandy lime was used as bonding material. Also cutting through 5165 was the construction cut (5079), for the north - south wall 5079, 2.2m x 0.4m of which superstructure had been almost completely removed except at the west end where a few bricks survived. Filling the cut was a soft, mid green grey clay sand with occasional crushed mortar, black casting sand and small tile fragments (5078).

*Deposits within small room*

Above 5165 within the room described above, was a soft, black casting sand deposit (5164). This contained a large number of iron objects (Plate 20). Above 5164 was a soft casting sand which was dark black with grey flecks, with occasional small coal fragments (5118). This deposit also contained some iron fragments. Above it was a moderately compact, light greyish purple sandy silt with occasional small to medium coal fragments (5076). Above 5076 was a soft, bright yellow sand with a moderate amount of broken bricks (5075) which was succeeded by a soft, black casting sand (5117). Within this deposit were numerous iron objects (see Section 9), the locations of which were recorded on plan.



*Plate 20 View south of Deposit 5164 containing iron objects with Wall 5132 on right*

Above 5117 was a soft to friable, black casting sand (5088). This deposit also included a variety of iron fragments of various shapes, including hooks, and a possible 'range door' (see Section 9 below). These objects may have been spoiled castings or metal waiting to be recycled. A crucible fragment was also found within this deposit. Above 5088 was a soft, black casting sand (5089).

Above 5089 and on the west side of the chamber was a soft, mid pinkish red sandy silt with very occasional crushed brick (5086). Above it was a firm soft, black casting sand, with frequent small coal fragments (5087). Stratigraphically above it was 5085, a soft, mid yellow white sandy lime mortar with very occasional charcoal flecks and occasional small broken brick fragments concentrated adjacent to Wall 5132.

*Deposits east of small room*

The earliest deposit found in Area U, above 5165 to the east of Wall 5079, was a firm, dark blue grey silty clay, with occasional gravel, mortar and crushed tile and brick (5212). Above 5212 was a soft, light yellowish white sandy lime mortar floor (5210).

Covering most of 5210 was a moderately firm deposit of mid green grey sand and clay laminations (5209). Above it was a moderately compact mid-greenish grey silty sand (5208). Also above Floor 5210 was a small accumulation of soft, dark brown clay silt (5236) succeeded by the remains of a small brick wall (5211), aligned north-south, and 0.75m long, with three courses of brick surviving. It was only one brick wide, and the bricks measured 0.22 x 0.11 x 0.07m, with pinkish white sandy lime mortar used as bonding material. This was probably a small dividing wall within this area.

Above 5208, and also covering Wall 5211 was an accumulation of soft, mid yellow to light green sand (5194). This was probably an accumulation of clean unused casting sand. In the surface of this deposit was an indentation possibly from a machine footing. Also above 5194 was a compact, yellowish white chalk with lime mortar surface (5206). This was possibly a floor, but only 1.2 x 0.8m survived. Above it was a firm, mid green grey sandy clay (5074). Above 5074 was a firm, mid green grey silty clay, with occasional sand, gravel, charcoal and iron waste inclusions (5073). Above 5073 was a soft, dark brown to black clayey sand, with occasional small tile fragments and very occasional small stones and gravel (5072).

Cutting through 5072 was a series of cuts possibly related to the location of some sort of heavy machinery. As a result a series of cuts or imprints was left once the machinery was removed. These are 5046-52, which taken together formed the shape of a 'B' which measured c. 2 x 2m.

Above 5046-52 was a compact, mid brown silty sand, with yellow sand lenses (5043). Above it was a thin layer of loose, black casting sand (5041). Above 5041 was a heavily compacted, white chalk and lime deposit (5032).

*Post-foundry*

Above 5032 and 5085 was a soft, dark black casting sand, with occasional slag fragments and cinder on its west side, and reasonably pure on its east (5001). Above 5001 were the modern layers or overburden (5000).

**5.3.3 Area Q**

The only feature recorded in this area was a north-south wall (5023)

5.3.4 Areas W, X, Y and AD: Test Pit 6 (Plates 19, 21-2)



Plate 21 Trench 5: view south-east showing Wall 5132 running lower left to top right, the Cobbled Alley 5057 on right and the Concrete Base 5021, lower left

In Areas W and X, to the west of Wall 5132 (see above) and between Wall 5096 and the concrete base 5021, a test pit was dug to examine the lowest courses and foundations of Wall 5132.

*Pre-foundry*

The earliest deposit found in Test pit 6 was a compact, yellowish brown clayey silt with occasional mortar fragments, building material and charcoal flecks (5128). Above it was a compact, light grey silty clay, with frequent charcoal, mortar and building material flecks (5124 = 5234). This deposit was very similar to 4197 in Trench 4, and it was probably late medieval, not related to the foundry.

*Foundry deposits and features*

Cutting through 5124 = 5234 was a construction cut (5142) for the north – south wall 5132 which here had eight or nine surviving courses of bricks. Filling the construction cut 5142 was a compact, dark brown silty clay (5141). Above 5141 was one of the first floors of the foundry (5229) which was made of compact, yellow sand. It also received context numbers 5223, 5231 and 5233, due to a modern drain cutting it into separate pieces. Also above 5141 and to the west of Wall 5132 in Area X, was a linear cut (5119), aligned north - south, with sharp break of slope at top, unclear bottom and in some areas unclear edges. It measured 2 x 1m,

and its purpose was unknown. Filling 5119 was 5097, a firm, yellowish grey clayey silt deposit, with frequent brick and small Elland Flag fragments, a moderate amount of cobbles, tile and stone fragments and occasional mortar flecks.

In addition, cutting through 5141 was 5021 a substantial base made of concrete mixed with building material fragments, cobbles and stone, trapezoidal in plan. It measured c. 1.42m across and it survived to a depth of 1.25m. One interpretation is that this base supported a crane.

South of Test Pit 6 above 5097 were two small secondary walls (5096, 5133; Plates 23 and 25) of the foundry, both aligned east – west. They had no obvious construction trenches and butted up to Wall 5132. Wall 5096, in Area X, 1.60m long, was one brick wide, with three surviving courses of bricks



Plate 22 Area X: view north showing Concrete Base 5021 and Wall 5132 on right



Plate 23 Areas W and X: view south showing Wall 5132 (left) and Walls 5096 and 5133 (beyond shovel)

joined with creamy white mortar. The bricks measured 0.22 x 0.11 x 0.06m. The wall foundation was made with irregular bricks and limestone fragments. Wall 5133 c. 1.5m to the south of 5096 had four visible courses and was two bricks wide. It measured 1.74m long x 0.24m wide; the bricks measured 0.22 x 0.11 x 0.05m and were joined with creamy white mortar.

Also above 5097 and to the north of Wall 5096 was a firm to friable, light grey sandy mortar deposit, with mortar flecks and building material small fragments (5094). Above 5097, between Walls 5133 and 5096, was a small dump of firm, dark grey casting sand (5095).

Above 5095, and between Walls 5133 and 5096, was a compact, yellowish grey silty clay floor, with occasional mortar and building material flecks and slag fragments (5071). Above it was a compact to firm, light yellow sand with occasional mortar flecks (5070). This deposit was probably the same as 5092 (see below). Above 5070 was a firm to friable, brownish grey silt levelling deposit with frequent slag fragments and occasional mortar flecks and yellow sand patches (5059).

Cutting through 5059 was a pit circular in plan (5061) which measured 0.60 x 0.55m and had a maximum depth of 0.15m. It had a sharp break of slope at the top, steep sides and a concave base. The purpose of this pit is unknown, but it was placed exactly midway between the Walls 5133 and 5096. Filling Pit 5061 was a friable, dark grey silty sand with frequent small slag fragments (5060).

To the north of Wall 5096, and above 5094, was a firm, reddish brown silt with occasional slag fragments (5093). Above it was a compact to firm, light yellow sand (5092). This was probably the same deposit as 5070, to the south of Wall 5096 (see above). Above it was a thin layer of firm, light grey silty sand with a high amount of crushed limestone (5091). Sitting above it, and with no visible construction cut, were the remains of a secondary small wall (5090). This was aligned east-west, with only one course of surviving bricks. It measured 0.28 x 0.68m, and was only one brick wide.

Above Wall 5090 was a compact, yellow crushed sandstone with occasional brick fragments (5084). Above it was a compact, light brown clay accumulation with occasional sandstone flecks (5083). Above 5083 was a loose, greyish brown sandy silt, with a moderate amount of mortar flecks and building material small fragments (5082), possibly a levelling deposit. Above it was another levelling deposit (5077), a firm, greyish brown mortary sand with frequent mortar flecks and building material fragments.

Covering 5077, Pit 5060, and Deposits 5227, 5229, 5231 and 5233 was the bedding (5230) for a cobbled surface. It was a compact, dark grey silty sand with occasional slag small fragments. Above it was a cobbled surface (5057) for the alley running down to the river which is shown on the 1<sup>st</sup> edition OS map. It extended throughout Areas W, X, Y and AD (Plates 21, 24-5).

On the west side of Area X, almost opposite the concrete base (5021) and embedded into 5057 was 5062, a 0.4m square iron structure similar to a lid, but of unknown function. It had two rounded iron hooks on its north and south sides.



Plate 24 Areas AD and W: view west of Cobbled Surface 5057



Plate 25 Area W: view east of Cobbled Surface 5057 and Walls 5096 and 5133 (right)

In Area W and above 5057 was a firm, dark grey slaggy silt, with occasional slag fragments and a moderate amount of building material and mortar small fragments. (5228). The same deposit received context number 5232 in Area AD.

Also in Area W above 5057, was a friable, brownish grey sandy silt with a moderate amount of mortar and charcoal flecks (5017). At this same level, but to the south of it was a compact, orangey brown sandy silt with frequent slag fragments and occasional mortar flecks (5019). Above 5019 and 5017 was a compact, light grey mortary silt, with frequent small slag fragments and occasional mortar, charcoal and building material flecks (5016). This deposit was the remains of a floor within this area. Directly above it was a compact, very dark grey silty coke and cinder (5012), possibly a levelling deposit. Above 5012 was a loose, yellowish orange silty sand with a moderate amount of mortar flecks and building material fragments (5009).

Above the cobbled surface (5057) in Area X was a friable, light grey silty sand with very frequent small coke fragments (5042) succeeded by a friable, yellowish brown mortary sand with very frequent brick fragments and mortar flecks (5034). Also in Area X on its west side, and above 5057, was a very compact, reddish grey sandy silt with a moderate amount of charcoal and mortar flecks and small slag fragments (5038). Above 5038 was a firm, dark grey slightly silty casting sand, with very occasional mortar flecks and small slag fragments (5026).

Cutting through 5038 was a pit sub-circular in plan (5037), 0.2m in diameter, which had a sharp break of slope at the top falling steeply into a concave base. Filling it was 5036, a firm to friable, greyish brown silty sand with frequent mortar fragments, tile fragments and a moderate amount of small slag fragments. Above 5036 was a friable, light yellow mortary sand with frequent mortar flecks and occasional building material flecks (5025).



*Plate 26 Area X: view east of Wall 5024*

On the west side of Area X and above 5025 was a brick structure aligned north - south (5024). This was three bricks wide, with one course high and it measured 0.24 (north - south) x 0.11m. The bricks were laid on bed with no visible bonding material, and measured 0.23 x 0.11 x 0.08m (Plate 26).

Above 5024 and 5026 was a firm, brownish grey mortary silt with very frequent mortar fragments and a moderate amount of building material in small fragments (5018). Above it and to the west was a soft, orangey grey silty sand with a moderate amount of slag small fragments (5020). Also above 5018 was a friable, dark grey silty sand with occasional mortar flecks (5015). Above it was a compact to firm, light brown silty clay with occasional mortar and charcoal flecks and occasional building material fragments (5014) which was succeeded by a loose, yellowish orange silty sand with occasional mortar flecks and building material fragments (5013).

Above 5013 and 5009 (see above) was a compact to firm, greyish brown clayey silt with occasional chalk, mortar flecks and small to medium sized building material fragments (5008). Above it was a friable, light brown sandy silt with occasional small fragments of coal and building material (5007). Above 5007 was firm, brownish grey silty sand with very frequent tile fragments, and a moderate amount of chalk and mortar flecks (5006). Above it was a deposit of dark grey cinder and coke within a matrix of sand, with a moderate amount of coal fragments (5002).

