Hartlington Kiln 2010
Excavation of an oven structure at Hartlington, Burnsall, North Yorkshire

Project code HK10

Compiled by David Johnson

2011

Contents

	Page
1. Summary	3
2. Introduction	3
3. Previous archaeological work	5
4. Aims and objectives	8
5. Methodology	9
6. Excavation results	10
7. Finds report	14
8. Discussion	17
9. Interpretation and conclusions	20

10. Recommendations 24
11. Acknowledgements 25
12. References 26
13. Appendices 27
    1. List of contexts 28
    2. List of small finds 31
    3. List of archived drawings 34
    4. Photographic index (archived) 35
    5. Harris matrix 39
    6. Radiocarbon dating certificates 40
14. Figures 42

1. Summary

Excavation of a partly buried stone-built structure on the village green at Hartlington, in Upper Wharfedale in the Yorkshire Dales, was commissioned by the Yorkshire Dales National Park Authority in consultation with the local Parish Meeting. The aims were to determine its state of preservation, given that it was investigated in the late 1890s by an antiquarian, and to identify whether it had been a corn-drying kiln, as listed on the Historic Environment Record, with possible parallels with a proven two-phase kiln excavated at Kilnsey in Upper Wharfedale in 2009.

The structure was proven to have been a rectangular structure, though not fully stone-built, with a circular oven base at one end and an underfloor flue extending beneath and beyond the oven. The nature of the structure tends to rule out its use as a corn-drying kiln. Though no conclusive archaeological evidence was found to prove the hypothesis, it is most likely that it was a communal bread oven with the heat being recycled for other purposes. Radiocarbon dates from two charcoal samples in secure stratigraphical contexts place its use in the Late Medieval or early Post-Medieval period.

2. Introduction

1. *Project background*

The project was commissioned and funded by the Yorkshire Dales National Park Authority (YDNPA), through its Senior Historic Environment Officer, after consultation with representatives of Hartlington Parish Meeting.

The Authority felt that the level of detailed and reliable recording of archaeological features within the Burnsall area was lacking when compared to other parts of the National Park. It was specifically felt that the feature in question, though recognised for many decades, was largely an unknown quantity in terms of its form and original function.

Dr David Johnson was commissioned to undertake an archaeological investigation of the structure and he designed a project brief for submission to the YDNPA and Parish Meeting. The groundwork was undertaken, under his direction, by volunteer members of the Upper Wharfedale Heritage Group and Ingleborough Archaeology Group.

Preliminary work was carried out on 26 July and excavation from 2 to 8 August 2010. At the request of the local community, the feature was left exposed on completion for the

remaining summer weeks and finally backfilled on 14 October, though with the oven base and some masonry deliberately left exposed for the long term.

2. *The site*

The structure investigated lies on Hartlington village green, adjacent to the Burnsall to Appletreewick road, at SE03921 61012, at the junction with the access drive to Hartlington Hall. Prior to investigation the structure showed on the ground as a vague structural feature with masonry just breaking the turf line on all sides. It was roughly squared in plan, measuring 2.90m on the north-south axis, and tapering from 2.60m on the east-west axis at the north end to 1.60m at the south end. These measurements were taken without disturbing the turf layer. The surrounding ground was grassed over but very damp between the structure and the road, even in dry conditions, possibly owing to a failed drain. The structure as seen was bounded by masonry wall footings, dominantly single-skinned as far as could be determined without removing the turf.

3. *Hartlington: historical background*

Hartlington is now a distinct civil parish in its own right but was formerly a constituent township within the ancient parish of Burnsall. It lies 800m east-south-east of Burnsall village centre at a height of 154m OD. On the south side of the lane is a rounded hillock known as Chapel Hill and marked thus on the 1853 Ordnance Survey 1:10,560 map (surveyed in 1848-50) and on the 1891 and 1909 1:2500 editions. This is reputedly the site of Hartlington's medieval manor house of the de Hertlington family. Certainly, in the field below the hillock, west of the River Dibb and south of Spout House (a former inn), and called Hall Garth on early Ordnance Survey mapping (Fig. 1), are the earthwork remains of a large linear medieval fishpond. However, when the modern agricultural buildings associated with Wharfe House Farm were erected no evidence of manorial buildings was located, according to the occupants.

Upstream of Grade II listed Hartlington Bridge (SE04011 60929), on the Dibb, lies Hartlington Mill, also Grade II listed. Now in residential usage, this was originally a corn mill, converted to cotton spinning in the mid to late eighteenth century, utilised for worsted from 1835, and more recently serving as a saw mill. Its 5.5m-diameter undershot waterwheel has survived intact.

Until 1894, when Hartlington Hall was built, the present Green was shown on Ordnance Survey mapping as an open space at the south-western end of a low limestone outcrop called Barrel Brow, with a squared 'pound' at the north-east corner (Fig. 2). It appears thus on the 1853 1:10,560, 1891 1:2500 and 1894 1:10,560 editions. The hall was not depicted on the 1894 edition as the map was surveyed prior to the year of construction. The 1909 1:2500 edition does mark the hall as well as 'LB' for the letterbox that still exists in the wall close to the excavated feature, and the adjacent water trough, but not the pound which had been removed when the driveway to the hall was put in.

The trough has an engraved inscription on its front face, namely *De torrente in via bibet: propterea exaltabit caput*. This is Psalm 110, verse 7. In the Authorised King James Version of the Bible this translates as *He shall drink of the brook in the way: therefore shall he lift up the head* or in modern translation *He will drink from the stream by the road, and strengthened, will stand victorious*.

The field immediately north of the Green is known as Mirefield and it contains a sequence of cultivation terraces probably associated with the manor house.

Present day Hartlington consists of a scattered collection of individual houses and farmsteads with the greatest cluster at the junction of the Burnsall-Appletreewick road and the minor road northwards up Hartlington Raikes.

3. Previous archaeological work

1. The structure in question had been investigated over a century ago by William Cudworth, a Bradford-based journalist and local historian of some repute who was a founder member of the Bradford Historical and Antiquarian Society (BHAS) in 1878 (D J Croft, pers. comm.), and its editor until 1893 (Sheeran 2005, 5). Nothing relevant has been found within the BHAS archive and, though there is a small collection of Cudworth's incoming correspondence and a field notebook in the West Yorkshire Archive Service, Bradford (WYAS [B] DB65/C2/8)), no entries relevant to Hartlington have been located. The only real mention of Upper Wharfedale in the correspondence is a letter to Cudworth from Edward Jones of Prestwich, north of Manchester, dated 25 July 1895, advising him that the Grassington-Linton area was 'not so rich in archaeological material' (WYAS [B] DB5/C27/A/5). According to a short article he wrote on the Hartlington site, dated August 1897, he had carried out his investigations 'a few months ago' which presumably means earlier that year (Cudworth 1898). Most of the material at WYAS relates to his keen interest in Roman lamps and in prehistoric sites in this country and abroad. In addition, he was instrumental in the establishment of Ilkley's Roman museum and greatly aided the formation of the museum in Grassington (Federer 1912, 5), and was regarded highly as a historian.

2. Cudworth described how the structure had been revealed when workmen were levelling 'a piece of ground' near the entrance to the newly built Hartlington Hall, an area that is now the Green. He says they unearthed a 'mass of rude masonry' of which even the oldest local inhabitant had no knowledge. The piece of ground had been no-man's-land used, as long as anyone could recall, by the community as a communal midden. Cudworth asserted that the accumulated rubbish reached a thickness of 'eight or nine feet' (2.25m – 2.54m). The present day lie of the land makes it extremely unlikely that such a depth could have covered what is now the Green as the surrounding field walls are less than that height and the walls that exist now are shown on early Ordnance Survey mapping. Furthermore, it is inconceivable that such accumulations would not have spilled down on to the road. Could this suggest perhaps that the present line of the road has changed and that the pre-1987 line was at a higher level than now? The detail shown on the 1853 edition is too small to be definitive in this regard though the southern edge of the road, west of Spout House, does appear to run along its present line. The two editions from the early to mid 1890s, however, clearly depict the present narrow tree belt between Spout House and Chapel Hill with walls following their current line: this was before the workmen began the clearance.

3. Added to this is evidence on a grainy photograph in Cudworth's article (Fig. 3) which shows the relationship between the structure and the field wall below Mirefield: had his 'eight or nine feet' of midden deposits existed, then a truly prodigious volume of material must have been cleared away in its entirety. The conclusion has to be either that the workmen had exaggerated the degree of accumulation and had misled Cudworth, or he himself had overstated the matter.

4. Cudworth described a stone structure ‘about 15 ft. in length by about 9 ft. in width’, on slightly falling ground, trending north-south, with walls on three sides leaving ‘an aperture resembling the mouth of a flue or furnace quite open on the fourth side’ facing south. The walls that he found were only just above foundation level generally with only one course visible above ground. Above the flue aperture was a round feature ‘with stone calcined throughout’ with the underlying flue choked with sooty material and wood ashes. He described the round feature above the ‘fire-place or stoke-hole’ as a ‘circular floor, in segments, composed of slabs of millstone grit, originally about ten or twelve inches in thickness’ but reduced to ‘six or eight’ inches by intense heat. In the centre of the circular floor was a circular hole ‘about five inches’ in diameter. The bulk of the rectangular structure was ‘flagged with slabs of stone of unequal shapes’ with a flue passing underneath them ‘direct from the firing place, and branching off to right and left’. These, too, were choked with soot and wood ash.

5. The 2010 investigation found various discrepancies between what Cudworth described and what was found on site, as will be discussed in later sections of this report.

6. Cudworth was quite unable to make any conclusions about the structure’s original function other than to state categorically that it had been a kiln of some sort: of that, he wrote, ‘there cannot be a shadow of a doubt’. His use of the term ‘calcined’ suggests the burning or firing of solid materials, such as mineral ores or limestone, to reduce them by thermal decomposition. He was clearly mistaken in his use of that term as it emphatically was not a lime kiln or an ore-bearing furnace, as he indeed said. In his article he went on to suggest the possibility that it had been a Roman pottery kiln but there is no mention at all of any material finds within the flue or overall structure to support that view. In fact, he ended by admitting he did not know what it had been.

7. Edmund Bogg (1904, 217) was sufficiently aware of the feature to mention it in his description of Upper Wharfedale but not as a pottery kiln, perhaps suggesting that the local consensus had decided otherwise since Cudworth’s involvement there. He wrote ‘By the roadside at Hartlington, an ancient kiln for drying corn was lately discovered’. This conclusion may simply have been repeating that of Speight (1900, 381) who had described it as ‘an ancient kiln for parching corn’.