#### *Post-foundry*

Cutting through 5002, 5020, 5034 and 5228 = 5232, was a north – south construction cut for a modern drain (5136). It had a sharp break of slope at the top, with almost vertical sides. Housed by it was a modern ceramic pipe drain (5135). Filling 5136 and above 5135 was a firm, light brown sandy silt (5134).

Stratigraphically above 5134 were the modern overburden layers (5000).

#### *5.3.5 Areas AA (part of), AB (part of), AC (part of), AE, AF and north-west corner of Area S*

##### *The Foundry: primary walls*

The earliest foundry structures in these areas were Walls 5106 (Area S, aligned east-west, see above), 5200, 5216 and 5223.

Wall 5200, in Areas AB and AC, was aligned north – south and it measured 6.40m long. It was two bricks wide, with the bricks laid on bed. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey white mortar.

In Area AC, Wall 5216, was aligned north-south (and was in line with Wall 5132 in Area AD) with a return to the west at the south end. It was two courses high and three bricks wide, it measured 1.85 x 0.60 x 0.20m. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with greyish white mortar.

Wall 5223, in Area AD, was aligned east – west (in line with Wall 5106) with a return to the south at the west end, but was truncated at both ends by modern intrusions. It stood two brick courses high. It measured 1.10 x 0.60 x 0.20m, and was two bricks wide. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey white mortar.

#### *Foundry deposits and structures*

Stratigraphically above Walls 5106, 5200, 5216 and 5223 was one of the first floors of the foundry in this area (5227) which was made of compact, light yellow sand. Due to being divided up by modern intrusions, it also received context numbers 5229, 5231 and 5233.

Above 5227, 5229, 5231 and 5233 was a firm, mid grey brown sandy clay, with occasional mortar flecks (5224). This was a bedding layer for the next deposit, a small cobbled surface (5205) which was only visible in a small area to the east of Wall 5200. Above it were the remains of two small internal walls neither of which had foundations. Wall 5202 was aligned east – west, measured 0.8 x 0.2m and only one course of surviving bricks which measured 0.23 x 0.11 x 0.05m and were bonded with grey-white mortar. North of 5202 was Wall 5203, also aligned east – west which had one surviving course of bricks. It measured 0.6 x 0.4m, and the bricks measured 0.23 x 0.11 x 0.05m.

Stratigraphically above Walls 5202-3 was a friable to firm, mid greyish brown sandy silt with occasional medium size building material fragments (5207). Cutting through it was a feature of unknown purpose (5181). What survived was sub-rectangular in plan, but it was truncated by modern intrusions on three of its four sides. Filling it was a friable, dark grey silty sand (5180).

#### *Late foundry walls.*

To the west of Wall 5200, and stratigraphically above 5180, was a small internal wall (5199). Aligned north – south, it was truncated at both ends. It measured 0.80 x 0.20m, with only one or two courses of surviving bricks which measured 0.23 x 0.11 x 0.05m and were bonded with creamy white mortar.

In Area Z, to the east of Wall 5200, and also above 5180 was another north – south brick wall (5204, see below). Above Walls 5199 and 5204 was a friable, mid yellow-brown sandy silt, with frequent small building material and limestone fragments (5159).

#### *Brick floor*

To the south of Wall 5106 in Areas AA and S, the earliest deposit was a friable to loose, dark grey-brown silty sand with frequent small fragments of building material and occasional mortar flecks (5112=5163). It ran up to Wall 5106, and it was truncated by modern intrusions. Above

5112 = 5163 was a brick floor (5105) (Plate 27). This was made with irregularly laid bricks, some on edge and most on bed. It had a slightly recessed north – south channel or gully running through the middle. The bricks measured 0.23 x 0.11 x 0.09m.



*Plate 27 Area AA: view west of Brick Floor 5105*

#### *Post-foundry*

Cutting through 5105 and 5159 were several modern intrusions. In Areas AA, AB and AC was a north – south construction cut (5140) for a pipe with a sharp break of slope, with vertical sides and flat base. Housed by it was a brown glazed ceramic sewage pipe (5139). Above it and filling 5140 was a solid, grey white concrete (5138) succeeded by, and also filling 5140, a loose, mid brown sandy silt (5137). Also cutting through 5105 and 5159 in Areas AA, AC and AF, was the trench (5146) for another service pipe, aligned east – west. It had a gentle break at surface with almost vertical sides and a flat base. Housed by it was a modern service pipe (5256), above which and filling 5146 was a moderately loose, mid grey brown sandy silt, with frequent medium size building material and mortar fragments (5145). Finally, also cutting through 5105 and 5159, was a cut rectangular in plan (5065) which measured 2 x 1.8m, and had a sharp break of slope with vertical sides and a flat base. This was probably part of the 1950s building in this area. Filling it was a compact, grey concrete pile (5066). Above it and also filling 5065, was a moderately compact, mid grey-brown clayey silt (5066).

In Area AA, above 5105 and 5159 was a plastic, firm to friable, whitish grey mortary silt deposit (5154). Cutting through it were two modern pipe trenches, aligned north – west / south – east (5153) which contained a brown glazed ceramic pipe (5152). The trench was filled with a firm, mid grey brown sandy silt (5257).

Cutting through 5154 was a pipe trench (5151), aligned east – west which contained a brown glazed ceramic pipe (5150). Above it, and filling 5151 was 5149, a firm, white mortar mixed with mid brown sandy silt, with frequent medium sized building material fragments. Cutting through 5149, and following the same alignment as 5148 was a layer of highly compacted, grey concrete (5147). Contained by it was a small metal pipe (5147), which measured 0.05m in diameter. This was possibly a gas pipe.

Above 5147, 5149, 5256, 5145, 5137 and 5257 was the modern overburden 5000.

### 5.3.6 Areas AB (part of), AC (part of), AE and AF

The west side of Trench 5, west of Wall 5200, especially in Areas AB and AC, there was considerable disturbance by modern features, such building footings, pipelines and cables.

#### *The foundry: primary wall*

The earliest foundry structure in Areas AB and AC was Wall 5200 (see above).

#### *Foundry deposits and features*

Above Wall 5200, and covering most of Areas AB and AC was a compact, light brownish yellow sand floor surface (5238). These deposit was truncated in several places by modern intrusions. Above it, and also present in Area AD, was a compact, mid brown silty clay, with occasional building material small fragments and charcoal flecks (5240).

On the west side of Area AC and in Area AF, above 5240, was a highly fragmented, east – west aligned wall footing (5248). It was made of Elland Flag and brick fragments laid on bed, with no obvious bonding material. Above 5248, was a compact, dark brown sandy silt (5249), a bedding layer for 5250, a surface (highly disturbed) made of large cobbles, and some large Elland Flag blocks.

On the west side of Area AB and above 5240, were the remains of a small secondary brick wall (5242), aligned north – south, with only two to three courses of surviving bricks, and one brick wide. It measured 0.95m long, and the bricks which measured 0.23 x 0.11 x 0.05m were bonded with grey white mortar. Above 5242 was a small cobbled surface (5241), made of medium to large cobbles. This was probably the same as 5250 (see above).

#### *Post-foundry*

In Areas AB, AC, AE and AF, and above 5240, was a loose, mid-grey brown sandy silt demolition deposit (5239). Cutting through 5240, was a north – south aligned drain trench (5136) which contained a ceramic drain pipe (5135). Above it, and filling 5136, was a firm, light

brown sandy silt (5134).

On the west side of Areas AB and AC, and above 5239, was a stack of bricks (5243), eight courses high and all laid on bed, with no bonding material. Most of the bricks were complete and measured 0.23 x 0.11 x 0.05m. This was probably a pile of bricks made during the re-building of this area in the 1950s.

Above Wall Footing 5248 (see above) was a loose, dark brown black cindery sand, with frequent building material small fragments, charcoal and mortar flecks (5244). This was probably a demolition deposit, accumulated after the foundry was abandoned. Cutting through it was an east – west aligned trench (5246), 5m long and 0.07m wide, which housed a metal gas pipe (5247). Above it, and filling 5246, was a loose, dark grey brown sandy silt (5245).

Above 5250, 5245, 5243, 5241 and 5134 were the modern overburden layers (5000).

### 5.3.7 Areas Z and AA (part of) (Plate 28)



*Plate 28 Area Z: view west showing north-south Wall 5160 at base, east Wall 5198 on left and east-west Drain 5187, right of centre. Structure 5218 is immediately right of the scale*

#### *The foundry: primary walls*

Primary foundry walls found in these areas were 5160 and 5198.

Wall 5160, aligned north - south was 5.2m long, two bricks wide and survived up to seven courses high. The bricks measured 0.23 x 0.11 x 0.05m, and were bonded with grey mortar.

Wall 5198 in Area AB was aligned east – west with a return to the north (5258), 1.4m long at its western end, this return being in line with Wall 5132 (see above). Wall 5198 was 4m long x 0.24m wide and had five courses of surviving bricks. The bricks measured 0.24 x 0.11 x 0.05m and were bonded with grey white mortar.

Post-dating Wall 5160 and to the north of it were the remains of another possible wall (5162), aligned east – west, with only one course of surviving bricks laid on bed, which measured 0.4 x 0.2m. It was truncated to the west by a modern intrusion, and it disappeared beyond the edge of the excavation to the east. Also sitting directly above Wall 5160, towards its centre, were the remains of a brick floor (5161). Most of the bricks had a north – south alignment, and these probably marked an entrance or even a possible doorway in this area of the foundry.

#### Drain

Above Floor 5161 and Wall 5162 was a brick-lined drain (5187) (Plates 28-9). This was 5.2m long, aligned east-west, but curved slightly to the south – west at its western end before being truncated. The bricks were bonded with white mortar, and measured 0.23 x 0.11 x 0.05m. Five metal plates were placed at regular intervals on top of the drain. This drain disappeared beyond the east edge of Trench 5, passing through Wall 5160, in which it was capped by two large sandstone blocks, and it was probably connected to Drain 4306 in Trench 4. Filling 5187 was a soft, dark grey brown sandy silt, with occasional small fragments of building material (5235). Above the drain was a series of sandstone cap stones (5169), most of them broken.



Plate 29 Area Z: Drain 5187 with stone slabs forming a lintel through north-south Wall 5160

#### Foundry deposits and features

Stratigraphically above Drain 5187 was one of the first floors of the foundry in this area (5226), a dark grey to black cinder surface with frequent yellow sand patches. Above 5226 was a

reddish brown sandy silt floor, with frequent metal slag and building material fragments, and occasional cobbles (5221). Cutting through 5221 were two post-holes (5123 and 5222), circular in plan, with sharp break of slope, vertical sides and slightly concave base. They measured 0.15 x 0.14 x 0.52m deep and were filled with loose, reddish brown sandy silt (5121-2).

On the east side of Area Z, and also above 5221 was cobble surface (5220), made of medium to large cobbles with occasional metal slag fragments. It measured 1.80 x 1m, and it was severely truncated by modern intrusions. On the north – west side of Area Z, and above 5221 were the remains of a grit stone floor (5219), 0.80 x 0.40m. This was at the same level as 5220 (see above), and the machinery base 5218 (see below).



*Plate 30 Area Z: view north of structure 5218 with Drain 5187 beyond*

In addition, above 5221 on the west side of Area Z was a structural base (5218), sub-oval to rectangular shape in plan (Plate 30) which was aligned east – west and measured 1.2 x 0.8m. It was made of bricks, with two square sockets set into it, one to the north – west, and the second to the south – east. The sockets suggest a super-structure above the bricks.

Finally, also above 5221 in the north-east corner of Area Z, were the remains of an insubstantial north – south brick wall (5204), 0.9m long x 0.4m wide. It had no foundation, and was bonded to Drain 5187. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey-white mortar. Above 5204 was a friable to loose, mid reddish brown silty sand, with frequent building material and slag fragments (5177). Above it were the remains of another insubstantial wall (5190). This was aligned north – south, and it measured 0.6m long x 0.2m wide. The surface of the bricks was covered by white creamy mortar.