8. This view persisted into the twenty-first century. An article on corn drying kilns in Airedale and Wharfedale referred to Cudworth’s piece but conflated the structure in question with another nearby circular feature, on Barrel Brow, that had been confirmed as a corn drying kiln by previous excavation and was surveyed without excavation by Mason and Pacey (2000, 84-85). The grid reference SE039 610 was given by Mason and Pacey for the site they had surveyed and these co-ordinates do correspond with the co-ordinates for the site excavated in 2010 (SE0392 6101), but Arnold Pacey’s sketch of the structure refers to the proven corn drying kiln on Barrel Brow, which is located at SE0399 6101 (Fig. 4). The author(s) had erroneously assumed that the kiln they surveyed was the same as Cudworth’s kiln. Anecdotal evidence suggests that Pacey had been unable to correlate the roundness of the site he found on the ground on Barrel Brow with the rectilinear form of Cudworth’s description (pers. comm. Alison Armstrong, August 2010). Apart from the marked contrast in plan form of the two structures, internal dimensions do not match up either: Cudworth’s structure measured 2.90m on its long axis by 2.60m on the shorter, prior to de-turfing, whereas Mason and Pacey’s fieldwork

gave the Barrel Brow kiln an internal surface diameter of 4.80m. On the other hand, their drawing shows the flue and firing hole of the Barrel Brow kiln orientated to the south and they wrote that the 'position of the firing hole and flue illustrated by Cudworth can also be approximately located'. The flue, as excavated in 2010, does indeed run on a south-north alignment, so in this respect they were correct in their own minds. This similarity could be due to mere coincidence or could reflect similar topographic conditions, or could perhaps suggest that the same alignment was chosen for the two structures to take advantage of optimal airflow dynamics.

9. The proven corn drying kiln on Barrel Brow had been excavated about thirty years ago but no excavation report seems to exist, at least in the public domain, and it was, perhaps understandably, assumed that the structure on the Green may have been one and the same as from that excavation. Thus, the YDNP Historic Environment Record (HER) referred to the structure in question as the remains of a medieval corn parching kiln with undressed foundation stones of a probable rectangular building, 3.7m in length and 2.7m in width, in a fragmentary condition and completely overgrown, 'precluding any attempt to confirm their purpose or date'. However, this entry originated entirely from the Ordnance Survey Archaeology Division Record Card for the site which states:

> SE0393 6100 The remains of a Md. corn parching kiln, excavated in 1896, are visible in the triangle of ground before Hartlington Hall gates. (1-2) Surveyed at 1:2500. The undressed foundation stones of a probable rectangular building, 3.7m. in length & 2.7m. in width. The remains are in a fragmentary condition and completely overgrown, precluding any attempt to confirm their purpose or date. (3) Condition unchanged.

Dr Arthur Raistrick is listed as a reference correspondent for the Division Record Card but an examination of the Raistrick Archive has not produced any evidence that he had any direct involvement in the site.

4. Aims and objectives

The precise aims and objectives were discussed and agreed by the YDNPA's Senior Historic Environment Officer and this writer:

1. the prime purpose of the current excavation was to reopen the structure to see if it was still possible to determine its function, depending whether the structure had been backfilled in 1897 according to modern archaeological practice or partially destroyed.
2. it was also hoped that it would be possible to determine the structure's detailed form in plan and section, and to equate what was found with Cudworth's excavation account and with the plan drawn up by Mason and Pacey (2000, 85).
3. depending on the outcomes from the above aims, and assuming it did indeed prove to be a corn drying kiln, comparison was to be made with the two-phase corn drying kiln excavated at Kilnsey in 2008 (Johnson *et al.* 2009). It was not thought likely that any dating evidence would have survived within the structure but its plan form might enable relative – rather than absolute – dating to be ascertained.
4. It was believed that the structure may have been deliberately left in an exposed state for public viewing after the 1890s excavation, though over the years it would have become completely obscured by vegetation and soil movement. It was not known if it had benefitted from any subsequent consolidation work. Thus, this project was also designed to inform a management strategy for the site and, in particular, to determine whether the remains were sufficiently robust to be left re-exposed for the long-term.

5. Methodology

1. Recording

Recording within the trench was carried using standard archaeological methods, using context record, photographic record and object proforma sheets (Appendix 4). A comprehensive photographic record of digital images was compiled throughout, by Jane Lunnon and Alan Williams with additional photography by the site supervisor. The trench was planned on completion of the excavation phase by the site supervisor and Ruth Spencer; and trench coordinates were logged using a Leica Builder 509 total station under the supervision of Ruth Spencer. All finds were logged, washed and bagged (except wood and metal) on site, by Pauline Dodsworth, according to industry best practice, with further examination undertaken by the site supervisor in the post-excavation phase. A sample of logged charcoal was examined and identified by Denise Druce of Oxford Archaeology North.

2. Excavation

1. A trench was laid out to encompass the entire structure and the area immediately outside each of its four sides, measuring 5m north-south and 3.60m east-west, with an extension at the north-west corner 500mm long by 1.80m wide.
2. All work was undertaken by hand and given the damp nature of part of the site, and a desire not to damage the Green, buckets were used for moving material rather than wheelbarrows.
3. Again owing to the sensitive nature of the Green a spoil heap was not used for the bulk of material removed from the feature, though a small amount of soil was stacked on Visqueen sheeting on rough ground against the wall on the east side of the Green. All other spoil was deposited in the bucket of a mechanical loader, courtesy of Messrs Daggett. The bucket was left unattached until full, and then taken away for the spoil to be stored until needed for backfilling. In total two bucket loads were filled.
4. Prior to the actual excavation phase long grass and weeds were cut using hand shears, by Peter Gallagher and the site supervisor. At the start of the excavation phase turf (and coarse weed growth) was removed from the structure and its immediate outer surroundings using spades with only a thin layer being taken off in this way. All other work was undertaken manually using archaeological trowels and hand shovels.
5. Stonework removed from the interior of the structure and from the oven base, to enable investigation within the flue, was carefully stacked to one side so it could be returned to its original place on completion of the excavation.
6. On completion of the 1897 investigation some interior stone paving had been put back in a careless manner, or the stones had become dislodged in the intervening period before it was obscured by vegetation; during the current excavation it was replaced more carefully in the state it would have been when the structure was in use.
7. Weather conditions were fine and dry for almost all the excavation period, with slight drizzle on one day only.

3. Archive

A site archive and a day book were maintained by the site supervisor and these have been added to the main project archive deposited with the YDNPA, the commissioning organisation. Small finds were also deposited with the YDNPA.

6. Excavation results

Plan reference nos. 001-004
See Figure 5 and Appendix 3

1. The structure is located on Hartlington village green, at NGR SE 03921 61012, adjacent to the Burnsall to Appletreewick road. Prior to excavation it showed as a vague footprint with squared sandstone blocks forming two clear lines, in an L-shape, with other masonry blocks breaking the vegetation layer but not displaying any obvious structural form. Examination prior to the excavation phase showed a vaguely rectangular feature with a visible single but incomplete course of masonry forming a squared feature internally 2.90m in length by 2.60m in width, aligned more or less north-east to south-west on the long axis. Cudworth had measured it at fifteen feet (4.62m) by nine feet (2.78m). In section, it appeared as a deliberately levelled step on ground gently sloping down, southwards, to the road. It was mainly overgrown with coarse long grass and rank flowering species, with a spring rising immediately below the structure.
2. When the vegetation had been cut and clipped short more of the structure's form was identifiable as a definite rectangular structure with clear single-skin wall foundations and, at the south-east corner, a circular stone-built feature composed of wedge-shaped sections of Millstone Grit blocks.
3. The original brief from the YDNPA was to investigate just part of the structure, the exact part as advised by the site supervisor, to determine if it was still broadly intact, given Cudworth's excavation in 1897. The key aim, other than determining that, was to see if any of the structure's original form could be discerned. It very quickly became obvious that it was broadly intact and that time and staff availability made full investigation feasible.
4. A trench was laid out 5m by 3.60m to take in all the structure within the wall lines already identified, as well as a strip of about 500mm beyond each of the four sides. Turf and other growth, as well as topsoil (Context 101) (see Appendix 1 for Context descriptions), were removed from the entire trench revealing a stone-built feature in a state of generally sound preservation. It was soon apparent that, whatever Cudworth had done in his investigation, he had not significantly impinged on its structural integrity as what was seen on the ground corresponded very closely to what could be discerned in the photograph in his article of 1898.
5. What was seen on the ground was a rectangular structure with a circular stone feature in the south-east corner (104) divided into eight wedge-shaped segments laid flat, very much like a traditional French millstone (Fig. 6). The segments on the northern part of the feature were missing – there was no means of knowing if they had been lost before Cudworth set to work or had been misplaced during his reinstatement of the structure. The fact that there was slippage of segments round the southern part of the circle might suggest the latter. The circular feature has a diameter of 1.20m. Two holes, or voids, could be seen within the circular feature. Initially it was not possible to determine if these gave access to the flue channel mentioned by Cudworth or simply represented missing stones.
6. The structure was bounded on two sides (west and north) by a single-skin, single course of wall foundation stones (106) with only one such stone having remained *in situ* on the eastern side and none on the southern. The height of these foundation stones varied from 60mm to 240mm. Internally, the structure measured 3.80m on the north-

south axis by 2.60m on the east-west axis. The trench was extended outwards at the north-west corner by 500mm to see if a rear skin or rubble infill or foundation stones could be found but there had been no such skin and no signs of a filled in robber trench. The nature of the surviving inward facing stones, with their partly rounded top surface and narrow width, rules out their having supported a full height wall. This point will be returned to in Section 8.

7. Most of the interior of the structure was formed of paving stones but the nature of these was not the same: there was variation of stone type and size (Fig. 7). The central part (103) consisted of large stone slabs which had clearly been disturbed and then relaid, presumably by Cudworth. Within (103) was a very large and roughly squared stone, measuring 800mm by 470mm, among smaller slabs. Around (103) the entire area had been paved with thinner and smaller flagstone slabs (102) and this was interpreted as a walking floor surrounding (103) which was interpreted as the base for whatever had been carried on within the structure. These thinner flags were undisturbed and clearly *in situ* along the western and north-eastern sides of the structure but very much disturbed along the northern side of (102). It was assumed that these had been taken up by Cudworth and not replaced in their original position as they lay at oblique angles with some flags missing. On the eastern side, sandwiched between (102) and (103) were three large flagstone slabs laid in line on a north-south alignment (105). In the south-western corner of the interior, between (102), (103) and (104), the flagstone flooring had been removed and not replaced (by Cudworth, perhaps) revealing a lens of very small stones and gravel (108), mixed in a lime mortar matrix. This was interpreted as the foundation surface on which the flagstones had originally been laid. This lens measured 850mm by 530mm.

8. Various small finds (sfn 101-127) were logged from within these Contexts, consisting of pot sherds, glass fragments, a piece of tile drain, a corroded nail, numerous fragments of brick and miscellaneous fragments of coal and charcoal. As all were found either within the topsoil (101) or at its base these are considered to be residual finds which have either accumulated after Cudworth's excavation or were within material used by him to backfill the site.

9. As topsoil (101) was trowelled off the area between the wall lines (106) and the edge of the trench, and down the eastern strip between where that wall line had been and the trench edge, a surface (107) consisting of very small rounded limestone cobbles and pebbles with gravel interspersed was revealed. Whether this represents a natural surface of levelled glacial deposits or a surface created by the builders of the structure could not be determined: this would require extensive excavation beyond the trench to see how far this surface extended. Two short lengths of softwood (sfn 128) were logged from (107).

10. Cudworth had written of a flue system within the structure and it was clearly important to see if this had survived his excavation. He wrote of a 'main flue' 'passing underneath' the flagged area 'direct from the firing area, and branching off to right and left'. He had also written of a circular hole in the centre of the oven base.

11. Soil backfill was removed, initially underneath the oven base by clearing out the hole and by following under the oven slabs from the external opening to what looked like a possible flue. It soon became clear that the flue channel did run right under the oven base, with the central hole being an integral part of the flue system. Cudworth had

measured the hole's diameter as five inches (125mm) whereas it is actually 130mm. The flue channel under the oven base was given Context number (110) and its infill (111). The channel is aligned on an axis of 170-350^0. Its internal width is 220mm, internal height 250mm and total length from the external entry point to the inner edge of the oven base 1.21m. It was lined with angular sandstone. It was completely filled with loose silty material (111) interpreted mainly as backfill from the 1897 excavation. However it also contained a range of material that had survived Cudworth's attention the most notable of which were several pieces of charcoal, a piece of coal and four pieces of congealed lime mortar. It was concluded during the current excavation that the charcoal in particular was most likely to have been associated with the oven's use as the pieces were at the base of the flue channel. One fragment of charcoal was recovered at a depth of 260mm directly below the central hole.

12. Several of the loose and displaced oven base stones were lifted, partly so that they could be replaced in their original position, but also so that the team could investigate how the base had been bedded. Beneath the removed slabs, and extending under those not lifted, was a layer of friable sandy silt (112). Whether or not that had been laid down as a base for the oven or had worked its way in over the centuries could not be determined with any certainty.

13. To test Cudworth's assertion that the flue channel ran underneath the flagged area, the two very large stone slabs on the western side of the structure were carefully lifted and the flue channel (113) below was also cleaned out. The channel changes orientation at the northern edge of the oven base running exactly south-north to the northern end of the flagged floor, and it extends 2.45m from the northern edge of the oven base, and is 310mm wide by 240mm deep. The channel here is also stone-lined and was completely full of silty material (109). Much of the material was from Cudworth's backfilling, containing thirteen pot sherds, five glass fragments and two pieces of animal bone, but eleven pieces of coal and thirteen of charcoal were removed from within recesses of the channel that he had not touched. These were perceived as clearly being of great potential significance for dating the structure, especially sfn 132, found at 260mm depth, 152 at 340mm, 156 at 250mm, and 174 at 300mm.

14. It was not possible to determine the form of the northern end of the flue channel (113). It could not be determined if the channel abutted against the north wall line (106) or ended short of it. This is because Cudworth had not ensured that the flagstones he had presumably removed were put back as found. In the current excavation, they were found set at acute angles in a seemingly random fashion as though they had more or less been thrown in. However two stones, immediately south of the north wall line, were earthfast and set at the same angle suggesting that they had remained *in situ* and had served during the structure's use to deflect hot air upwards to heat up the slabs forming the flue's roof or through a vent into the main body of the structure.

15. Several of the disturbed slabs, on the eastern side of the flue channel (113), were lifted in a search of the right branching flue that Cudworth had mentioned. Beneath the large slabs within (103) was a layer of silty soil (114) that clearly resulted from the 1987 backfill, intermixed with small flagstone pieces. In turn this was haphazardly set on a deposit of angular sandstone pieces (115) that were interpreted as a foundation layer for the internal paving of the structure. It was concluded that Cudworth had been less than rigorous in reinstating this part of the structure. What was apparent, though, was

that there was no sign whatsoever of any right branching flue. It is surely inconceivable that he would have said there was one if there was not so one has to conclude that he had – for whatever reason – destroyed it during his investigation. On completion of this part of the excavation, the current team carefully reset all the flagstones horizontally.

16. The current team did find that the undisturbed inner (western) edge of the three large gritstone slabs (105) making up the eastern section of the internal floor area was sporadically faced with lime mortar. This invites two conclusions: firstly, that the pieces of lime mortar recovered from Cudworth's backfill during the current excavation were directly connected with the structure's construction; and secondly that the adjacent paving stones had been set in mortar against the slabs of (105). This reinforces the evidence from the lens (108) on the western side which also contained traces of lime mortar.

7. Finds report

1. A total of 103 small finds were recovered and logged (Table 1) in addition to quantities of coal, charcoal and stone. Fragments of glass and common brick and pot sherds dominated the assemblage. A full list of small finds is provided in Appendix 2.

Table 1 Summary of small finds

Type	Number	% of total
brick	30	29.13
tile	1	
pottery	22	21.36
metal	3	
wood	4	
bone	4	
H-AVM*/ slag	1	
glass	38	36.89

H-AVM – heat-affected vesicular material

2. Pottery and glass

Given that the structure had been excavated in 1897 – and assuming it had been undertaken with care – it was not expected that any finds would have been recovered from the 2010 investigation. Given that, according to Cudworth, the site had been covered with a considerable depth of accumulated midden deposits , it was assumed that any deposits that might be found would be residual, the product of centuries of discard rather than directly connected with the original use of the structure being excavated. The majority of finds logged were very small in size and probably represent material earlier discarded and then re-deposited within the structure after Cudworth had completed his work. In other words, it is assumed to be part of Cudworth's backfill. Of the total of thirty-eight glass fragments no less than twenty-six were recovered from the topsoil layer (101) and eleven from backfill within the flue channel (109); for pot sherds the corresponding figures are twelve and eleven.

The small size and degraded nature of much of the pottery and brick made the task of identifying types and fabrics very difficult. The coarseness and high proportion of

inclusions in the brick suggest that it pre-dates the middle of the nineteenth century, but it has not been possible to date the brick fragments.
Most of the pot sherds and glass are from nineteenth-, or possibly late eighteenth-, century vessels, either bottles (glass) or domestic kitchen and table ware (pottery). The nature of the assemblage is considered typical of late-period midden deposits.

3. Metal

Three pieces of metal were logged, two from within the topsoil (101) and one from Cudworth's backfill in the flue channel (111) underneath the oven base. All are therefore considered to be residual. However, the degree of corrosion and concretion on all three items suggests that all had lain in the ground for a considerable period: were they thus artefacts that had been discarded on the midden long before Cudworth's time? The descriptions given in Appendix 2 are tentative as the amount of corrosion and concretion rules out precise identification of what lies hidden within the concretion without recourse to X-radiography. Sfn 109 is probably a small nail, 145 may be part of a horseshoe, but 124 could not be identified.

4. Coal

Ten small finds numbers were allocated to samples of coal of varying size. One sample was logged from the topsoil layer (101) which was considered residual and out of context, but all other samples came from within the fill of the flue channel, mainly from its northern section. It was clear from the excavation that Cudworth had not fully emptied the flue channel – indeed may not have cleared some parts of it at all – so these samples are deemed to have been found *in situ*. There were probably remnants of fuel used within the oven.

5. Charcoal

Of more value to understanding the structure's history were the relatively large quantities of charcoal recovered from within the structure. In total twenty-two discrete samples were logged, some very small but others of substantial volume. One sample was logged from the topsoil (101), and disregarded. All other samples came from within the structure: one from under the oven base slabs (112), three from within the southern section of the flue channel under the oven base (111), and three from the deposition layer (114) between the east gritstone flooring slabs (1030 and the foundation layer (115). The greatest number and volume were logged from within the north section of the flue channel (109). As these were all located deep within the flue channel, and most from sections Cudworth had clearly not touched, they were considered to be *in situ* and thus of value in interpreting the structure.
A representative proportion of charcoal samples were examined by Denise Druce of Oxford Archaeology North to determine species composition. Of the seven samples examined three are of hawthorn-type (*Maloideae-Crataegus*) species (sfn 132, 174 and 188). Hawthorn or quickthorn was especially suitable for use in kilns and ovens as it gives a good strong burn at high temperatures. One sample was of a blackthorn-type (*Prunus*) species (156), a group which includes blackthorn itself (*Prunus spinosa*), wild cherry (*Prunus avium*), bird cherry (*Prunus padus*) and plum. Again, hardwoods such as *Prunus* give a strong flame. Two were of ash (*Fraxinus excelsior*) (152 and 180) with the latter having been identified as roundwood, that is wood in its natural felled state. Sfn

158 was identified as hazel (*Corylus avellana*) roundwood. Both were considered good sources of wood for kindling or firing fuel in kilns and ovens.
Four of the samples examined were considered to have potential for radiocarbon dating of the structure as they were recovered *in situ* and at depth within the flue channel (Table 2).

Table 2 Depth of charcoal samples

Sfn	Context	Species	Depth
132	111	*Maloideae*	260mm
152	111	*Fraxinus*	340mm
156	112	*Prunus*	250mm
174	109	*Crataegus*	300mm

It was clear during excavation of these samples that they had not been disturbed by Cudworth's work and thus had integrity in terms of obtaining reliable radiocarbon dates. Funding for dating two samples was provided by the YDNPA: sfn 132 and 174 were sent to the Scottish Universities Environmental Research Centre (SUERC) in East Kilbride (see Section 8).

8. Discussion

1. The current excavation highlighted a number of ***discrepancies*** in Cudworth's account written in 1897. His measurements do not tally with reality and there was no evidence at all to support his description of branching flues within the structure. Part of the eastern section had been severely disturbed by his excavation but the three large slabs (105) showed no signs at all of their having been disturbed and an eastern flue branch would presumably have extended under them if it were to distribute heat across the entire internal area. It has proved impossible to reconcile this discrepancy.
2. In terms of ***morphology*** the structure – the generalised and neutral term used so far in this report – was a rectangular feature which can be referred to as a building, with an internal length of 2.90m and internal width of 2.60m sitting on a levelled platform on a gently falling slope. This now appears to be a natural slope but, if Cudworth's claim (or repetition of what he had been told) that nearly 3m of midden deposits had covered the site is acceptable, the angle of slope may be the result of rubbish clearance and landscaping. This, too, cannot be determined with full confidence but it is this writer's feeling that Cudworth's comment cannot be taken at face value and that a degree of landscaping was undertaken when the new access road to Hartlington Hall was laid out in the 1890s.
3. The building was contained, on three sides at least, by ***walls*** set on stone foundations. However, the nature of the surviving foundation layer precludes there having been full- height stone walls as such rounded stones set in a single-skin wall can never be load-bearing. A single-skin wall could not have supported more than a few further courses and the absence of an outer skin or a robber trench or signs of internal

rubble infill support this contention. It has to be assumed that the building had walls of less permanent construction, possibly timber or maybe turf, though the complete absence of post-holes does not aid the former interpretation. However, centuries of weathering and soil processes, plus the 1897 excavation, could have removed such evidence more easily than removing signs of a robber trench. Pre-existing disturbance on the south-western side of the building precludes any firm statements being made about a fourth wall. It must also be concluded that the building had an impermanent roof, probably of thatch.

4. Within the building there are definite changes in ***form*** (see Figure 6). The south-eastern corner is dominated by the substantial gritstone base (104) of a perfectly circular 1.20m-diameter oven with stone segments averaging 130mm in thickness. The base is composed of segments of wedge-shaped gritstone of which nine have survived. Widths of these segments at their outer edge extend up to 560mm and up to 140mm at their inner edge. Long axis lengths of the three longest segments are 470mm, 540mm and 590mm respectively. This feature can only be described as massive and definitely designed to withstand very high temperatures. There was no discernible evidence of how the outer perimeter of the base related to the south side of the building. The height drop from the top of the oven base to the present ground surface is 600mm and the flue entrance (110) under the base is on the assumed line of the southern wall of the building. It may be that the flue entrance was set into, and accessed through, the south wall of the building.