Directly above 5169 (cap stones above 5187, see above) was a decayed wall (5107). It was aligned east – west, measured 1.2m long and 0.3m wide, and was made of roughly hewn bricks and rounded cobbles.

In the north – west part of Area Z, dug next to Drain and stratigraphically above 5169, as a cut (5181), sub-rectangular in plan, with sharp break at surface, concave sides and concave base. It measured 1.9 x 0.85m. Filling it was a friable, black silty sand (5180).

In the south – west part of Area Z, and south – east part of Area AB, above Wall 5190 and also partially covering Wall 5198 (see above), was a firm, mid yellowish sandy silt, with frequent building material and mortar fragments (5170). Above it was an east – west aligned, small brick wall (5173). It was 0.5m long and only one course high, with the bricks laid on bed. Above it was a compact, dark grey to dark brown sandy silt, with frequent building material, mortar and slag fragments (5157). This was truncated by a modern concrete pile.

Above 5157 was a compact, dark grey black slag deposit, with occasional building material (5143) succeeded by a compact to loose, grey brown sandy silt, with frequent mortar and building material fragments, and frequent mortar flecks (5127 = 5129 = 5130). This was probably a demolition deposit.

On the south – west side of Area Z, and also above 5157 was a loose to compact, reddish brown to dark brown sandy silt, with frequent building material fragments and a moderate amount of metal slag fragments (5126). Above 5126, and 5127=5129=5130, was a compact to loose, reddish brown to orangey brown sandy silt, with frequent slag fragments, occasional building material fragments and occasional mortar flecks (5100).

Above 5127 = 5129 = 5130, on the north side of Area Z, was 5099, a very loose, mixed deposit on a matrix of mid grey mortary sandy silt, with frequent mortar flecks and a moderate amount of broken bricks and cobbles. Above 5099 was a soft to loose, very dark grey to black sandy silt, with frequent mortar flecks (5098).

Above 5100 on the south – west side of Area Z was a firm, greyish brown sand with frequent cobbles and brick fragments (5104). On the south side, and also above 5100 was 5125, the remains of a brick floor. it was highly fragmented, but it continued beyond the south edge of Trench 5.

In the south – west part of Area AA, and above Drain 5187, was a firm, greyish-brown sandy clay with mortar flecks (5224) succeeded by a moderately compacted to friable, mid greyish-brown sandy silt, with occasional small building material fragments (5207). Above 5207 was a small cobbled surface (5225) succeeded by the remains of an insubstantial brick wall (5203) without foundations. It measured 0.6m long x 0.4m wide. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey-white mortar. Above 5203 was another insubstantial brick

wall (5202) only one course high, without foundations which measured 0.8 x 0.2m. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey-white mortar.

Above 5207 on the west side of Area AA was a heavily truncated brick wall (5215) which measured 1.2m long x 0.4m wide. The bricks measured 0.23 x 0.11 x 0.06m and were bonded with creamy white mortar. Above 5215 was a heavily truncated brick floor (5214); the bricks measured 0.23 x 0.11 x 0.05m and had no apparent bonding material. Above this floor, and in the same area was another truncated wall (5213) aligned north – south which was possibly a later addition or extension to Wall 5215. The bricks measured 0.23 x 0.11 x 0.05m and were bonded with grey white mortar.

Above Walls 5185, 5202 and 5213 was a layer of loose to friable, dark grey-black cindery silt with frequent building material flecks (5156). Possibly part of this deposit, but truncated by a modern drain was 5163, however this also included a major quantity of sand patches. Above 5156 and 5163 was a loose to friable, dark grey brown silty sand, with occasional mortar flecks and small building material fragments (5112). This was a bedding layer for 5105 (described above).

Above 5105, and also above 5159 = 5158 = 5157 (see above, Area Z) was a firm to friable whitish grey mortary silt (5154).

#### *Post-foundry*

Cutting 5098, 5104, 5125 and 5154 was a series of modern drains.

In Areas AB and Z, Drain 5101 = 5176, 2.7m long x 0.5m wide x 0.7m deep, was aligned east – west. It had a sharp break of slope, vertical sides and flat base. Housed by it was a modern drain pipe (5102 = 5175). Above it, and filling 5101=5176, was a compact, mid grey brown to dark grey brown sandy silt, with frequent mortar flecks and occasional building material fragments (5103 = 5174).

In the centre of Area Z, and cutting through all the deposits in this area was a modern construction cut (5063). It was square in plan, and measured 2 x 2m, and 0.3m deep. It had sharp break of slope at top, vertical sides and flat base. Filling it was a concrete pile (5064), possibly part of the 1960s building which had stood on the site.

Aligned to 5063 and similar to it was 5065, a construction trench, 2m x 1.8m and up to 0.6m deep. It had a sharp break of slope at the top, vertical sides and flat base. Housed by it was a concrete pile (5259). Above this was a moderately compact, mid grey-brown clayey silt, with occasional building material and mortar fragments (5066).

In Areas AA, AC and AF was an east – west aligned service pipe trench (5146) which was not

completely excavated. Filling it was a firm to loose, mid grey-brown sandy silt, with frequent building material and mortar fragments (5145).

In Areas AC, AD and W was a linear north – south aligned drain trench (5136) which curved to the west in its northern end which was not fully excavated. Housed by it was a modern drain pipe (5135). Above 5135, and filling 5136 was a firm, light brown sandy silt (5134).

Finally in Area AA, and cutting through foundry deposits was another drain trench (5153), aligned north – west / south – east, which had a sharp break of slope at surface, vertical sides and flat base. It housed a ceramic pipe (5152). Above it, and filling 5153 was a firm to loose, mid brown sandy silt (5260).

## **6. ARCHITECTURAL FRAGMENTS** **by Jane McComish**

Two architectural fragments (AFs) were examined and are described below. AF1 had clearly originated elsewhere and been used as building material while AF2 was a fragment of poured concrete which had also been reused as building material. The fragments are of little use in interpreting the structures on the site, beyond showing that reused material was incorporated into the walls of the iron foundry.

AF 1 - Moulded sandstone block. Roughly rectangular in plan and cross-section. Part of four faces surviving (F1-4). F1-2 are the sides of the block, F3 the top surface, and F4 the underneath. All the other sides are broken off. F4 is carved with a single dentil ornament. This was originally part of a dentilated cornice of 18th century or later date.

AF 2 - Lump of poured concrete, triangular in plan. Part of three faces surviving (F1-3). F1 and 2 are the flat upper and lower surfaces and F3 the edge with a 1.5cm horizontal groove running along the midpoint. This fragment was only recorded to prove concrete from elsewhere was being reused as building material.

### **6.1 Recommendations for further work**

None required.

## **7. CERAMIC BUILDING MATERIAL** **by Jane McComish**

A total of 36.450 kilograms of Ceramic Building Material (CBM) was examined from the site. The material ranged from medieval to modern in date, and it was recorded following standard YAT procedures.

A number of forms were identified including medieval flange tile of 12<sup>th</sup> century date, medieval peg and plain tiles of 13-16<sup>th</sup> century date, pan tiles of 17<sup>th</sup> century or later date, and sewer/drain pipes, floor tiles and wall tiles dating to 1850 or later.

The material largely consisted of forms and fabrics that are typical for York. The bulk of the material examined was pan tile, most of which was heavily sooted due to the industrial nature of the site. Only a couple of the fragments were of particular interest. One of the brown glazed sewer/drain pipes in context 4011 was exceptionally large with a bore of 230mm. The size of the pipe may be a reflection of the industrial nature of the site. There was also a triangular tile in context 4308 which was unusually thick. It may have been designed to carry the weight of a piece of machinery or to be exceptionally fire resistant.

Most of the material present was typical for York as a whole. The main interest of the material is in providing dating evidence for the various contexts on site and building up a picture of which forms and fabrics were in use both chronologically and spatially throughout York.

**for further work:** It is recommended that a day is spent producing a fuller report, focussing on the possible use of some of the CBM in the foundry infrastructure.

Context	Date	Forms
4000	19th century +	Sewer
4011	1933 +	Sewer, Pan, Brick, Plain
4013	19th century +	Sewer, Brick
4020	17th century +	Pan
4021	17th century +	Pan
4042	12th century	Flange
4046	19th century +	Sewer, plain
4057	17th century +	Pan
4074	17th century +	Pan
4075	13th - 16th century	Plain
4092	17th century +	Pan
4184	early 19th century	Brick
4198	17th century +	Pan
4206	17th century +	Pan
4308	19th century +	Floor
4341	19th century +	Sewer, Plain
4426	17th century +	Pan
4449	17th century +	Pan
5010	20th century	Peg, Plain, Wall
5068	17th century +	Pan
5071	early 19th century	Brick
5099	17th century +	Pan

5125	early 19th century	Brick
5126	early 19th century	Brick, Pan, Sewer
5127	early 19th century	Brick
5184	17th century +	Pan
5190	early 19th century	Brick
5252	17th century +	Pan

Table 1 Ceramic Building Material summary

## 8. POTTERY by Ann Jenner

### 8.1 Domestic pottery

Pottery was recovered which span from the Roman period to the present day but the majority of the wares are clearly from the 19<sup>th</sup> century (see Table 2 below).

#### 8.1.1 Roman

There are four residual, abraded, Roman sherds from context 4075.

#### 8.1.2 Medieval

One sherd of Splash glazed ware from context 4512 may be 13<sup>th</sup> century. This would make it the earliest medieval pottery on the site. There is no other material from this context.

There is a small number of mostly residual medieval green glazed wares in a number of contexts. These include York Glazed ware (contexts 4029, 4046] and Brandsby-type ware ( contexts 4000, 4013, 4029, 4046, 4075, 4103, 4148, 4384, 4472, 4521, 5124, 5234]. Humber wares of late 13<sup>th</sup> to early 16<sup>th</sup> century are also found in small quantities in a number of contexts (4029, 4042, 4046, 4074, 4075, 4148, 4198, 4341, 4384, 4426, 4521, 5013, 5068, 5069, 5104, 5115, 5124, 5179, 5234]. There are only two possible Hambleton-type green glazed wares of late 13<sup>th</sup> to late 15<sup>th</sup> century from context 4521 and one from context 4075 suggesting either a hiatus in activity during the 15<sup>th</sup> century or the use of Humber wares in preference to Hambleton-types. Ryedale wares of late 16<sup>th</sup> to early 18<sup>th</sup> century are also present (contexts 4047, 4075, 4089, 4521, 5000], but also fairly rare, again suggesting a low level of activity until the 18/19<sup>th</sup> centuries. Green glazed wares are much less popular by this time and a proliferation of Staffordshire and other English products, including slipwares, transfer printed wares and stonewares became available.

#### 8.1.3 Post-medieval

There are few other types which might be dated from the 15<sup>th</sup>- to 17<sup>th</sup>-centuries. Cistercian

ware or the various German stone wares common on many British sites from the late 14<sup>th</sup> to 18<sup>th</sup> centuries are virtually absent. There are no obvious foreign imports on the site, consistent with the idea that this was not an affluent area at this time.

Very few English red earthenwares, normally associated with 17<sup>th</sup> century contexts, were recovered ( contexts 4042, 4075]. Most are of the later 18<sup>th</sup> or 19<sup>th</sup> century type (contexts 4013, 4020, 4023, 4046, 4074, 4075, 4148, 4277, 4320] .

#### *8.1.4 Early modern pottery (18/19<sup>th</sup> century)*

There is a number of Staffordshire and other regional 18<sup>th</sup> century wares but the greatest number of sherds date to the period when the foundry was in operation in the 19<sup>th</sup> century.

#### *8.1.5 Stonewares*

A large number of English white stoneware jars/ointment pots which were recovered may have been used in conjunction with these industrial vessels as storage jars, as some of them contain a white powder (4023], probably lead (see discussion below). Brown stone wares also contain similar white deposits (4000]. Forty-six large sherds of buff and brown glazed stoneware bottles from (5179] support the suggestion that they may have been used for some sort of industrial process, perhaps related to those from the pit fill (5031] as one of these also contains a white ?lead deposit.

One stoneware ointment pot has an inscription which reads "J. Meakin, York" (4023]. Another has "T.. BRIT..YORK" (5179] indicating a local source for these types. Other stonewares are more likely to have been related to drinking beer or ale (5000].

One stoneware jar of "Virol" "ideal for children and invalids" gives us a small insight into the lives of the people who may have lived and worked in what was not a very healthy environment.

## **8.2 Industrial Wares**

A large quantity of industrial pottery was recovered from the site, mostly from a pit fill (context 5031] and comprises large smashed sherds, parts of near complete vessels. A number of profiles exist and the vessels conform to a series of standardised forms. Different vessel forms appear to fit together and must have had some sort of industrial purpose which may or may not relate to iron working.

Sherds do not show any abrasion suggesting that the dump is a primary context and deposition of the entire assemblage occurred at roughly the same time or at least over a relatively short period of time. The pit was probably sealed shortly afterwards as broken ceramic edges are still quite fresh and do not appear to have been exposed to the elements.

The largest numbers of sherds are of what we have temporarily named "ledged jars/cucurbits" (1402 sherds) and small "collecting jars" (472 sherds). Some have a whitish, or yellowish green powdery deposits. A number of wide shallow bowls (187 sherds) with whitish powdery ?lead deposits, tall crucibles with slag deposits inside them and one square rimmed bowl (3 sherds) and one black glazed mug (1 sherd) and a stoneware jar (2 sherds) make up the assemblage.

The fabric used for all apart from the tall flat bottomed crucibles is a fine oxidised earthenware with few, if any visible inclusions. The crucibles are made from very highly tempered yellowish coloured clay. This would allow vessels to endure high temperatures, suggested also by the sooting present. All other vessels described above show more limited evidence of sooting on external surfaces and were perhaps exposed to lower temperatures than the crucibles.

Most vessels only have internal glazing, although this is not the case with the wide bowls with straight rather than everted sides. Glaze is often partial and appears to have been applied by pouring a liquid suspension into the vessel, swilling it around the sides and pouring it out. This has left diagonal streaks around the upper, inner walls. Glaze colour varies from chestnut brown on the collecting bowls and baluster style ledged jars to light greenish yellow inside wide bowls and some baluster style ledged jars. The collared ledged jars are all glazed a darker brown as are some of the collecting bowls. Some wide bowls are glazed in a shiny dark brown colour reminiscent of contemporary domestic Black wares. Occasional ledged jars appear to have different coloured glazes above and below the ledge perhaps to indicate a water level. An intentional level or "water mark" may also be indicated on the small collecting bowls which are glazed to approximately 1 or 2 cms below the rim on the internal surface.

Initial analysis of yellowish residue suggests lead was present on the ledged jars/cucurbits and small bowls. Wide shallow bowls also have white deposits which may be residue from boiled water or lead.

### *8.2.1 Vessel types and descriptions*

#### *Ledged jars/cucurbits (1402 sherds)*

##### *Baluster shaped ledged jars*

The most common forms are smooth sided baluster shaped jars/cucurbits with a short (2cm wide) internal ledge approx. 8cms from the base. They all appear to have one or two diametrically opposed holes immediately below the ledge. In one instance one of the holes did not go right through the vessel and it was suggested that this did not matter as the holes were most likely to be for putting handles into in order to pick up vessels when still warm (pers comm. Paul Belford)

The vessels are unglazed externally and glazed internally in shiny chestnut brown glaze which

is sometimes yellowish green either intentionally or due to decomposition or reaction with contents. Occasionally a brown glaze is used and stops in a line at the ledge and one sherd shows a change in glaze colour from greenish yellow in the lower part to chestnut brown on the upper part, above the ledge. This line was probably significant as a water/liquid level as a guide to how much liquid should be used. The glaze looks as if it has been applied by pouring a suspension into the base and swilling it round the sides before pouring it out. This leaves the upper internal surfaces unglazed apart from diagonal streaks/patches. The base of these vessels is usually 6cm radius. The rims are simple squared off and rounded and are almost always 9cm radius. Fragments with small pulled lips suggest that this may have been the way the contents were poured out of the vessels. Heights reconstructed vary from 23 to 24 cms.

#### *Bulbous/collared ledged jars*

A variation on the above is usually thicker walled (1/1.5cm wide) and glazed internally in a more matt, darker brown colour. The walls are slightly thicker and bulge out at the same level as the ledge, forming a collar. Bases are also approx 6cm radius and one rim is rounded and appears to have been made by folding the clay over leaving a small void in the centre is approx 8/9cms radius. They are reconstructed to approx 18/19cms tall.

#### *Small jars/collecting bowls (472 sherds)*

Jars with slightly everted walls approx. 8cms high and bases between 6 and rims 7cms radius. They are glazed internally in chestnut brown, dark brown, light green and yellowish green. The glaze usually stops approximately 1cm below the rim. The external surfaces are usually unglazed. Some of these jars show evidence of a small hole through the vessel wall about 1cm below the rim, perhaps for lifting while still warm (see above under ledged jars). Heights vary from 9 to 10cms.

#### *Wide shallow bowls (187 sherds)*

Shallow bowls with wide bases of between 22 and 26cms radius are either with vertical sides or with slightly everted sides. Some are unglazed, others are glazed a yellowish green and occasionally brown internally. Walls are approximately 7 to 9 cms high.

Unglazed vertical sided bowls are approx. 8cms tall, base 14cms radius and rim 15cm radius. They have walls approx 1cm thick and simple rounded rims.

Yellow glazed everted rimmed bowls are approx 7cm tall with base radius 11.5cms and rim radius 16cms. Walls are approx 0.5cms thick and rims are folded over to form a slightly thickened collar. Glaze continues on the inner surface right up to and occasionally very slightly over the top of the rim.

Dark brown glazed wide bowls are approx. 9cms tall, base 12cm radius and rim 15.5 cms

radius. Glaze stops approximately 1.5cms from the rim, leaving an unglazed band/water mark.

*Tall flat bottomed crucibles*

Tall flat bottomed crucibles with pouring lip in highly tempered fabric have contents remaining inside. They appear to have been made and used to withstand high temperatures and dark surfaces suggest evidence of heating. Walls are approx 2/3cms thick and approx 25cms tall.

*Square rimmed jars (3 sherds)*

Only one profile has been found. It has a base 6cm radius and is 9.5cm high. It is glazed internally in a chestnut colour with patches of greenish-yellow. The rim is approximately 12cms across. It has a chestnut glaze internally.

8.2.2 *Conclusion*

The small bowls may have been placed on top of the internal ledge on the taller jars, which in turn may have been half filled with water and heated gently, in the manner of a 'bain marie'. The wider bowls may have been filled with water and used as a cooling bath.

It was suggested that this combination may have been used together to produce a type of paint for preserving and minimising rust on the iron products known to have been produced on the site. This might well have been applied to many of the products such as gates, railings, garden fittings and weather vanes known to have been made here, for outdoor use.

Context	Quantity	Spot date	Details
4000	18	20th century	2 English stoneware jar. 19th century. 1 English stoneware flanged dish. 1 English stoneware jar profile. *photo/ draw. Black transfer printed label "Virol A PREPARATION OF BONE-MARROW AN IDEAL FAT FOOD FOR CHILDREN & INVALIDS" 1 Transfer printed ware flange rim of bowl with floral decoration. 1600-1800. 1 English buff coloured stoneware bottle neck and rim. 1 white earthenware flanged dish. 1 Brown stoneware. 1 drawer from fireplace with lustrous 1 white earthenware flanged dish. 1 Brown stoneware. 1 drawer from fireplace with lustrous brown glaze and inscription "ENGLAND". 1930+ (continued below).....

			<p>1 Brown stoneware ?ale bottle with white powdery deposit inside neck and body. 19th century. Neck style 34 with relatively short collar (5mm deep) and thin rib below (see Switzer 1974 p8). For similar bottle shape see Switzer 1974 fig. 5, class 1, subtype 1b, p10.</p> <p>1 White earthenware marmalade jar with black lettering "...MALAD..." floral decoration below and "...OR MARMALADE"</p> <p>1 buff stoneware jar.</p> <p>1 base of ?ledged jar with internal green glaze. 12cm diameter.</p> <p>1 Brown stoneware ?blacking bottle shoulder</p> <p>1 White earthenware ?bowl pedestal base.</p> <p>1 White earthenware with blue stripe. 20th century.</p> <p>1 Brown glazed corner tile with applied oak leaf decoration, part of a fire drawer. 20th century.</p> <p>1 Brandsby-type ware with mottled copper green glaze and copper specks.</p>
4005	1	19th century?	1 Facetted tea cup with hand painted decoration in green, blue and brown.
4009	1	20th century	1 Yellow glazed buff stoneware.
4012	1	19th century	1 Creamware flanged dish/plate.
4013	41	19th century	<p>2 Later red earthenware with yellow glaze and white slip on internal surface. 18/19th century.</p> <p>1 Brandsby ware rounded jug with ribbed neck and mottled green glaze. 14th century.</p> <p>3 Brandsby mottled green glazed ware. 14th century.</p> <p>1 Brandsby-type ware with yellow glaze and brown pellet decoration with copper green fleck.</p> <p>1 Brandsby ware unglazed.</p> <p>3 yellow glazed vase/jar with large rib and scroll, perhaps a houseplant container.</p> <p>5 ribbed buff stoneware jar with panels of vertical grooves.</p> <p>3 later red earthenware with slip and yellow glaze internally.</p> <p>1 rim of pancheon/large bowl with slip and yellow glaze internally. Brown stripe along rim.</p> <p>1 Brown stoneware.</p> <p>1 Transfer printed ware with blue/white (continued below).....</p>

			<p>scene including girls legs and feet with bottom of dress and trees.  3 modern earthenware, blue.  4 stoneware jar with "TRADE MARK" under base.  5 white earthenware dish/plate.  1 white earthenware jar base with "GRAY...P..." on base.  1 buff stoneware with slag deposit.  1 Transfer printed ware with floral decoration in green.  1 Transfer printed ware dish/bowl with floral decoration in green.  1 Transfer printed ware bowl with greenish decoration.  1 ?porcelain bowl/dish with blue design.  1 Transfer printed ware with greenish floral decoration.</p>
4014	6	20th century	<p>2 English stoneware bottle, buff coloured with slag inside.  2 English white stoneware marmalade-style jar.  1 White earthenware cup/bowl base.  1 English stoneware ?oval bowl with yellow glaze and straight sides.</p>
4017	1	19th century	<p>1 Brown stoneware blacking bottle ?without stamp.</p>
4019	2	19th century	<p>1 Facetted cup base with green, brown and blue handpainted decoration. See (4005].  1 Brown stoneware blacking bottle.</p>
4020	2	19th century	<p>1 English stoneware.  1 later red earthenware with white interior and brown glaze externally.</p>
4023	63	19th century	<p>1 White stoneware ointment pot with (Continued below.....)</p>
			<p>white powdery deposit.  4 white stoneware ointment jar with stamp inscription "J ME...YO..." (J Meakin, York).  11 Buff stoneware jug with strap handle.  45 Stoneware jar with slag deposit inside.  1 later red earthenware green glazed pancheon rim.  1 burnt abraded unglazed, fine walled, red earthenware rim.</p>
4029	4	16th century and medieval	<p>1 Humber ware jar rim with green glaze. 1275-1550.  1 Humber ware ?cistern with greenish-brown glaze. 1250-1550.  1 York glazed ware with yellow glaze and (continued below).....</p>

			copper specks. 1175-1350. 1 Brandsby-type ware jug with thumb marks on either side of base of body/handle join. 1300-1400.
4042	6	18th century	1 Brown stoneware. 18th century. 1 Humber ware. 1250-1550. 1 Humber ware ?cistern with the edge of an applied stamped roundel and ring and dot stamp. 3 Red earthenware sherds with thick walls, rounded rim and rib below. Body sherd have incised series of horizontal line decoration. Internal surface of rim reduced.
4046	5	18th century	1 Black lustrous glazed fine walled bowl. 1740-80. 1 ?York glazed ware fragment. 1175-1350. 1 Brandsby-type ware with mottled green glaze. 1300-1400. 1 Humber ware. 1275-1550. 1 Later red earthenware with green glaze. 18th century.
4047	1	18th century	1 Ryedale-type ware with vertical applied thumb impressed strip. 1550-1750.
4051	1	19th century	1 White earthenware.
4053	1	19th century	1 white earthenware bowl with blue feathered edge.
4057	1	19th century	1 Transfer printed ware with blue and white decoration.
4058	4	19th/20th century	4 White stoneware ointment jar.
4074	16	20th century	1 Transfer printed ware jug handle with blue and white floral design. 1 brown glazed red earthenware teapot. 1900+ 2 Humber ware green glazed jug. 1 Transfer printed dish with scalloped rim with raised floral decoration and blue feathered edge. 16-1800. 1 white stoneware base with raised areas. 1900+ 1 Later red earthenware with brown and cream slip decoration. 1 Humber ware open form with green glaze inside. 1 white earthenware shallow dish. 1 Brown stoneware with matt surfaces. 18th century. 2 modern earthenware with yellow and blue glaze. 2 later red earthenware with white slip (Continued below).....