5. All the oven base segments were burnt red, the result of having been subjected to extremely ***high temperatures***. Furthermore, the nine surviving segments were the result of larger slabs having been fractured right through their 130mm thickness by extreme heat: on several of the segments one jagged edge knitted perfectly with the edge of the adjacent segment (Fig. 8). Thus, three of the surviving segments in the south-eastern quadrant were originally one large piece as were three of those in the south-western quadrant.

6. The outer area within the building – on the west, north and south – was finished off with a floor made up of carefully laid flagstones (102), much of which has survived *in situ*. This is interpreted as a ***walking surface*** giving access to whatever was positioned in the central part of the building.

7. That ***central area***, (103) and (105), was composed of slabs of gritstone, some of which are very large in all dimensions. The main flue (113) ran underneath the western part of (103) and Cudworth's elusive eastern flue would have run beneath the eastern part of (103) and under (105). The presence of lime mortar suggests that great attention was paid to ensuring that the internal features were strong and durable.

8. The very size and nature of the gritstone slabs, and their superimposition above the flue channel(s), suggest that ***heat*** was being distributed from the oven, along the flue(s) and through its central hole, to the bulk of the building.

9. The two angled slabs at the very north end of the western flue channel, referred to earlier (see para 6.14), suggest that hot air from the flue was thrown up into the northern part of the building. Between these two angled slabs the *in situ* stone that is part of the building's north wall was quite deeply fire-reddened, which can be taken as evidence that the air being thrown out of the flue reached very high temperatures indeed (Fig. 9).

10. Ten small finds numbers (sfn) were allocated to discrete samples of ***coal*** and a further twenty-one to samples of ***charcoal***, all but four of them recovered from deep within flue channel fill (109) and (111). Whether or not the coal and charcoal were utilised as fuel within the oven contemporaneously is impossible to determine. Samples of charcoal that were examined in the laboratory proved to be hawthorn- or blackthorn-type or ash and hazel roundwood. The first two are known to give a long and steady burn while the latter two burn with a fierce flame building up heat quickly. Samples of coal that were large and intact enough to permit identification were bituminous, the only type of coal occurring in Wharfedale (pers. comm. Mike Gill, February 2011). Given this, the coal may have been sourced from the local Thorpe and Burnsall Fell Coalfield, assuming it was in production during the structure's lifetime. This can be difficult to fire up but has the advantages of burning with a short even flame and being relatively smokeless thereby leaving minimal soot residue.

11. Two charcoal samples (sfn 132 and 174) were sent for ***radiocarbon dating*** to the SUERC facility and dates were successfully obtained (Appendix 6).

Sfn 132, from deep within Context (111), and hawthorn-type, gave an uncalibrated age of 315 ± 30BP; while sfn 174, from deep within 109, and of the same species type, gave an equivalent age of 405 ± 30 BP. When calibrated the samples came out as:

> sfn 132 – 1480AD to 1650AD at 95.4 per cent probability (SUERC-32080 GU-22717)
>
> sfn 174 – 1440AD to 1490AD at 62.7 per cent or 1570AD to 1630AD at 79.8 per cent probability (SUERC-32081 GU-22718)

The calibrated date ranges therefore place both samples in either the Late Medieval or immediate Post-Medieval Period. The date for sfn 174 has only a 5.5 per cent probability of being later than 1600 AD and only a 15.6 per cent chance of post-dating 1570 AD so that sample can safely be taken as indicating Late Medieval usage of the building. Sample 132 has only a 15.1 per cent probability of post-dating 1610 AD so it could have been a few decades later than sample 174.

The two key conclusions to be drawn here are that the building was in use for a long period of time – many decades – and it should be borne in mind that the samples may well only relate to its last years; and secondly that it was in use up to and beyond the end of the medieval period.

9. Interpretation and conclusions

1. *Function*

No conclusive evidence was secured to state with any degree of confidence what the building's original function might have been. There are a number of possibilities but some can be eliminated with certainty.

Cudworth wrote of the oven base having been 'calcined throughout'. This suggests some form of **ore processing** or reduction of minerals, or else **lime burning**. These can be discounted as there was no evidence whatsoever of ore processing and the structure's morphology is unlike known ore hearths or pre-Early Modern lime kilns.

For similar reasons its use as a **whitecoal** or **chopwood** kiln can also be dismissed. Known examples of such kilns invariably were built in a sunken manner with an external flue, quite unlike the Hartlington feature.

Cudworth, in an attempt to come to a firm conclusion, likened it to a pottery kiln and decided there was a distinct similarity between this structure and excavated Roman **pottery kilns** at Caistor in Northamptonshire, in having a circular kiln base with flue beneath. However, no archaeological evidence was revealed by Cudworth or by the current investigation to support that idea, so it too should be discarded as a potential function for this structure.

Prior to this investigation the structure was listed on the HER as a **corn-drying kiln** but this was based not on any firm empirical findings but rather on Ordnance Survey data. It may have been tainted by confusion with the known corn-drying kiln close to the structure in question – the two were conflated in the official record. To suggest that it was primarily a corn-drying kiln must also be discounted. The drying of grain (probably oats or barley in this area) required an upward flow of warm air from an oven or furnace either below the drying floor or physically detached from it. Grain drying was a slow process. Very high temperatures would have scorched the grain rendering it unfit for milling. The very fact that the oven base stones had been fractured through and through, and the fire-reddened stone on the northern wall footings, confirm that extremely high temperatures were being achieved within the oven – far too high for mere drying of grain.

In exactly the same way, its use as a **malting kiln**, or **mash-oven**, for drying out barley to stop the germination process, for use in brewing, can be ruled out as these did not require high temperatures either.

Two potential uses can be given careful consideration:

a. Ham- or bacon-curing

In rural societies during the medieval and post-medieval periods ham and bacon needed to be cured to preserve them for the lean winter months. Two methods are known: the joints were either slowly smoked directly over oakwood in a brick-built kiln, or used smoke channelled to the smoking chamber from an adjacent oven. In the latter sweet wood was often used, such as beech, oak or fruit tree wood, to give the cured meat a distinct and pleasant flavour. The joints were hung, for several days depending on local conditions, in a wood-lined room rather than in a stone-built structure.

b. Bread oven

In pre-modern times bread was baked in ovens which generally had a circular heat-resistant base and a domed superstructure or ‘former’. The latter could be made from a range of materials dependent upon what was locally available, such as fire-resistant stone, firebrick, clay, adobe (straw mixed with mud) or a cement-earth mix. If clay or adobe were used in its construction, they were pasted over a wattle lattice known as a ‘former’. Prior to baking, a fire was set within the oven to bring the temperature up to 500^0 or even 600^0 Celsius using coal or wood. A higher temperature could be achieved more quickly using thin rather than thick wood. Once the desired temperature had been achieved, the ashes were first spread across the oven base before being raked out. The dough was then placed on the floor and slowly baked using retained heat within the oven. The diameter of the oven base is within the range for known bread ovens and the degree of reddening of the stone indicates not just that they were exposed to extreme

temperatures but also that this heat was trapped (retained) within some kind of superstructure.
There was no evidence to suggest that the superstructure was of a permanent nature and, had it been clay bonded to a 'former', one would not necessarily expect to identify any evidence on the ground. Having said this, though, one assumed excavated medieval bread oven had a shallow curvilinear structural slot around the oven base that could have supported a 'former' (Coward and Speed 2009, 119).
Furthermore, the conclusion is drawn that the Hartlington structure was a communal bread oven. Evidence strongly suggests that domestic bread ovens were built into the gable wall of a house, often adjacent to a fireplace to make maximum use of retained heat. This oven was not part of a domestic building and was not in close proximity to any other building, as far as surviving evidence indicates. It was set in a building in some isolation. Medieval communal bread ovens are known to have been associated with manorial complexes but at some distance from the main complex because of the acute risk of fire in such oven buildings. It was one of the lord of the manor's prerogatives to cream off a tithe from those using the bread oven.

c. Conclusion

It is considered, on the balance of probability, that the structure was essentially a communal bread oven with a secondary function that could conceivably have been subsidiary to bread making or of equal importance. However, bread was a staple and so would have been needed year-round whereas curing was a seasonal activity, so the former would undoubtedly have been its primary purpose.

2. Form

The structure took the form of a small rectangular building with impermanent walls set on stone foundations. The rounded nature of the *in situ* stones and the fact that the evidence points to there having been only a single skin discounts the possibility of a full-height stone wall. It can only have been constructed of timber or wattle and daub.
At the south-east corner of the building a circular oven base, with a non-permanent superstructure, was accessed from outside the building, presumably by a small door.
Excess heat was drawn out of the oven, through the central hole, into the flue channel which distributed the heat into the rest of the building. According to Cudworth, two channels branched to left and right distributing heat equally across the entire area but only one was confirmed during the current investigation.
Thus, the building consisted of two parts: the circular, domed oven and a rectangular chamber behind it.

3. Period

The two charcoal samples (sfn 132 and 174) sent for radiocarbon dating were obtained from deep within the underfloor flue so came from secure stratigraphic contexts. It is not possible to say whether they were from the building's final use or had remained intact through a sequence of firing episodes. That would depend on how assiduously the flue channel had been scraped clean after each event. It is also impossible to determine when the oven was built and first used. The dating results merely indicate that it was in use between 1480 and 1650, according to sfn 132, or between 1570 and 1630 according to sfn 174. In terms of periodicity, therefore, it was functioning in the Late Medieval and/or Early Post-Medieval period.

However, if the samples represent its latest use then one can assume that the oven was in use prior to the Late Medieval. Certainly, the degree of fire-reddening and fracturing of the base stones strongly points to an extended length and intensity of use. When the manor complex on Chapel Hill was abandoned is unknown: thus it is not possible to directly link the oven to manorial control.

4. Archaeological parallels

A trawl of published material was undertaken as part of the post-excavation investigation to seek parallels with this particular style of building. Searches were undertaken typing oven, communal oven, bread oven and bakehouse into computer search engines. In addition, material both published and in the grey literature sphere held on the Archaeology Data Service (ADS) archive was examined for examples of (bread) ovens and bakehouses.

No examples of a medieval or post-medieval bread oven were located by entering the term 'bread oven' into the ADS search engine for grey literature (ads.greylit), though two were identified by searching the general catalogue (ads.ahds). However, neither example was convincing.

Firstly, excavation of a medieval site in Warwick revealed what was described as 'an oven or malting kiln' so this may be totally irrelevant to the Hartlington site (Thompson and Wright 2003). Secondly, a site adjacent to Barking Abbey, excavated in 1988, unearthed a medieval layer which included 'evidence for a medieval bread oven' but the evidence was too scant to enable any comparison to be made with Hartlington (Newham Museum service 2000).

A survey of archaeological sites in Kent lists one at Fulston Manor, Sittingbourne, which excavated a medieval bakery attached to a farmstead with an oven and hearth at one end, built of clay at some distance from other buildings in the farmstead (Andrews *et al.* 2006; Wessex Archaeology 2006). The conclusion drawn by the authors was that it had probably been used for baking and for smoking or drying making use of waste heat from the oven, and that it probably had had a domed roof. It was dated by archaeomagnetism to 1180-1230. Mention has already been made (see p. 21) of a site at Freeschool Lane in Leicester though here again surviving evidence rules out meaningful comparison between this and the Hartlington oven.