			and internal glaze. 1 white earthenware pedestal base of bowl. 1 modern earthenware with light brown external surface and white internal surface.
4075	24	19th century and some medieval	1 Slipware dish (local?) in pinkish-buff fabric with pie-crust rim and brown trailed decoration on yellow slip. 18th century. 1 Calcite gritted Late roman ware. Late Roman. Residual. 3 Grey ware rim and body sherds. Roman. Residual. 1 ?Hambleton-type ware ribbed strap handle with light grey core and buff thick margins. Late 13th to late 15th century. 5 Brandsby-type jug sherds with mottled green glaze including rim, lip and lower wall sherd. 3 Humber ware with scale on it. 1 red earthenware with greenish-brown glaze. 2 ?Brandsby unglazed. Sooted external surface. 1 Brown stoneware. 18/19th century. 1 later red earthenware bowl with white slip with yellow glaze and brown slip decoration. 1 yellow glazed earthenware with brown slip decoration. 18/19th century. 1 Black glazed red earthenware. 18th century. 1 Brandsby-type ware with rilled neck and green glaze. Early 14th century. 2 ?Ryedale-type ware rim/body of open form. Late 16th to early 18th century.
4089	3	19th century	1 Transfer printed ware with blue and white decoration. 1 Ryedale-type ware. 1550-1750. 1 Brown lustrous glazed fine walled jar. 1740-1780?
4092	1	18th/19th century	1 red earthenware jar with shiny brown metallic glaze and thumbled rim edge.
4103	5	14th century	1 Brandsby jug with brown applied pellet decoration. 4 Brandsby ?small/medium rounded jug with mottled green glaze.
4130	3	19th century	1 Transfer printed ware with degraded surfaces. 1 English stoneware buff jar. 1 yellow glazed earthenware jar.
4148	17	19th century and some medieval	3 Later red earthenware pancheon/bowl (continued below).....

			including rim and body sherds with lustrous internal green glaze. 1700+. 2 Humber ware bowl/dish. 1500-1550. 1 Humber ware jug/cistern handle with ribbed and stabbed decoration. 1 ribbed Humber ware jug handle 1 Humber ware strap handle. 1 Transfer printed ware bowl rim with band of blue and white raised roundels on rim edge. 1 later red earthenware with internal green glaze. 18/19th century. 1 Brandsby ware green glazed jug with rectangular roller stamping. 14th century. 1 Brandsby mottled green glazed ware. 1 English stoneware with brown painted external surface and cream coloured internal surface. 18/19th century. 2 White earthenware dish. 1 Earthenware with blue and white stripes. 20th century. 1 Humber ware jug.
4154	8	19th century	8 White earthenware oval bowl with short flange. Same vessel as (4053].
4162	2	19th century	2 English stoneware ?ale bottle. For similar vessel form see Switzer 1974 p10, fig 5 class 1, subtype 1b. 19th century.
4184	1	19th century	1 yellow glazed earthenware.
4198	13	19th century	4 Cream coloured earthenware plate/dish. 3 White stoneware ointment jar profile with white powder ?lead deposit inside. 4 Modern stoneware with buff fabric. 1 Humber ware rilled green glazed jug neck/shoulder sherd in reduced fabric with white external margin. 1 Humber ware. 1250-1550.
4277	1	19th century	1 Later red earthenware with white slip and yellow/brown striped decoration.
4299	7	19th century	7 Industrial vessel with fine red earthenware fabric and chestnut/yellow glaze. Ledged jar.
4303	1	19th century	1 Creamware open form.
4304	2	19th century	2 Transfer printed ware dish similar/same as (4319].
4306	2	20th century	1 English stoneware bottle stopper with green glaze. 19/20th century. 1 English buff stoneware jar.
4310	10	20th century	6 English buff stoneware jar. 18-1900. 1 English buff stoneware jar. 18-1900. 2 Porcelain. 20th century. 1 tea bowl with very fine walls and thin (continued below).....

			band of blue sun-burst decoration along internal rim surface. Early 18th century.
4319	1	19th century	1 Blue-and-white Transfer printed ware. Closest parallels are "Fitzhugh" pattern found on Chinese export porcelain and also on English porcelain from Caughley and Coalport. late 18/19th century. (see Savage, G. and Newman, H. 1974 p121). This border pattern is perhaps more closely paralleled with a pearlware "willow pattern" soup plate of early 19th century date (see Noel-Hume 1969 fig 47, p130).
4320	8	19th century	1 Red earthenware with brown shiny glaze. 7 ledged industrial jar with greenish/yellow glaze below the internal ledge and chestnut glaze above.
4325	1	18th/19th century	1 Brown stoneware with tiger skin texture like Frechen wares.
4340	5	19th century	4 Ledged jar in red earthenware industrial fabric. 1 slipware with brown and yellow external glaze and yellow internal glaze.
4341	6	18th/19th century	1 Burnt pinkish gritty ware with ?limestone inclusions. 11/12th century. 1 Brandsby-type ware with dark green glaze. 14th century. 2 Humber ware. 1 Fine red earthenware with shiny brown glaze 1 Slipware cup/mug with buff fabric and yellow glaze on both surfaces and feathered decoration externally
4374	2	14th century	1 York glazed ware. 1175-1350. 1 Brandsby-type ware with mottled green glaze. 1275-1400
4384	4	18th century	1 ?Brandsby-type ware. 1 Staffordshire slipware with yellow internal glaze and brown externally. 17/18th century. 1 Humber ware with glaze on both surfaces. 1 Slipware with mottled brown and yellow glaze.
4426	6	19th century	2 Brown stoneware ?blacking ?bottle 1 fine red earthenware with brown glaze 1 fine red earthenware with black glaze 2 Humber ware
4472	5	19th century	1 Brandsby-type ware with incised wavy line decoration. 3 white earthenware. 1 Slipware with buff fabric.

4512	1	?13th century	1 Splash glazed ware with reduced core and oxidised margins. Abundant quartz protruding through surface reminiscent of MOX. 1075-1250
4521	21	18th century and some medieval	1 Iron stained buff earthenware. 18th century. 1 Tin glazed ware bowl with external blue and white floral decoration and slightly sooted base. 1 Staffordshire slipware mug with yellow ground and brown pellet decoration. 2 Humber-type ware with glaze on both surfaces. 5 Humber ware jug. 1 Humber ware ?chaffing dish glazed on both surfaces. 1 Brandsby-type ware with incised horizontal wavy line decoration. 3 Brandsby-type ware with mottled green glaze. 1 Staffordshire slipware mug with internal yellow glaze and external brown glaze. 2 ?Hambleton-type ware open form with internal green glaze. 1 Humber ware with glaze on both surfaces. 1 Ryedale-type rod handle. 1 Brandsby-type rod handle.
4529	2	19th century	1 Fine red earthenware with shiny black glaze. 1 Creamware 1770-1900.
5000	5	19th century	1 Modern stoneware bottle base with applied oval label with wavy edge and series of incised lines around it, stamp inscribed "HO...SEGA...IOB..." For similar ginger beer bottle see Hedges A. A. C., p21. 19th century.
			1 Ryedale-type ware ribbed handle from green glazed jug. Late 16th-early 18th century. 2 English stoneware buff coloured jar. 1 White salt glazed stoneware with blue painted floral decoration. 1720-70?
5001	3	19th century	3 Ledge jar in fine red earthenware fabric with light green glaze, perhaps used in industrial/paint manufacturing process related to iron/lead working.
5010	6	19th century	1 oxidised green glazed earthenware. 1 buff stoneware with light brown exterior and buff interior and incised line decoration. 1 unglazed later red earthenware. 18/19th (continued below).....

			century. 1 fine red earthenware industrial ?ledged jar. 19th century. 1 Brown stoneware bottle 1 burnt cream stoneware
5013	2	18th century	1 Green glazed Hambleton/Ryedale-type ware bowl/jar with patch of light greenish yellow glaze on rim. 1 medieval Humber ware with reduced fabric, pitted splash galze and fine walls.
5032	1	19th century	1 Thick walled tile/base/collar/rim, not dissimilar to ledged jar rims but in a buff/yellow refractory clay with reduced surfaces apart from the external surface to approx 5cm below the rim.
5043	3	19th century	3 jar/bowl sherds in fine red earthenware, possibly used for industrial purpose related to iron working, for example paint/lead manufacture. (See (5031] for similar).
5053	14	20th century	1 Green glazed buff earthenware base sherd with black stamp under base with inscription "...MINGHAM". (Birmingham). 1 Earthenware ?saucer/lid profile with yellow glaze. 20th century. 1 Earthenware with white internal and blue external glaze. 8 Transfer printed ware. 1600-1800. 2 White earthenware flatware. 1 Lustre ware dish rim.
5067	7	19th century	1 Drain fragment 2 Porcelain flat ware with blue leaf decoration. 1 Transfer printed ware. 1 white earthenware with purple/red line decoration. 1 Staffordshire white salt-glazed stoneware. 1720-70. 1 Creamware. 1770-1900.
5068	26	20th century	1 Brown glazed fire draw. 4 Transfer printed ware dish with blue and white floral decoration. 1 Black glazed red earthenware. 1 Humber ware base. 3 buff stoneware bottle (greenish tinge). 3 Brown stoneware 1 buff corrugated stoneware. 8 white earthenware. 3 white porcelain. 1 modern white porcelain.
5069	7	19th century	1 ?Walmgate-type oxidised earthenware (continued below).....

			jug with strap handle and central groove. 1375-1550. 1 white stoneware marmalade type jar. 18/19th century. 1 Slipware with yellow glaze and orange dot and crude brown trailed decoration. 17/18th century. 2 Transfer printed ware dish with blue and white decoration. 1600-1800. 1 Humber ware with patch of soot on external surface. 1 white earthenware bowl/cup.
5071	1	19th century	1 White earthenware bowl.
5098	1	16th/17th century	1 Fine red earthenware with shiny brown glaze following the Cistercian tradition.
5104	2	uncertain	1 Burnt coarse red earthenware. 1 Burnt greyware, possibly Roman
5115	1	16th century	1 Humber ware with thick walls.
5120	17	20th century	5 English stoneware jar representing approximately 3 vessels. 2 Porcelain/coloured blue glass. 20th century. 8 Transfer printed ware dish/plate with brown floral decoration. 1 Transfer printed ware with blue design. 1 White earthenware miniature cup.
5124	12	19th century	6 Brandsby-type ware including 1 with vertical combed line decoration. Late 13th/14th century and 2 with yellowish green glaze inside and green glaze outside. 1 rim of unglazed ?ledged jar with deposit of yellow powder. 4 Humber ware. Late 13th to early 16th century 1 ? local slipware with chestnut glaze and cream decoration of horizontal bands of reversed "s" separated by horizontal feathered lines of slip. 18/19th century?
5177	1	19th century	1 Fine red earthenware with thick walls, rib and heavy sooting externally. An industrial purpose is likely for this sherd.
5179	46	19th century	12 English buff stoneware jar with white ?lead deposit and 1 base with "T BRIT...YORK..." 1 Black glazed red earthenware bowl with fine walls and lustrous glaze. 3 Transfer printed flanged dish with blue and white Chinese style floral decoration. 1 white earthenware with blue external and white internal surfaces. (continued below).....

			4 English buff stoneware jar. 1 Brown stoneware blacking bottle shoulder. 18/19th century 2 Brown stoneware bottle shoulder. 2 Brown stoneware bottle base 100% 2 Brown stoneware bottle base 98% 2 Brown stoneware bottle base 50% 2 Brown stoneware bottle base 30% 9 Brown stoneware body. 1 Brown stoneware shoulder. 1 Brown stoneware bottle rim. 2 Brown stoneware neck. 1 Humber ware dish/bowl with collared rim.
5180	1	19th century	1 White stoneware jar.
5184	1	18th century	1 Staffordshire slipware dish/bowl with pie-crust rim and brown slip decoration. 1600-1800
5194	1	19th century	1 Creamware foot ring of pedestal base of bowl.
5234	3	early 16th century	2 Humber ware 1 ?Brandsby-type ware with yellow glaze and copper speckles.

Table 2 Pottery types by context

### 8.3 Ceramic Crucibles

Thirty-five of sherds represent approximately six vessels, some of which are quite substantial and in a number of cases almost complete. The largest number of near complete and various sherds of buff and white clay crucibles come from one context (4019]. Fragments of mortar ?channels were also found here (4019] and various lumps of mortar, some with flattened areas (4045], perhaps used as stands for hot crucibles.

#### 8.3.1 *Fabrics and forms*

At least three fabric types are present. These respect the distinct vessel shapes which probably relate to their function.

1. A buff coloured, coarse, granular refractive clay found in the near complete examples with "HOLLAND 30" stamped under the lip (4019 SF 115 and 52; 4184; 5031; 4005 SF 121].

Forms are clearly made to a standard size, being tall (23.5cms high), thick walled (1.5cms thick increasing to 2.5cms close to the base) and straight sided with gently everted walls. The rims are squared off and have a small pulled lip. The rims are all between 7 and 7.5cms radius and 16cms diameter at the lip. Bases are flat and 5cms radius.

2. A fine white clay, fairly friable, with smooth surfaces and very light discolouring, perhaps due to gentle heating in water as very little evidence of sooting. These are perhaps from a similar form but with thinner walls.

No complete forms were found. (4005; 5031; 4019; 4045] but forms are probably similar to those of type 1, with flat bases and slightly tapering walls. The latter being finer than those of type 1.

2a. A coarser variant of the white fabric with more granular texture (4053; 4019].

3. A fine light grey reduced fabric is found in only one example of a curved based crucible which has much thicker walls than the others (3cms wide) and is covered with a red iron deposit with white powdery lead inside. This may have been used for heating iron to higher temperatures, perhaps for steel (4185] SF 20.

It is not clear precisely what processes were carried out using the above types, though it is clear from the amount of slag and soot on the tall flat bottomed type 1 crucibles that they were subjected to substantial direct heat from coals or wood and contained molten iron.

Type 2 do not appear to have been placed directly onto coals as there is little evidence of soot on these forms.

One possible crucible squared rim in a very fine, friable clay has walls of only 1 cm thickness. (5031] SF 48. Although this form has slag attached to it shows no signs of heating and may have been used as a jar.

#### **8.4 Recommendations for further work**

A. Little further work is necessary for the domestic assemblage other than selecting material for illustration (photography).

B. Further work is necessary on the industrial wares in order to analyse and ascertain their precise use. This should be extended to the stoneware bottles and jars which may have been used in conjunction with them.

Preliminary examination of the white powdery deposit on the surface of these unusual vessels suggested that the refining of linseed might have been involved. Linseed oil may have been added to greensand to form hardened cores for casting hollow products or might have been involved in paint production. It is possible that the process which used these vessels had nothing to do with the foundry or smithy, but that the assemblage was simply dumped on the ground to make up grounds levels. Further analysis of surviving deposits is required to

establish their function. XRF analysis would help to establish the processes in which they were involved and further research on early chemical industries is required.

C. The complete or semi complete crucibles from the site appear to be unused, at least insofar as their use for melting iron is concerned. Crucibles of similar size and shape which were used at Laing's foundry (see acknowledgements) were covered with thick iron residues after a single use. Laing's crucibles were somewhat wider and larger so perhaps the Walker foundry examples were for some other process which accounts for the sooting on the surfaces. Further research into early ironworking processes is required, in particular in association with research in steel making processes.

## **9. IRONWORK by Ailsa Mainman**

The largest group of material was the ironwork itself which included machinery components, tools, failed castings, offcuts and by-products of casting, fittings and various products or parts of products.

### **9.1 Methodology adopted to assess the ironwork**

1103 fragments of iron were recovered. They were in a very corroded state having laid in damp soils for a hundred and fifty years. Often the corrosion completely obscured the shape of the object, and several objects had frequently corroded together into large lumps. Given the enormous quantity of objects, the fact that a high proportion of the material was likely to be cast rather than wrought iron, and many objects were very large in size, it was clearly not practical or appropriate to radiograph every iron object as is normal procedure.

Advice was sought from Dr. Paul Belford from the Ironbridge Trust who visited the site during excavation and subsequently reviewed the assemblage. In consultation with him and with YAT's conservators, a methodology for assessment of the iron was agreed. This involved using hammers and chisels to mechanically remove enough of the corrosion products to identify the shape and, where possible, the type of object and to take measurements. Where objects were too fragmentary, or disintegrated during this process, they were discarded and a basic record kept. Objects which were clearly delicate, or required other more complicated treatment (ie residue analysis etc), were packaged appropriately for assessment in the conservation lab.

Once this process was completed it was possible to identify items which needed to be X radiographed and items which needed more careful packaging for medium or long term retention.

The material was then grouped according to shape (and function when that could be determined), and initial digital images were taken.

All the measurements and descriptions were added to the Trust's central database IADB as 'small finds' (even though some had already been discarded) in order to provide a permanent record of these objects. These lists and descriptions remain in archive and, due to the scale of the collection, have not been printed here. A summary of what was recovered is given below.

## 9.2 Consultation with receiving museum

At this stage initial consultation took place with representatives of the York Museums Trust (both Andrew Morrison, Archaeology curator, from the Yorkshire Museum and Sarah Moltby, Social History curator, from the Castle Museum) to discuss long term retention of parts of the assemblage as it passes into the care of this institution. They indicated that they would not be accessioning very much of the material, other than one or two representative pieces or objects of particular interest. This input was useful at this stage as it confirmed the view that little was to be gained from conservation beyond stabilizing the material long enough for analysis and recording.

## 9.3 Results

The vast majority of the collection comprised bars, rods, sheet and plate fragments of various shapes and sizes. While some of these could be interpreted as components of fireplaces, kitchen ranges or railings, the function of many could only be guessed at. Consistent patterns, shapes and sizes of many of these objects suggested that they had performed specific functions in the foundry. In order to assist in understanding their role, the owners of two traditional iron foundries which produce much the same range of products using processes which have evolved little since the Victorian period were contacted and visited (see acknowledgements). The involvement of the foundry owners and foundry workers was invaluable in helping to interpret the function of some of the objects, and in explaining the processes and activities which must have taken place on the site. Some of these activities have left little tangible physical trace but must have been accommodated on the site, and their existence is hinted at only by some of the artefactual evidence.

The table below shows that most (41%) of the objects comprised rods of various sizes, cross-sections and proportions. Miscellaneous objects which represented less than 1 % of the assemblage were grouped together and form the second largest group (17%). Plate fragments (15%) and bars (8%) formed the next largest parts of the assemblage with all other types representing only small amounts.

Type of Object	Percentage
Rod	41.49
Other	17.21
Plate	14.98

Bar	8.07
Vessel	2.75
File	2.48
Pipe	2.39
Spike	2.39
Hook	1.86
Nail	1.68
Object	1.68
Bolt	1.51
Strip	1.51

Table 3 Summary of iron work

In summary artefacts include:

Tools, foundry equipment and fittings

- furnace components including firebars
- hammer heads
- files and chisels
- spanners and wrenches
- spikes and wedges
- nails, bolts and washers
- iron crucibles and melting pots
- lock fittings and keys
- culvert covers (some including re-used failed castings)
- large wheel cog fragments and other machine components
- ? casting box fragments and braces
- bars/??ingots
- lifting tools
- 'runners and risers' (part of the casting process but not part of the cast object)
- weights and weight plates

Products

Railings:

- triangular, round, square and rectangular cross-section railing cut-offs exist (clearly some standardisation of length and shape of cut-offs)
- possible railing finials (3-4 types)
- supports/fixings
- top bar cut-offs
- base parts - bars and discs

Ovens and ranges:

- shaped firebacks of different types
- possible range doors - some decorated
- large flat plates - components of ranges?
- shaped bars and supports from front of ranges
- grill fragment

Other:

- weights (including very large ? clock weights, small 'shop' weights, window sash weights)
- spikes - / railway spikes?
- domestic vessels including griddle, cooking pots, bucket shaped vessels
- small plate fragments
- shoe last
- bindings from barrels or casks
- pipes
- buckles
- agricultural equipment

#### **9.4 Discussion**

In considering the assemblage it is worth commenting on how it came to be on the site. We know from documentary records that Walker occupied the site from 1837 to 1847 and then moved his foundry to larger premises. John Walker died in 1853 but the old foundry premises remained in his son's ownership until 1856. The foundry, therefore, may have operated for just 10 years on the original site which might then have continued to be used for additional foundry space, storage or other related activities. Parts of it might even have been sub-let for small industries unrelated to iron founding (see the discussion on the industrial pottery).

The history of the sites' usage will have affected the composition of the assemblage. If the site ceased to be used as a foundry in 1847 all the detritus represents material left on the site after the final casting. There is a considerable quantity of ironwork which would normally have been remelted in the furnace but was not; perhaps it was left on site as it was not considered worth transporting it down the road to the new premises. If the site continued to act as a secondary foundry for smaller products when space was at a premium, then the detritus relates to continuous activity up to the sale of the premises in 1856.

It is also possible that activities on the site were reduced and perhaps only the smithy mentioned in the sale document continued to operate. Some of the re-organisation on the site might have been undertaken to make it more suitable for smithing. Different industries might also have appeared on site; the assemblage of broken industrial pottery might signal the end of whatever process these specialized vessels represent. The brick-lined pit or small structure towards the

river end of the site where almost one hundred iron objects were recovered appears to be the result of an attempt to clean up and collect miscellaneous rubbish and debris.

What was excavated, therefore, must mostly represent discarded broken and unwanted material left on site when the foundry business closed down, rather than material lost in the course of production.

## **9.5 Recommendations for further work**

### *The ironwork*

Further work on this body of material involves further research which will lead to a description, illustration and discussion of the main forms recovered and integration of the structural elements, wherever possible, into the main site report. This will form the main element of the further work on the finds.

## **9.6 Analysis**

### *iron crucibles and ladles*

A few corroded examples of small open forms survive which have a thick iron and occasionally lead deposits on the inside. Further analysis of their form (i.e. did they have handle attachments, pouring lips etc) may be revealed by further radiography once the dense internal deposits have been removed. The deposits themselves require XRF analysis to determine their composition. Lead, if it is lead, would have been used, among other things, in the setting of railings into wall copings.

### *slag and fuel*

Analysis of the form and composition of the slag may help elucidate the processes involved at the foundry components but here is little further useful work to be done. Similarly, although both coal and coke were recovered from the site the sample is too small and scattered to make further analysis profitable.

### *casting sand*

Initial discussion with Bradford University Archaeology Department suggests that further analysis of the casting sand to determine whether there is an organic component would be possible.. Analysis might indicate traces of additives such as linseed, resins or whale oil used to stiffen and harden casting sand for use in core molding. Analysis of the samples of casting sand taken from the possible casting pit may allow determination of provenance of the greensand. Greensand from Kent and Surrey was valued for its particular properties and

exported widely for foundry use (Laing pers comm.) although there are sources nearer to York.