The closest parallel is located at Llanelwedd in Powys (cpat.org.uk). Here excavation revealed a circular oven lying above a squared and stone-lined 'tunnel or flue' that channelled hot air to a rectangular chamber behind the oven (Fig. 10). It was interpreted by the excavation team as a 'corn-drying kiln and bread oven', in other words a dual purpose building as suggested for Hartlington. The overall size of the two buildings is broadly similar and both were set on a step cut into a natural slope. Thus far there are strong similarities but there are also marked differences: the drying chamber at Llanelwedd was sunk below ground level and grain would have been spread out on a framework laid across the top of the sunken chamber – hot air would have entered this from the flue and risen upwards. At Hartlington there was no such sunken area and the floor here was composed of solid stone slabs. In addition, the Llanelwedd oven was made up of vertically-set stones and had a clear stone-built superstructure very different from Hartlington's design. The former was dated to the fifteenth or sixteenth century and was closely associated with a discrete farmstead. It was (presumably) not designed for communal use.

Herein lies the main constraint in the search for corresponding structures elsewhere. It is widely known that isolated farm houses, manor houses and halls had at least one bread oven but these were either set into a gable end wall adjacent to a fireplace or in a detached kitchen building to minimise the risk of fire damage. According to Stearne (1984, 265) the tradition of detached kitchens, often with bakeoven(s), persisted until the 1470s with some houses having or using kilns for smoking bacon.

A comprehensive atlas compiled using data from fourteenth-century *Inquisitiones Post Mortem* demonstrated that bakehouses and bake ovens were a common element of manorial complexes, in the northern counties in particular, where they were perceived as a way of conserving precious fuel when used communally (Campbell and Bartley 2006, 99). Furthermore, communal bread ovens were the prerogative of the lord and thus a further source of income and profit for the estate.

Conclusion

No close parallel for the Hartlington kiln has been located in the literature and there seems to be a complete dearth of excavated examples of communal medieval or early post-medieval bread ovens. There is simply nothing to compare it with, at least as far as this search has found.

On the other hand, there are parallels for dual use of bread ovens with hot air and/or smoke being recycled for drying grain or curing bacon and ham.

10. Recommendations

Given the sound state of preservation of the structure, and the lack of known parallels within the Yorkshire Dales National Park (and beyond), it is recommended that the site be given due protection for the long term, in conjunction with the Parish Meeting. It is not being suggested here that it should be listed but it should be duly noted as a feature of historical interest of value to more than the just the local community, with the HER record being updated to reflect the 2010 findings. It was evident during the excavation that there is considerable local interest in the feature – indeed a sense of ownership of it – and considering that it is sited on parish-owned land, the local community should have a say in how it is preserved and presented. A press release issued by the National Park Authority after the 2010 excavation was picked up by a range of websites and local and regional newspapers and magazines suggesting more than a modicum of general interest in the structure. This could usefully be borne in mind when community decisions are being made.

Prior to this excavation it had become neglected and very badly overgrown and it is hoped that in future vegetation control can be extended to it. Much of the green is regularly cut on a voluntary basis by nearby residents and it is hoped that this could be extended to the actual structure to keep growth under control, or more precisely to prevent growth from encroaching on to the structure. This would clearly need to be done using a hand-strimmer with care being taken to avoid hitting exposed stonework.

Even though it is in a sound state, it should not be left fully exposed as frost action and possible disturbance by people or livestock would soon impinge on its structural integrity. At the end of the excavation the wall lines and the oven base were left standing proud of the soil level, with the interior having been covered over with topsoil: it is hoped that this status will be preserved. If funds permit, and if the Parish Meeting is agreeable,

a small and discreet interpretation panel could be installed, possibly also including the inscription on the adjacent trough.

11. Acknowledgements
Richard Brass, Archive Assistant at West Yorkshire Archive Service, Bradford, for locating information relevant to William Cudworth.
David J Croft, Hon. Librarian of the Bradford Historical and Antiquarian Society, for information on William Cudworth.
Denise Druce, of Oxford Archaeology North, for examination of charcoal samples and preparation of samples for dating.
Messrs Daggett of Hartlington Fencing Supplies for their invaluable assistance with logistical arrangements.
Hartlington Parish Meeting and its chairman Jack Tinker.
Dr Roger Martlew for the loan of his total station and for setting up site co-ordinates.
Robert White, Senior Historic Environment Officer, Yorkshire Dales National Park Authority.
The excavation team: Alison Armstrong, Pauline Dodsworth, Peter Gallagher, Jane Lunnon, Ruth Spencer, Jennifer Stearn, Alan Williams.

12. References
Andrews, P, Egging Dinwiddy, K, Ellis, C, Hutcheson, A, Philpotts, C, Powell, A B and Schuster, J. 2006. *Kentish sites and sites of Kent: a miscellany of four archaeological excavations*. Wessex Archaeology Report 24.
Archaeology Data Service, ads.ahds.ac.uk, accessed 3 January 2011.
Archaeology Data Service grey literature archive.
ads.ahds.ac.uk/catalogue/library/greylit/query.cfm, accessed 3 January 2011.
Bogg, E. 1904. *Higher Wharfedale*. York: John Sampson.
Campbell, B M S and Bartley, K. 2006. *England on the eve of the Black Death. An atlas of lay lordship, land and wealth, 1300-49.* Manchester and New York: Manchester University Press.
Coward, J and Speed, G. 2009. *Urban life in Leicester: an archaeological excavation at Freeschool Lane NGR: SK 58410 04650 centre*. University of Leicester Archaeological Services. ULAS Report No. 2009-140 v.2, p. 119.
cpat.org.uk/projects/longer/llanelwe/diary08/diary08.htm, accessed December 2010.
Cudworth, W. 1898. 'Ancient kiln in Wharfedale' *The Reliquary and illustrated archaeologist.* January, pp. 47-49.
Federer,CA. 1912. 'William Cudworth. In Memoriam' *The Bradford Antiquary.* New Series vol. III, pp. 1-6.
Johnson, D, Martlew, R, Carroll P, and Carroll P. 2009. *Report on the excavation of a corn drying kiln on Kilnsey Green, Kilnsey, North Yorkshire*. Skipton: Upper Wharfedale Heritage Group.
Mason, K. and Pacey, A. 2000. 'Corn-drying kilns in Wharfedale and Mid-Airedale' *Yorkshire Buildings* 28, pp. 82-93.
Newham Museum Service Archaeology Centre: Digital Archive. 2000 (updated 2009). *TQ 4393 8405. A pre-development investigation. The Abbey Road*. BA-AR88.

Sheeran, G. 2005. 'William Cudworth: writing local history in the nineteenth century' *The Bradford Antiquary* Third Series No. 9, pp. 4-13.
Speight, H. 1900. *Upper Wharfedale*. London: Elliot Stock (reprinted 1988, Otley: Smith Settle).
Stearne, J M. 1984. *The archaeology of medieval England and Wales.* London: Guild Publishing.
Thompson, P and Wright, K. 2003. *Archaeological evaluation at Bread and Meat Close, Friars Street, Warwick.* Warwickshire Museum Report 0316.
Wessex Archaeology. 2006. *Fulston Manor, Sittingbourbe, Kent. Assessment of the result of excavation of a small medieval farmstead.* Reference 57961.01. London: Wessex Archaeology.
WYAS [B]. West Yorkshire Archive Service, Bradford. DB5/C27/A/5. Letters on antiquarian and archaeological topics 1886-1906.
WYAS [B]. West Yorkshire Archive Service, Bradford. DB65/C2/8. William Cudworth's notebook 1890s.

13. Appendices

- **1. List of Contexts**
- **2. List of small finds**
- **3. List of drawings**
- **4. Photographic index**
- **5. Harris matrix**
- **6. Radiocarbon dating certificates**

Appendix 1 List of Contexts

Key

1 description of material
2 approximate thickness
3 above Context
4 below Context
5 small finds

Context 101

1 topsoil
2 5mm to 180mm
3 102-07
4 turf layer
5 sfn 101-12: tile, stone, coal, chert

Context 102

1 internal flagstone floor
2 n/a
3 108

4 101
5 nil

Context 103
1 capstones to west flue system
2 70mm-80mm
3 n/a but abuts 102, 104, 108
4 101
5 129: pot

Context 104
1 base to hearth or oven
2 130mm
3 n/a but butts 102, 104, 107
4 101
5 nil

Context 105
1 capstones to assumed east flue
2 n/a
3 108?
4 101
5 nil

Context 106
1 wall footings surrounding the structure
2 n/a
3 n/a but butts 102, 107, 108
4 101
5 nil

Context 107
1 gravel and cobbble layer
2 n/a
3 assumed foundation layer; butts 104, 106
4 101
5. 128: two pieces of soft wood

Context 108
1 gravel and lime mortar deposit
2 n/a
3 n/a but butts 102, 103, 106
4 101
5 nil

Context 109
1 buried soil within the flue channel
2 240mm
3 base of 113
4 103
5 130-31, 134, 136-44, 145-51, 153-54, 157, 159-60, 162, 166-67, 171-72, 176-77,179-89, 191: coal, pot, stone, charcoal

Context 110
1 flue channel beneath the hearth/oven base
2 250mm depth
3 n/a but is the same as 113
4 104, filled by 111
5 nil

Context 111
1 buried soil beneath the hearth/oven base
2 250mm
3 base of 110
4 104
5 132-33, 135, 145, 152, 155, 158, 161: coal, lime mortar, charcoal, natural chert, metal

Context 112
1 buried soil beneath part of the hearth/oven base
2 n/a
3 107
4 104
5 156: charcoal

Context 113
1 flue, northern section
2 240mm depth
3 assumed foundation layer; same as 110
4 103, filled by 109
5 nil

Context 114
1 buried soil deposit on top of sandstone slabs and covered by flagstone flooring slabs
2 30mm-40mm
3 115
4 103

5 brick, lime mortar, charcoal, pot: 163-65, 168, 170, 173, 175, 178, 190

Context 115

1 a deposit of sandstone slabs laid on top of natural as a foundation layer for the internal structure

2 n/a

3 natural

4 114

5 nil

Appendix 2 List of small finds

sfn	Context	Quantity	Material	Description
101	101	3	brick	fragments of pre-1850 brick, many inclusions, degraded, show signs of having been burnt, variable size
102	101	1	pot	unglazed body sherd with fully fired fabric, 30mm long x 5mm thick
103	101	1	pot	rim sherd highly degraded with , length 20mmdark brown/black glazing on rim edge
104	101	1	pot	creamware body sherd 33mm x 30mm
105	101	2	pot	white glazed tableware, body sherd plus lower handle sherd attached to body sherd, from same vessel – a probable cup
106	101	4	glass	fragments of clear glass of variable size
107	101	4	glass	fragments of blue translucent glass, 1 with a lip, 1 with lettering with “BL” visible
108	101	1	glass	dark green body fragment 12mm long x 5mm thick
109	101	1	metal	heavily corroded probable nail 45mm long
110	101	1	tile	dark brown ceramic drain pipe fragment, glazed, with many inclusions, 85mm x 35mm x 18mm
111	101	1	stone	spherical stone ball, 10mm diameter

112	101	14	coal/charcoal	misc. pieces of variable size
113	101	1	glass	greenish glass fragment of bottle neck, translucent, 20mm diameter
114	101	22	brick	fragments of red brick, coarse and degraded, variable sizes
115	101	5	chert	fragments of natural chert
116	101	5	glass, chert & porcelain	2 clear bluish glass body fragments; 1 white glazed body pot sherd; 2 pieces natural chert
117	101	5	glass	4 bluish & 1 clear body fragments, variable sizes
118	101	1	pot	body sherd of transfer-printed blue & white tableware 11mm long
119	101	1	chert(?)	unworked piece
120	101	1	wood	length of bleached softwood 38mm long
121	101	1	glass	fragment of translucent rim/neck to bottle 25mm x 23mm
122	101	1	stone	small stone ball diameter 7mm
123	101	6	glass	fragments of clear bluish glass of variable sizes
124	101	1	metal	heavily corroded & encrusted iron piece, 95mm long x 12mm thick
125	101	2	stone	small piece of probable slag
126	101	1	wood	piece of softwood 129mm long
127	101	2	glass	body fragments of thin translucent glass, 11mm and 20mm long
128	107	2	wood	pieces of softwood 102mm and 218mm long
129	103	1	pot	white glazed rim sherd 13mm long 130
130	109	1	chert	flake of worked chert
131	109	8	coal	pieces of variable sizes
132	111	1	charcoal	piece, hawthorn-type, found at 260mm depth
133	111	1	coal	piece, 20mmm diameter
134	109	3	coal	small pieces of variable sizes
135	111	-	lime mortar	coalesced lump of lime mortar, probably residual
136	109	1	glass	fragment of translucent glass 12mm long
137	109	1	pot	base sherd of fully reduced fabric with dark brown glaze, diameter 55mm, 12mm thick (cf sfn 150)
138	109	2	coal	very small pieces
139	109	1	pot	glazed body sherd, creamware

140	109	3	coal	small pieces
141	109	1	stone	ironstone piece, natural concretion
142	109	1	brick	tiny degraded pieces of red brick
143	109	1	coal	tiny pieces
144	109	6	charcoal	small pieces
145	111	1	metal	curvilinear piece of flattened and heavily corroded iron, possible horseshoe, 2mm thick x 97mm long
146	109	2	glass	base fragments of translucent glass, 10mm & 25mm long
147	109	1	bone	sliver of polished bone 12mm long
148	109	1	pot	rolled rim sherd of glazed creamware
149	109	2	bone	two rib pieces of small mammal
150	109	2	pot	1 white glazed body sherd 19mm long; 1 body sherd glazed fabric, with fluted internal finish & unglazed external face, 60mm long x 8mm-17mm thick
151	109	7	charcoal	several pieces
152	111	multiple	charcoal	pieces of ash charcoal found at 340mm depth
153	109	2	pot	1 abraded body sherd; 1 unglazed rim sherd, degraded 23mm long
154	109	3	brick	tiny pieces degraded red brick
155	111	1	chert(?)	unworked, if it is chert
156	112	several	charcoal	small pieces, blackthorn-type species found at 250mm depth
157	109	1	glass	translucent body fragment 19mm long
158	111	1	charcoal	piece of hazel roundwood
159	109	1	glass	body fragment of translucent glass
160	109	1	pot	body sherd brown glazed on both faces 13mm long
161	111	1	charcoal	small piece
162	109	2	coal	small pieces
163	114	1	pot	body sherd, partially glazed internal face, glazed external face, fully reduced fabric 56mm long
164	114	1	glass	translucent body fragment 18mm long
165	114	several	charcoal	small pieces
166	109	2	pot	salt-glazed body sherd; tiny sherd of blue & white ware
167	109	2	glass	body fragments of translucent glass 7mm & 13mm long
168	114	1	pot	body sherd unglazed pot with fully reduced fabric 13mm long
169	109	1	coal	cube, 18mm diameter

170	114	1	brick	piece of coarse and black-burned brick 16mm long
171	109	1	bone & tooth	upper jaw with twin incisors of small rodent
172	109	3	glass	bluish body fragments of translucent glass, variable sizes
173	114	2	charcoal	small pieces
174	109	several	charcoal	small pieces of hawthorn-type found at 300mm depth
175	114	3	lime mortar	coalesced piece, probably residual
176	109	1	pot	body sherd, white glazed, 16mm long
177	109	1	H-AVM/slag *	small piece, 13mm diameter
178	114	3	charcoal	small pieces
179	109	3	coal	small pieces
180	109	several	charcoal	small pieces of ash roundwood charcoal
181	109	several	charcoal	small pieces
182	109	3	charcoal	small pieces
183	109	1	glass	fragment of green translucent glass 12mm long
184	109	1	pot	white glazed body sherd with blue transfer-printed decoration 12mm long
185	109	several	charcoal	small pieces
186	109	5	charcoal	small pieces
187	109	several	charcoal	small pieces
188	109	1	charcoal	single large piece of hawthorn-type charcoal
189	109	several	charcoal	small pieces
190	111	several	charcoal	small pieces
191	109	several	charcoal	small pieces

H-AVM – heat-affected vesicular material – is a more correct description for this material than slag which suggests the smelting of metallic ore.

Appendix 3 List of archived drawings

001 Structure, west side, Context 107 (part)
002 All trench, Contexts 102-108
003 Structure, east side, Contexts 102, 107 (part)
004 Flue, Context 113

Appendix 4 Photographic index (archived)

1. *File name: hartlington cdk* – pre-excavation record

Photographed by David S Johnson

Spreadsheet

004 SW corner, looking NE
005 detail of east wall, looking NE
006 detail of oven base, looking SW
007 SE corner, oven base, looking N
008 detail of NE corner, looking N
009 general view of the structure, looking NE
010 general view of the structure, looking SE
011 general view of the structure, looking SW
012 general view of the structure, looking NW

***2. File name: HK10, disc 1* – excavation record, after first photo clean**

Photographed by Jane Lunnon

2541 general view, looking SE
2543 general view, looking S
2546 general view, looking W
2550 general view, looking NNE
2553 oven base, looking NNE
2558 oven base, looking SW
2563 general view, looking SSW
2567 general view, looking ESE
2569 general view, looking W
2574 oven base, detail, looking WNW
2577 general view, looking NNE

3. File name: HK10, disc 2 – excavation record, Sat 7 Aug 2010

Photographed by Jane Lunnon

2593 entire structure, looking SSW
2594 " north end, looking ESE
2595 north flue, looking WNW
2598 entire structure on completion, looking SSW
2599 " looking SSW
2603 " looking S
2606 " looking S
2612 " east side, looking SSW
2618 " west wall, looking SSW
2622 " west wall, looking ESE

2624 oven base, looking SE
2626 oven base and west wall, looking SE
2629 oven base and west wall, looking SSE
2632 south end, looking SSE
2638 south end, looking SSW
2642 oven base, detail
2644 oven base, detail
2647 oven base, detail
2651 inside flue (Context 110), detail
2654 inside flue (Context 113), detail
2657 " detail
2660 " detail
2663 " detail
2665 north end, looking N
2681 within flue (Context 113), looking N

***4. File name: Hartlington_Kiln_AW (D)* – excavation record**

Photographed by Alan T Williams

There are 3 file formats for each photograph

1 NEF: This is the 16 bit RAW file from the Nikon D300 with no adjustments and a colour profile of Adobe RGB (1998)

2 TIF: this 16 bit uncompressed file which is the result of processing the NEF file with a RAW converter (Nik Software Capture NX2). The White Balance and Levels have been adjusted if necessary and all sharpening has been reduced to zero. The colour profile remains as Adobe RGB (1998) the dimensions are 4288 x 2848 pixels and the resolution is 300 ppi

3 JPG: This is the 8 bit image produced from editing (cropping, cleaning and sharpening etc.) the TIF in Adobe Photoshop CS3 and saving at the maximum resolution (i.e. minimum compression). The colour profile has been converted to sRGB, the dimensions are either 1680 x 1115 or occasionally 1200 x 1200 the resolution is 72 ppi

Spreadsheet

05/08/10	ATW	102	NE
..	..	..	..
..	..	..	..
05/08/10	..	104	N
..	..	..	..
..	..	..	..
05/08/10	..	103	NE
..	..	..	..
..	..	..	..
05/08/10	..	104	NE
..	..	..	..
..	..	..	..
05/08/10	..	104,107	NE
..	..	..	..

..	..	..	..
05/08/10	..	111	N
..	..	..	..
..	..	..	..
05/08/10	..	104,107	NNE
..	..	..	..
..	..	..	..
05/08/10	..	104,107	N
..	..	..	..
..	..	..	..
05/08/10	..	104,107	N
..	..	..	..
..	..	..	..

5. File name: HK10 backfilled

Photographed by David S Johnson

001 general view, looking S
002 general view, looking ESE
003 general view, looking NE
004 oven base, looking SW
005 oven base, looking SSW

Appendix 5 Harris matrix

	101		topsoil
	↑		
	114		backfill layer from 1897
	↑		
fill of 113 from 1897	109	111	fill of 110 from 1897
	↑		
flagstone flooring	102	105	eastern gritstone flooring slabs
	↑		
	103		central gritstone slabs
	↑		
	104		oven base
	↑		