## **10. NON-FERROUS METAL SMALL FINDS by Nicola Rogers**

Forty-four copper alloy and seven lead alloy objects were assessed. Apart from a possible coin which needs further cleaning prior to being identified by a numismatist (SF101, context 5038), none of the finds is datable, but it is assumed that most relate to the years of the operation of the Foundry. Some of the copper alloy finds appear to reflect the daily life of the Foundry workers, including a probable teapot (SF60, context 4009), parts of watches and clocks (SF43, context 4198; SFs61-2, context 4009), and a spoon (SF99, context 4013). A large buckle (SF72, context 5004) may have been worn by one of the workers, while a small dress pin (SF100, context 5040) is likely to have been part of a woman's dress. Two buttons may also have been from workers' clothes (SF39, context 4020; SF40, context 4198) but two others post-date the Foundry, and derive from the 20<sup>th</sup> century (SFs105-6, context 5108). Decorative candle holders (SF109, context 4053) seem fancy, and may have been used in a room where the management worked.

Many of the remaining finds seem likely to have been involved in industrial activities, although at this stage it is not clear in what way they were all used. Several lengths of copper alloy wire, some twisted together, were recovered (SF21, context 5010; SFs30, 76, context 4000; SF34, context 4057; SF35, context 4089; SF41, context 4198; SF57, context 4009), and sheet fragments, offcuts and strips were also found (SF33, context 5019; SF45, context 4198; SF56, context 4054; SF59, context 4045; SF65, context 4023).

Other finds include a collection of three iron and lead weights of similar form but varying in size and weight (SF92, context 4019; SF117, context 4413), and another possible weight (SF25, context 4009), as well as probable lead working debris including SF22, context 5010. SF26, context 4074 is a lead pipe which was presumably structural.

### **10.1 Recommendations for further work**

A small amount of work is required to integrate the domestic and personal items with the rest of the domestic elements of the assemblage. Similarly work is required in describing items which relate to the processes of the Foundry.

## **11. GLASS by Anne Jenner**

A total of 127 sherds of glass were viewed from a number of contexts (see Table 4). The majority of these consist of large pieces of lemonade and beer bottles. Other bottles include Hambleton and Codd mineral bottles, and rectangular or square pharmaceutical bottles of late

19<sup>th</sup>- and 20<sup>th</sup>-century date.

Bottles appear to have been coming in from the surrounding area as well as the immediate vicinity as their legends include York, Leeds, Harrogate, Tadcaster, Barnsley and Wakefield.

Many of the bottles are represented by large sherds or are near complete. This suggests that they are from a primary deposition and were in situ.

Other smaller pieces of window glass are present in much smaller numbers and are probably contemporary with the Foundry.

No further work is recommended on the glass.

Context	Quantity	Spot date	Details
4000	12	19th century	1 Lemonade/mineral bottle with screw top and raised inscription "BARRACLOUGHS HARROGATE". Late 19th century. 3 Large lump of glass waste. 2 square pharmaceutical bottle. Light green glass. 1 Late 19th century bottle base. 1 20th century screw top straight sided short jar. 1 Bottle neck. "IMPERIAL...OWER BR" 2 ?Neck of pharmaceutical bottle including 1 very narrow with thick walls and vertical depressions and 1 with short neck and square shoulder. 1 ?Pharmaceutical ?glass stopper
4012	1	uncertain	1 Window glass fragment
4013	4	?19th century	1 Bottle base with tall kick-up with flattened upper surface. Light green glass. 2 Bottle. Green glass. 1 Bottle base. Clear glass. 1 Bottle base with tall kick-up with squared upper surface. Light green glass.
4014	2	late 19th century	1 Square bottle with raised inscription "...DGE" 1 "Codd" mineral bottle. (see Hedges Shire Album 6, p13)
4020	4	?19th century	4 Bottle. Light green.
4023	10	19th century	1 Bottle neck and rim. Green glass. 3 Bottle. Brown. 1 Window glass. 1 Bottle neck. 3 Bottle body sherds. 1 ?Glass waste 1 Green body sherd.
4042	1	19th/20th century	1 Bottle sherd. Brown glass.

4045	1	uncertain	1 Window glass.
4057	4	uncertain	4 Window glass.
4074	9	19th/20th century	2 Bottle base. 1 Bottle neck with vertical ribs. Light green glass. 4 Bottle. Light green. 2 fragments of bottle glass
4148	5	uncertain	3 Bottle base. 1 Bottle rim. 1 Bottle base.
4198	15	19th/20th century	1 ?Champagne bottle neck. 1 Bottle base with raised inscription "JOHN KILNER WAKEFIELD" under the base. Light green glass. 3 Pharmaceutical bottle base/body including one with raised inscription "ONS". Light green. 1 "Codd" body. Clear glass. 4 Window glass. 2 Straight sided bottle base. Dark green. 1 Straight sided bottle body. Dark green. 1 egg-shaped "Codd". Early 19th century. 1 small straight sided bottle base. Green glass.
4206	1	?20th century	1 Bottle body sherd. Brown glass.
4209	1	?20th century	1 ?Beer bottle neck. Brown glass.
4307	1	19th century	1 Glass bottle fragment.
4310	7	late 19th century	1 Square bottle base. Light green glass. 1 square pharmaceutical bottle body. Light green glass. 3 Window glass. 1 Bottle body. Green glass. 1 Hambleton-type bottle body. ?Egge shaped. (see Hedges Shire Album 6, p12).
4426	5	uncertain	5 Window glass.
4521	1	?19th century	1 Small bottle base.
5000	6	19th/20th century	1 Bottle body sherd. 19/20th century. 3 ?Lemonade bottle. Raised inscription "...TTY" above "S....". 1 Beer bottle. Brown glass. "John Smith's Tadcaster. 20th century. 1 Screw topped square bottle. Clear glass.
5004	1	20th century	1 Bottle body/base with raised inscription "...REWERY Co" above "TADCASTER YORK". "B-G inside a shield. Raised inscription on base "7266". Green glass.
5010	2	19th century	1 Bottle base. Green. Late 19th century 1 Bottle body/base with raised inscription (continued below).....

			"GEORGE WOOD" "MAK....R" (maker) "HUNS..ET LEEDS" (Hunslet Leeds) on one side and "D. MOORE", a logo of a small "D" in the centre of a larger "M", with "YORK" below.
5022	1	19th/20th century	1 Bottle. Light green glaze. Raised inscription "I. WALKER YORK TRADE MARK" above a logo of a small "I" in the centre of a larger "W". On the other side a raised inscription of "REDFERN BROS" above "BOTTLE MAKERS" ABOVE "barnsley" in an oval. "R. B". on base.
5032	2	19th/20th century	1 Moulded green glass. 1 Light green glass.
5040	1	uncertain	1 Window glass.
5043	6	uncertain	6 Window glass. Light blue/green.
5053	7	19th/20th century	2 Bottle base. 5 Bottle body.
5067	1	19th/20th century	1 Bottle neck and rim.
5098	6	19th/20th century	1 ?Mineral bottle body with raised "I. G". Light green glaze. 1 Bottle body with raised "INR"? Light green glaze. 1 Bottle neck. Dark green glass. 3 Bottle neck.
5235	8	19th century	1 Bottle neck. Early 19th century. 1 Bottle neck. Mid-late 19th century. 3 Bottle body sherds. Early 19th century. 3 Bottle body sherds. Mid-late 19th century.

Table 4 Summary of glass by context

### 11.1 Recommendations for further work

A small amount of work is required to integrate the domestic and personal items with the rest of the domestic elements of the assemblage. Similarly work is required in describing items which relate to the processes of the Foundry.

## 12. TOBACCO PIPES by Anne Jenner

### 12.1 Pipe bowls

24 bowls were recorded as small finds on IADB.

Decorative schemes include leaf decorated seams, fluting, rose and thistle, Prince of Wales feather design and Masonic symbols. Many of these were fairly closely paralleled with similar

designs described by White and Davey from Pontefract Castle (White and Davey 2003 129-144) and are mostly from the 19<sup>th</sup> century.

## **12.2 Pipe stems**

139 pipe stems have been counted and recorded as bulk finds on IADB. No further work was done on them as they were plain and unmarked.

## **12.3 Heel stamps**

Only three pipes had maker's marks on or around the heel. One with a small spur has an "O"? on the side (4000] another has an "a"? (4045] and another has two feint raised lines underneath.

## **12.4 Recommendations for further work**

Further work will help to attribute these marks to a specific maker. The decorated pipes are worthy of illustration as the Masonic, Prince of Wales and rose and thistle designs may differ slightly from those from Pontefract Castle and as yet no other published contemporary parallels from the region have been recognised and consulted.

## **13. ANIMAL BONE by Charlie Dean**

### **13.1 Summary**

A moderately sized assemblage of well preserved animal bone was recovered. The main domesticates were fairly evenly distributed, with a difference of seven fragments between the most common (sheep/goat) and the least common (cattle). Rabbit and chicken were also present, as were dog, cat, horse and haddock.

The majority of bones were well preserved with no flakiness, and there was little evidence of burning. There was also some staining of the elements due to the presence of metal in the soil. Twenty percent of the elements had evidence of butchery. There was a small amount of gnawing in the assemblage and a small amount of root etching. Half the elements recovered showed no signs of taphonomic processes occurring on the bones.

### **13.2 Method**

The hand collected vertebrate remains data was directly entered into an Access database. Subjective records were made of the state of preservation of fragments, as well as evidence of gnawing, burning, butchery, fresh breaks and root etching where applicable.

Fragments were identified to species using the University of York modern comparative reference collection. The bones which could not be identified to species were described as unidentified. Within this category distinctions were made between fragments belonging to large mammals (cattle, horse, large cervid), medium mammals 1 (caprovid, pig, small cervid), medium mammals 2 (cat, dog, hare) and totally unidentifiable (ui in table 5).

### 13.3 Results

Animal bone from 53 contexts was submitted for analysis, amounting to 559 fragments, and weighing 6464g.

### 13.4 Preservation

Preservation of the remains was generally good. Those that were not well preserved tended to have less than 30% of flaky patches on the bone surface. There was little variability in the colour of the fragments within contexts except in context 4046 where one unidentified fragment was a significantly different colour to the rest of the deposit which may suggest that the deposit had been disturbed. The majority of bones were unabraded and the bones tended to be angular. Fragmentation of the bones was not high in most contexts; the average weight of fragments (excluding context 5120) was 14g. This is unsurprising, given that the material was hand collected. Context 5120 however, consisted mainly of very small fragments of unburnt bone. It is unlikely that they would have been used to add carbon to iron in the hardening of small steel parts (Legge, Pers. Comm), but it is always possible that the intention was to burn them *after* crushing.

### 13.5 Taphonomy

Eleven elements showed evidence of gnawing, whilst a further eleven showed probable gnawing. Most of this gnawing was the result of canid activity, ie, dogs. However, there was some evidence of cat gnawing and possible rodent activity too. Overall, the number of elements gnawed was small, accounting for just 2% of the total bones recovered.

Metal staining and/or encrustation was present on a number of bones. Copper working was evidenced by the green colouring assumed by 26 bone fragments, eg contexts 4198 and 4018, and there was evidence of iron encrustation on a further 8 elements, (context 4023).

A small number of bones (13) showed evidence of root etching. One element (from context 4018) appeared to have been weathered on one side only, suggesting that the bone had lain on the surface for some time before becoming incorporated into the deposit.

One medium mammal one second phalange seemed to have become squashed and distorted and this may suggest ingestion and subsequent excretion by a scavenging animal, probably dog.

Half of the elements recovered showed no signs of any taphonomic processes occurring on the bones.

### **13.6 Butchery marks**

One hundred and eleven elements showed some evidence of butchery, ranging from knife marks and chop marks to bones reduced in size through chopping and sawing.

The majority of elements with evidence of butchery were rib fragments from medium and large mammals. Vertebral elements were also heavily butchered, usually chopped to reduce in size, or split sagittally along the midline. These elements represent the majority of large and medium mammals that could not be identified more closely to species, hence the predominance of ribs and vertebrae. In total, large and medium mammal elements that had evidence of butchery accounted for 50% of the total number of butchered elements.

Eighteen pig elements showed evidence of butchery. This included six instances of knife marks, eleven instances of chopping and reducing in size and two instances of sawing through the bones. Butchered elements were dominated by fore and hind limb bones although one mandible and one pelvis showed evidence of some degree of butchery.

Fifteen sheep/goat elements had evidence of butchery. Seven elements showed evidence of knife marks and a further five showed evidence of chop marks. Eight elements showed evidence of being chopped and reduced in size. There one was instance of sawing through the bones, in this case a tibia. Butchered elements were dominated by forelimb elements, the pelvic girdle, and foot bones. Some hind limb elements were present.