108 gravel foundation layer for 102 and 105

↑

flue passage south 110 113 flue passage north

↑

106 external wall lines

↑

112 foundation layer, oven base

↑

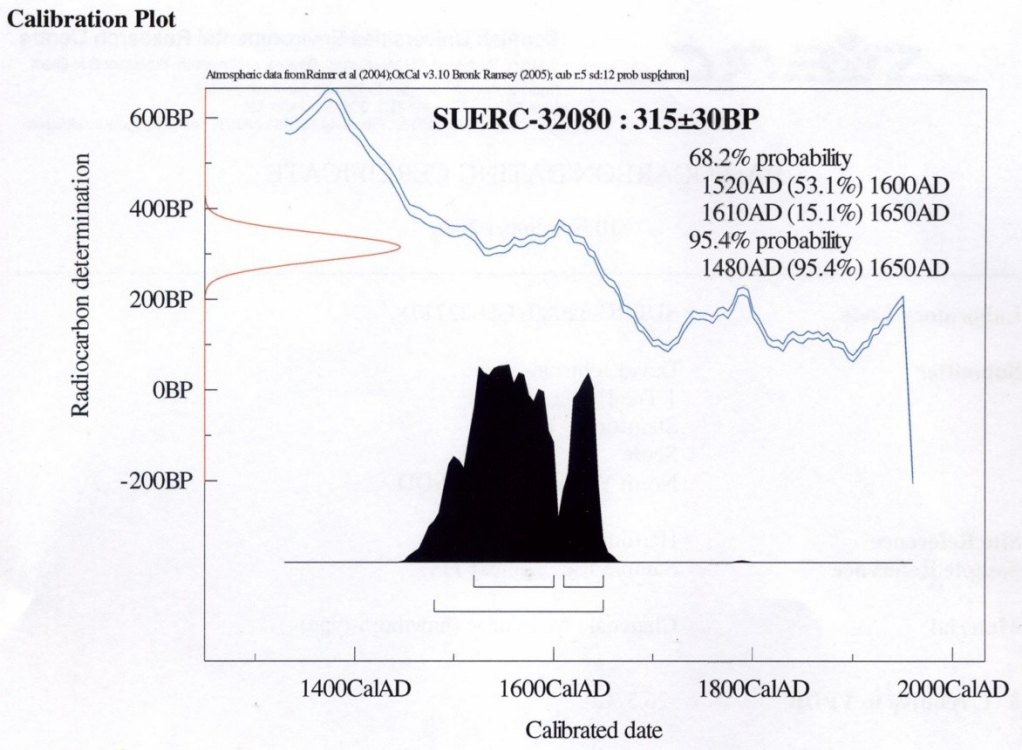
115 foundation layer, main structure

↑

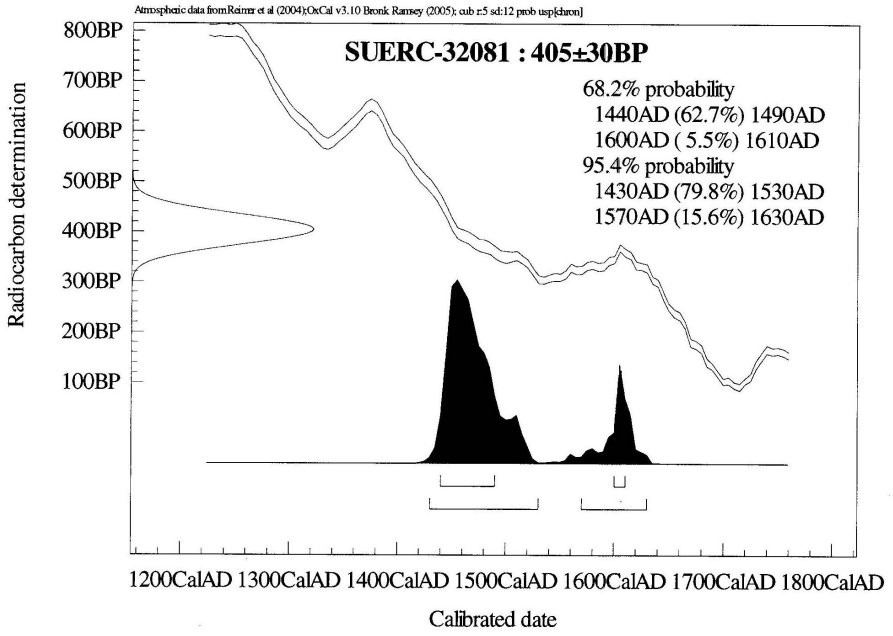
107 external gravel base laye

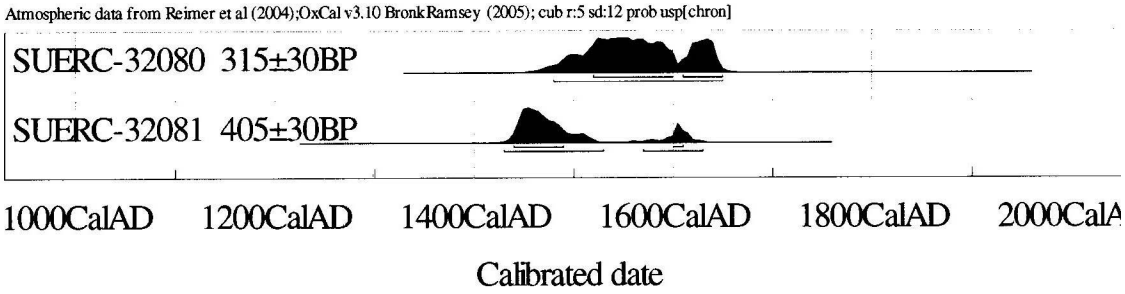
Appendix 6 Radiocarbon dating certificates

Sfn 132



Sfn 174


Atmospheric data from Reimer et al (2004);OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]
SUERC-32081 : 405±30BP
68.2% probability
1440AD (62.7%) 1490AD
1600AD (5.5%) 1610AD
95.4% probability
1430AD (79.8%) 1530AD
1570AD (15.6%) 1630AD
Radiocarbon determination
800BP
700BP
600BP
500BP
400BP
300BP
200BP
100BP
1200CalAD 1300CalAD 1400CalAD 1500CalAD 1600CalAD 1700CalAD 1800CalAD
Calibrated date


Atmospheric data from Reimer et al (2004);OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]
SUERC-32080 315±30BP
SUERC-32081 405±30BP
1000CalAD
1200CalAD
1400CalAD
1600CalAD
1800CalAD
2000CalA
Calibrated date

14. Figures

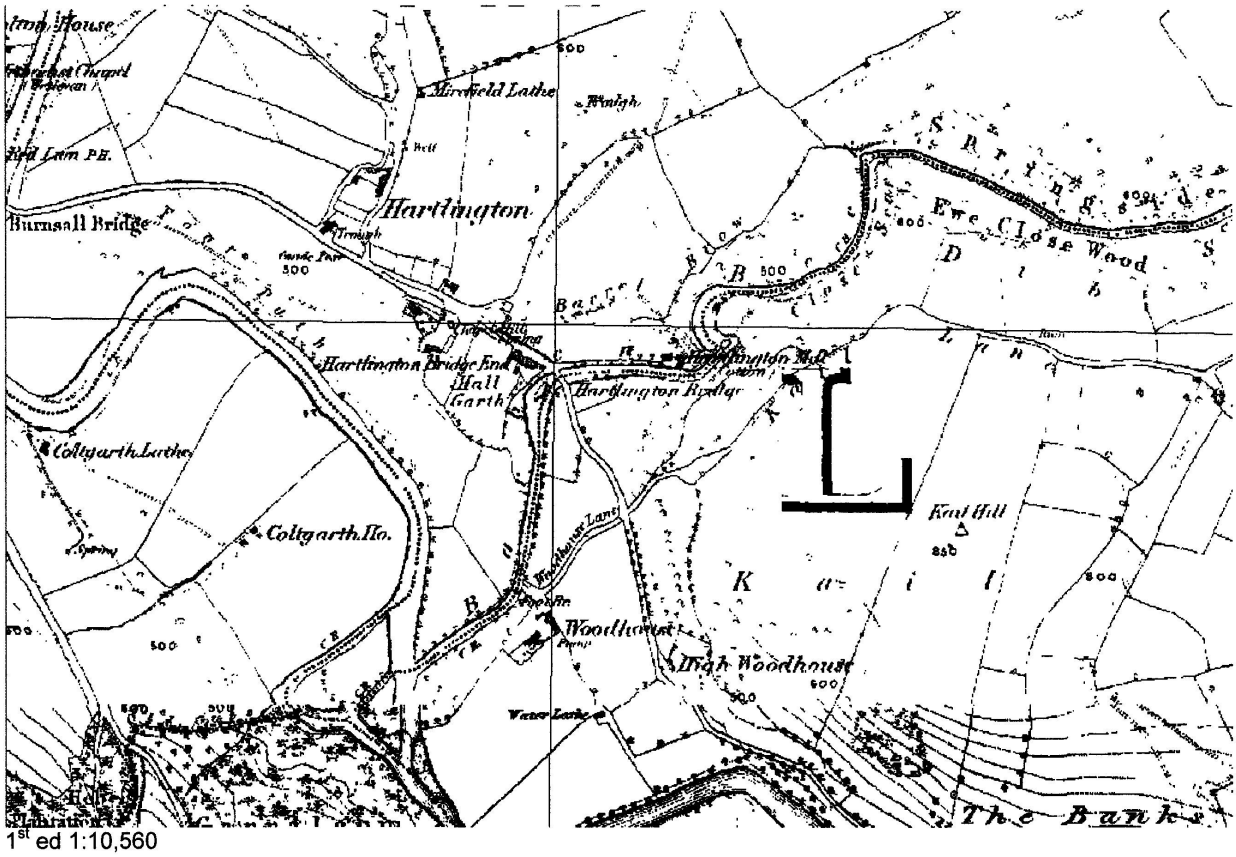


Fig. 1 Ordnance Survey, First edition 1:10,560, 1853

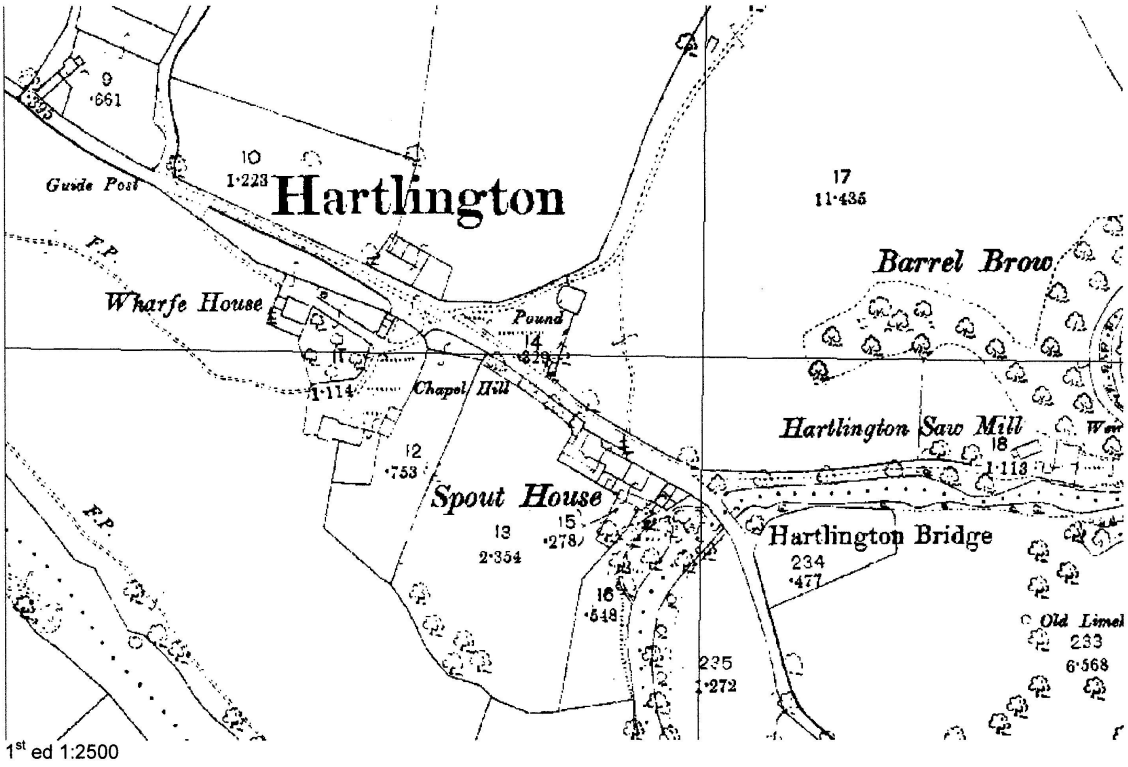


Fig. 2 Ordnance Survey, First Edition 1:2500, 1891

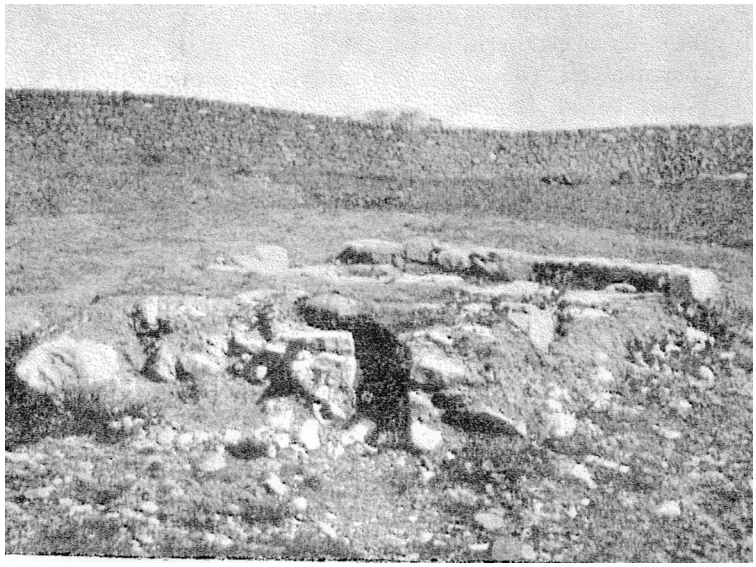


Fig. 3 Cudworth's photograph of the building

*Figure 2: Remains of the kiln at Hartlington, near Burnsall (SE 039610), with **d**, the flue from the firing hole, now below ground, and **e**, exposed stonework defining the internal face of the kiln wall. (**x** indicates triangulation points used to make the survey, November 1999.) (Drawing by Arnold Pacey)*

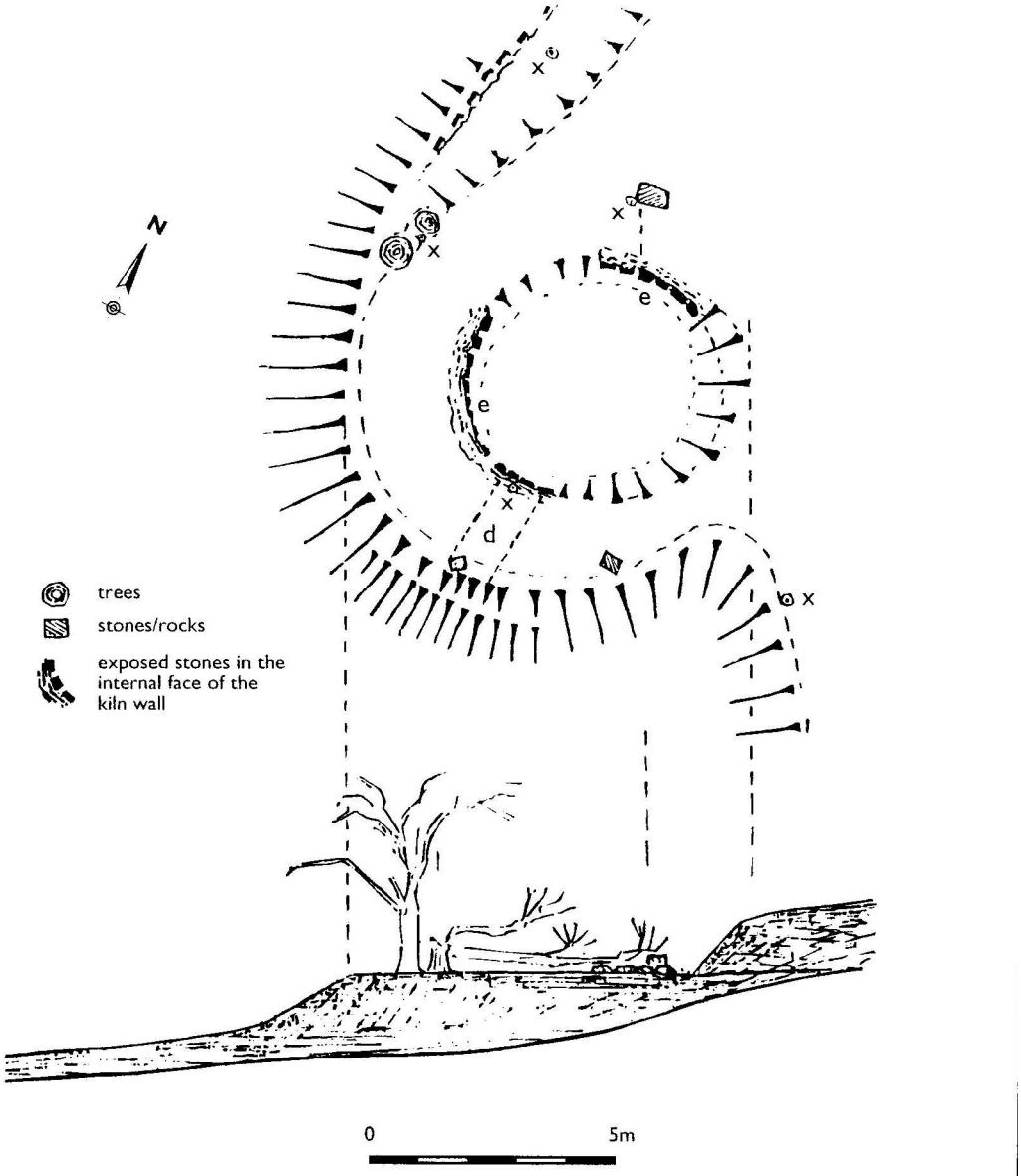


Fig. 4 Drawing by Arnold Pacey of the proven corn drying kiln on Barrel Brow

Source: Mason and Pacey 2000, 85.

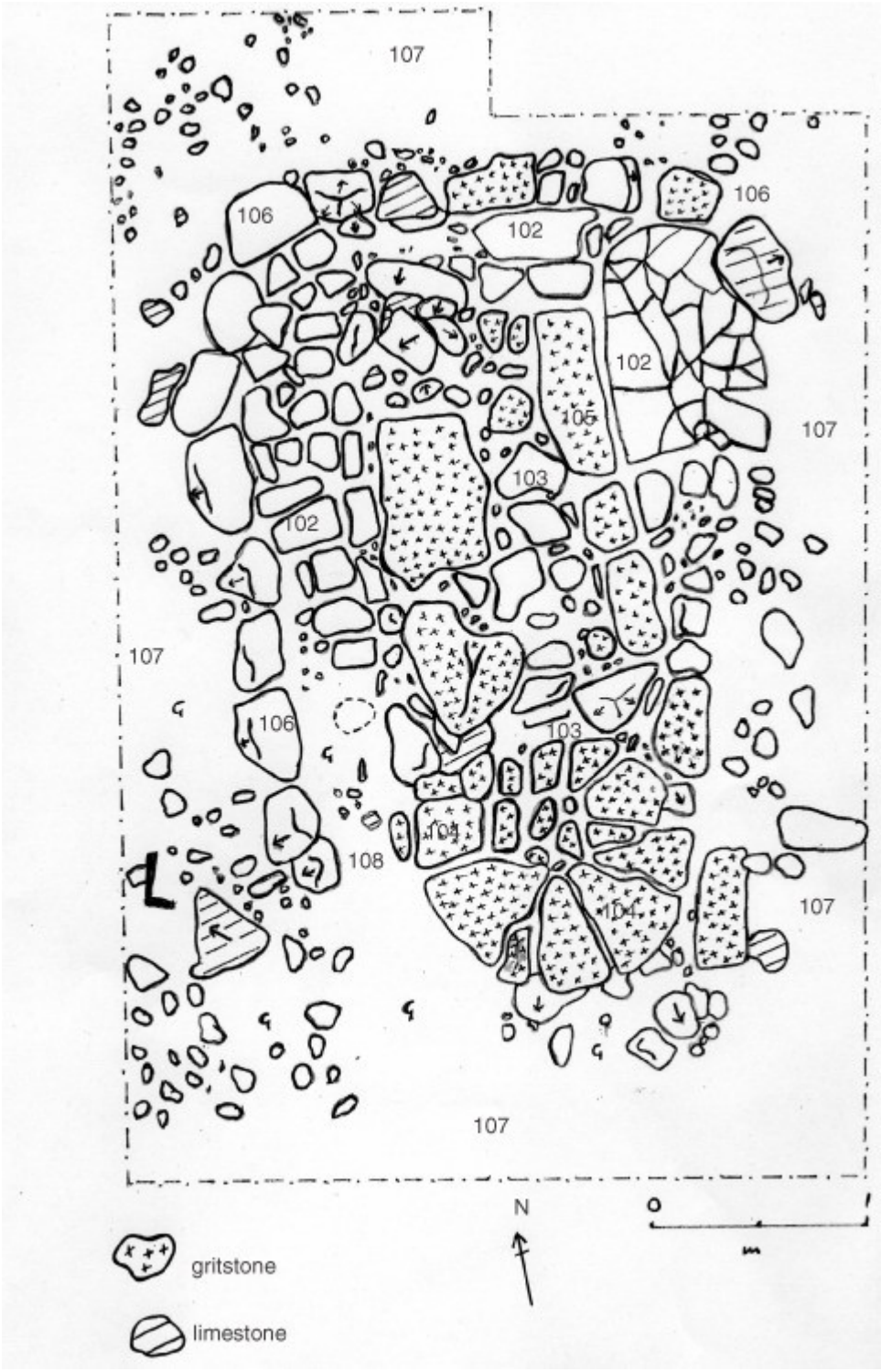


Fig. 5 Excavation plan, Contexts 102 - 108

Fig. 6 The building prior to lifting disturbed stone slabs
David S Johnson

Fig. 7 The building on completion of the excavation
Jane Lunnon

Fig. 8 The oven base showing fracturing of the stones
Jane Lunnon

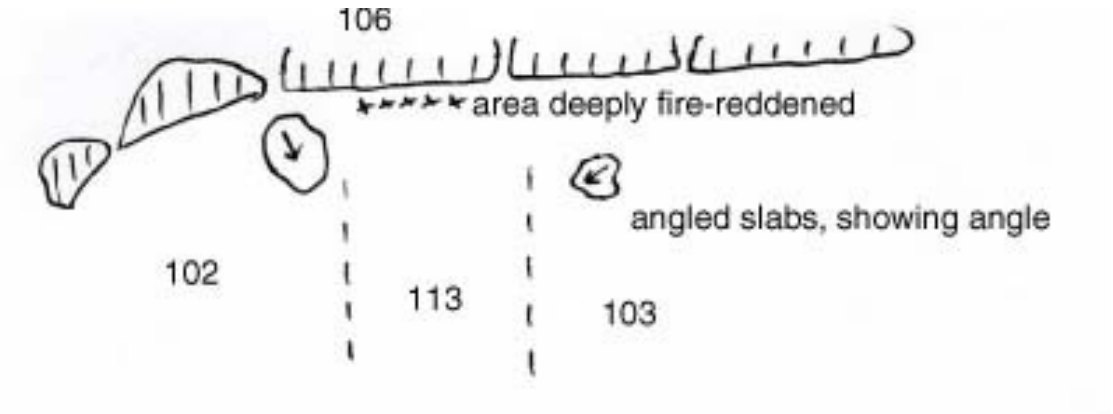


Fig. 9 Sketch of the angled slabs and fire-reddened wall foundation stone

Fig. 10 Llanelwedd bread oven and corn drying kiln
Source: Clwyd-Powys Archaeological Trust