Ten cow fragments showed evidence of butchery, mainly in the form of chopping to reduce in size. With the exception of an atlas, all butchered elements were limb bones or came from the feet.

One dog metacarpal showed evidence of a probable knife mark, whilst a rabbit femur had evidence of three probable knife marks. A probable chicken tibiotarsus had one knife mark on it, but of the eleven birds, was the only one to show any sign of butchery.

The most heavily butchered elements were ribs, usually in the form of knife marks or by being chopped through at the end, and vertebrae which were usually chopped sagittally in half through the midline.

There did not seem to be any coherent patterning in the distribution over the site of butchered elements, although contexts 4000, 4075, 4198, and 4310 all had more than 20 butchered elements present. In all cases, this represented over half of the total number of bones in the context, so these may well represent disposal areas for butchery waste.

### **13.7 Burning and calcining**

There was no evidence of charring on the recovered fragments, and only three elements showed evidence of having been calcined (contexts 4000, 4310 and 5120), which may suggest that the majority of the bones present are from domestic consumption rather than present through industrial processes.

### **13.8 Species identified**

The assemblage was numerically dominated by large and medium mammals, which were unidentifiable to species. These accounted for 46% of the identifiable bone fragments. In terms of the three main domesticates (cow, sheep/goat and pig), the distribution of these species is fairly even, and with a difference of seven fragments between the most and least frequent of the three. It is difficult to interpret the assemblage any further given the small number of bones involved, and almost impossible to say anything meaningful about the distribution of the three domesticates within the site.

One horse element was recovered, a third phalange, with no evidence of butchery and no other associated foot bones.

Medium mammal two species were also present on site and included cat, dog, and rabbit. Cat and dog were relatively infrequent compared to rabbit, of which 16 elements were present. These elements were present in 8 contexts, and whilst it is possible that some may represent later disturbance from burrowing animals, at least one (context 4018) had evidence of butchery marks, suggesting human agency.

The only bird species present was chicken, accounting for four elements, with a further four probable chicken elements. Fish were represented one haddock cleithrum, one of the most robust elements in the haddock skeleton.

### **13.9 Pathology**

There were twenty four instances of periostitis on the bones, and a further six probable instances of periostitis. A sheep sized distal rib showed evidence of a slight remodelling of the bone as well as a patch of periostitis. One *Capra-ovid* second phalange showed evidence of a bony growth on one side, and the head of one *Capra-ovid* radius was distorted. Finally, one bovid calcaneum seemed to have a patch of extra bony growth on the shaft, although the cause is unknown.

### 13.10 Metrical analysis

Fifty eight fragments were suitable for metrical analysis, covering a range of species and elements. In terms of the main domestic ungulates, fifteen *bovid* elements, fifteen *capra-ovid* elements and seven *Sus* elements were measurable.

Other elements that were present and measurable came from horse, chicken, rabbit and cod.

Only four ungulate mandibles had teeth remaining in them, and only two of these, one sheep and one pig, were suitable for age determination, in this case, through the presence of deciduous dentition.

### 13.11 Discussion and statement of potential

This site has yielded a moderate assemblage of bone which is largely well preserved. The majority of bone comes from the 19th century. Fifty eight fragments are suitable for metrical analysis, and 2 mandibles would allow age determination.

The identifiable remains were numerically dominated by domestic ungulates: *capra-ovids*, bovids and pigs. Other domestic species represented included horse, dog and chicken. Rabbit and fish (gadids in this case) were also present.

There are very few comparable sites mentioned in the zooarchaeological literature. This means that it is difficult to make meaningful comparisons with other sites, but illustrates that full recording and analysis of this assemblage would be most fruitful.

### 13.12 Recommendations

The material from Dixon's Yard is of value for a number of reasons, but mainly because it provides a moderately sized body of material dating from a period which is marked by a paucity of well preserved bone assemblages. Further work is warranted on this assemblage due to the paucity of well recorded animal bones dating from this period. If the material is to be disposed of, it should be fully recorded first.





## 14. DISCUSSION AND CONCLUSIONS by Ailsa Mainman, Patrick Ottaway and Javier Naranjo Santana

The excavations at the site of the former Walker iron foundry, Dixon's Yard, produced a sequence of well-preserved structural remains and a considerable build-up of associated stratified archaeological deposits. Within these deposits were a large number of artefacts representing life and work in the foundry as well as copious quantities of industrial debris. When fully analysed the site will make a substantial contribution to the study of York in the early 19<sup>th</sup> century and to the history of iron founding.

### *Pre-foundry*

In a number of areas deposits were encountered, but not usually excavated, which pre-dated the foundry. Their date is uncertain, some may be associated with construction or ground preparation for the foundry at the beginning of the 19<sup>th</sup> century whilst others may be late or early post-medieval build-up on the edge of the King's Fish Pool.

### *The foundry*

The plan of the foundry itself, defined on the ground by brick walls, appears to correspond in general terms to what is shown on the 1<sup>st</sup> edition OS map of 1852 (Fig. 00). It appears to have lain between two property boundaries running north–south from Walmgate to Wormald's Cut, but separated from buildings on the Walmgate frontage by an east- west boundary. All three boundaries can still be seen on the ground today. The foundry buildings appear to have consisted of a main block at the northern end of the site which had a wing projecting southwards from its south-west corner. On the east and west sides of the plot, following the property boundaries, were strings of other buildings which are assumed to have also formed part of the foundry. What was found in the excavations corresponds to much of the main block and projecting wing, and to the string of buildings on the east. To the west of the main block the cobbled surface (5057) probably occupied an alley shown running down to Wormald's Cut between the main block and the buildings on the west side of the plot of which only the eastern wall line was identified.

The foundry walls were built of brick and the buildings would have appeared fairly utilitarian, although limestone and sandstone was used for door surrounds. Determining the functions of the various rooms and spaces identified within the foundry and relating them to the components listed in the 1850 Bill of Sale (Malden 1976, 39) is difficult, although further research on the structures and finds may provide elucidation. It is known however, that the building in the south-west corner of the plot (not within the excavated area) was the Master's House or 'Manor House'. Built c. 1830, it has now been largely destroyed (RCHMY5 , 237).

The principal casting area of the foundry was probably in the centre of the main block where the large pit (5116) c. 2m deep and 10m in diameter was found. Above this there was probably a

chimney of which no trace survived. On the eastern side of the site another distinctive feature, probably primary, was a rectangular chamber c. 1.3m deep. Its function is uncertain but the timber beams at the base probably supported an item of machinery, perhaps a pump. In a low lying zone close to the Foss flooding and rising ground water was probably a constant problem. Disposal of water was probably to some extent, at least, also the function of the drains on the site. They may also, however, have served to distribute a supply of water to the foundry where it was used for quenching, washing and other tasks associated with metalworking.

South of the chamber was an area of brick flooring into which stone blocks were set which are thought to have supported an item of machinery, possibly a grinding wheel. A brick-lined pit set in clay (4159) which was clearly associated with a grinding wheel was found near the southern end of Trench 4. Being west of Wall 4156 this may have stood in the open air. South of the brick floor and Drain 4306 in what appears to have been a large elongated room there was an extensive area of flooring formed from stone setts. This room was perhaps used for storage or even as stabling, although there are no distinctive features indicative of the presence of horses.

Immediately west of the main block in the north-west corner of the site, probably in the alley, a very substantial concrete base was found. One interpretation is that it supported a crane which would have assisted in moving material on and off boats drawn up in Wormald's Cut.

During the life of the foundry alterations to the structures were clearly made; in many cases with brick walls which were very poorly constructed. It is not usually clear, however, if they represented reorganisation of space or emplacements for machinery. One striking alteration occurred on the north side of Area F where a room originally defined on the south and west side by Walls 4034 and 4215 had in its first phase a pit or well probably round in plan and lined with bricks. Subsequently there was a considerable build up of material, much of it slag, such that the doorway through Wall 4215 had to be closed. On top of this build-up a large sandstone block (5205) was placed; sockets in each corner of its upper face suggest it supported an item of equipment, perhaps something as robust as a steam engine.

It is known that by 1850 the focus of Walker's founding activities had moved to the Victoria Foundry a short distance to the east and his original foundry was sold. In its latter years, perhaps largely disused, it is possible that the site was used primarily for dumping waste materials. Deposits of casting sand filling Pit 5116 and located in several parts of the site may have been brought from the Victoria Foundry for disposal. Similarly the dumps of industrial pottery vessels in Area S and of iron artefacts in the small room in Area U also appear to represent disposal of unwanted materials.

#### *Post-foundry*

The subsequent history of the site remains to be researched in full, but archaeological evidence

for it is sparse, apart from numerous drains and the concrete piles of a building erected in the 1960s.

#### *Artefacts and industrial debris*

All parts of the site produced numerous artefacts which relate to the products and processes of the foundry and to a lesser extent to the daily lives of its workers. This is a large collection of material which relates to a nationally important iron founder whose products were exported widely. There is sufficient material recovered to illustrate many of the products which are documented by the sparse surviving examples.

Amongst the most unusual artefacts are several ceramic crucibles used for handling molten iron and steel, and also for brass casting which was clearly taking place alongside ferrous metalwork.

Tools found include large pincers for picking up crucibles, punches for shaping and piercing metal, and files for finishing. An unusual find was a massive weight which came from the bottom of the furnace pit.

A large dump of very distinctive ceramic vessels has aroused a great deal of interest. The vessels are either baluster-shaped jars or wide shallow bowls and they bear an unusual lead-based deposit. It is currently thought the vessels were used for preparing a varnish for treating railings and other items.

Large quantities of slag, casting sand and other debris will, when analysed, provide information on details of the founding process which is, surprisingly, not well understood at this crucial period in Britain's industrial history.

Products of the foundry, which may have been discarded as substandard and unsuitable for sale, include parts of kitchen ranges, several iron cauldrons and a railing with a fleur de lys terminal.

Finally, aspects of the daily lives of the workers on the site are revealed by glass ginger beer bottles and clay pipes.

## **15. SUMMARY OF RECOMMENDATIONS FOR FURTHER WORK**

### **15.1 Stratigraphic and Structural Data**

The site narrative above is based on careful checking of the records and development of site matrix. Although a simple phasing of the various areas of the site has been achieved, further work is now needed to correlate the different areas more closely. The structures themselves, the materials used and methods employed in construction would also benefit from more

detailed analysis setting them in the context of industrial and other buildings of the early 19<sup>th</sup> century in York.

## **15.2 Pottery**

Little further work is necessary for the domestic assemblage but further work is necessary on the industrial wares in order to analyse and ascertain their precise use. This should be extended to the stoneware bottles and jars which may have been used in conjunction with them.

Further research into the crucibles is required, in particular in association with research in steel making processes.

## **15.3 Ironwork**

Further work on description, illustration and discussion of the main forms recovered and integration with site structures is proposed.

Analysis of deposits by XRF etc will be required on the iron crucibles and ladles.

## **15.4 Slag and fuel**

Some analysis of the form and composition of the slag may help elucidate the processes involved at the foundry. Analysis of the casting sand possible to determine whether there is an organic component and provenance of greensand.

## **15.4 Non-ferrous metal**

A small amount of work is required to integrate the domestic and personal items with the rest of the domestic elements of the assemblage. Similarly work is required in describing items which relate to the processes of the foundry.

## **15.5 Tobacco Pipes**

Further work will help to attribute marks to a specific maker.

## **15.6 Animal bone**

The material from Dixon's yard will provide a useful body of zooarchaeological material, dating from a period and type of site where there are few well preserved assemblages. Further work is warranted on this assemblage and it should be fully recorded.

## 15.7 Publication

Once the structures, finds and residues have been analysed as recommended, the data should be brought together to present a synthetic account for publication of the development of the foundry and of the metal working processes which took place within it. This account should seek to set the site in the wider contexts of York's industrial history in the early 19<sup>th</sup> century and of metal working in Britain as a whole. There can be no doubt that an important contribution will be made thereby to knowledge in both fields.

It is currently proposed that the vehicle for publication will be the York Archaeological Trust web site ([www.yorkarchaeology.co.uk](http://www.yorkarchaeology.co.uk))

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