# Anglo-Saxon Pottery in South Yorkshire: Characterisation studies

***Alan Vince***

## Introduction

There has been no general survey of pottery in south Yorkshire dating from the 5th to the 11th centuries and only a few published references to such pottery. Doncaster has produced by far the most importance collection of material, and most of the finds from excavations in the 1960s and 1970s have been examined by Dr C Hayfield, first for his PhD thesis and subsequently as part of the publication and synthesis of these excavations ({Buckland & Hayfield 1989 #11833}).

The author and Jane Young re-examined the published Doncaster finds and were of the opinion that some sherds tentatively identified as being Anglo-Saxon were actually abraded sherds of Roman date but agreed with the identification of much of the collection, and could supply tighter dating as a result of having studied the pottery sequence at Lincoln, where many of these types have been excavated in datable deposits ({Young & Vince forthcoming #44553}).

## The South Yorkshire Anglo-Saxon Pottery Sequence

As noted above, several of the sherds published by Buckland and Hayfield as being of Anglo-Saxon date were examined by the author and Jane Young and both agreed that they were actually Roman types, sometimes affected by weathering. In one case a shell-tempered ware was found which was not recognised as a late Roman shelly ware, either of the Dales Ware type or the south-east Midlands type produced mainly in Bedfordshire. This is perhaps a candidate for an early-to-mid Anglo-Saxon shelly ware but is, likewise, not recognised either as a northern Maxey-type ware nor any of the minor shelly wares found in the east Midlands in the mid Saxon period. A sample was taken for thin section and chemical analysis (V1931).

**Table 1**

| TSNO | Sitecode | Context | REFNO | cname | Form | Action | Description | subfabric |
|---|---|---|---|---|---|---|---|---|
| V1931 | DQ | | No.429 | RPOT?JAR | | ICPS;TSSHELL | PUBLISHED AS CHAFF-TEMPERED BUT ACTUALLY | FINE SHELL IN A MICACEOUS GROUNDMASS |

There is just one sherd of pottery from Doncaster which is clearly of early Anglo-Saxon date. This sherd, No. 1 in Buckland and Hayfield's catalogue, is from a stamped urn of the type known from numerous cremation cemeteries in eastern England. Sherds of similar vessels are, however, known from settlement sites and it is likely that the Doncaster vessel was used in a domestic context rather than being evidence for a disturbed burial. Samples from this sherd were taken for thin section and chemical analysis (V1957).

[Fig 00. 6th-century Stamped sherd from Doncaster]

Despite this positive identification of a, probably, 6th-century vessel there is no evidence from the county for the use of pottery in the mid Saxon period, from the late 7th to the mi 9th centuries. Immediately to the east, in Lincolnshire, and the Isle of Axholme, there is abundant evidence for the use of Northern Maxey-type ware but no sherds were found at Doncaster, nor were there any sherds of this ware from the recent excavations at Sprotbrough, which have produced two mid Saxon coins and a dress pin. To the north, in York, the Fishergate excavations demonstrated the use of Northern Maxey-type ware alongside locally-produced handmade coarsewares and imported vessels probably made somewhere in the Meuse valley and the Rhineland. There is very little evidence for the trading of these imported wares, or the Northern Maxey-type ware, from York into the hinterland and what evidence there is suggests that this hinterland consisted of the Wolds and the Vale of York rather than south Yorkshire.

[Fig 00. Distribution of Northern Maxey-type ware, Ipswich ware and mid Saxon imports in northern England]

The next phase in the South Yorkshire pottery sequence is dated to the late 9th or early 10th centuries. Excavation at both York and Lincoln demonstrate that these early Anglo-Scandinavian settlements were supplied with wheelthrown pottery, including some attempts at producing glazed wares, and the distribution of these wares indicates that in both cases there was a rural hinterland supplied with pottery made in or near to the town.

The Lincoln products are of four fabrics: a gritty ware (LG), a sandy ware (LSLS), a shelly ware (LKT) and a partially glazed ware (ELSW). Of these, the sandy, gritty and glazed wares have the shortest period of use, being restricted to the late 9th to early 10th centuries, whilst the shelly ware continued into the mid and late 10th centuries and is therefore less useful for determining the size and location of Lincoln's hinterland. These early Lincoln products occur solely within Lincolnshire and are restricted to sites within 50km of Lincoln. They do not occur in the south of the county, for example, but are found to the south of the Witham, at Ancaster, Old Leake and Fishtoft. South Yorkshire has produced no examples of these wares, but is more than 50km from Lincoln and so this may be either due to distance or to political geography. The only sites to have produced more than stray sherds are in three locations: a) within 10km of the city, b) in the Trent valley to the north of Torksey or c) in the Witham valley.

**Table 2**

| locality | ELSW | LG | LG? | LGLS | LSLS | LSLS? | LSLSOC |
|---|---|---|---|---|---|---|---|
| Ancaster | | | | | 4 | | |
| Bardney | | | | | 2 | | |
| Barton-upon-Humber | | | | | 1 | | |
| Caistor | | | | | 2 | | |
| Cherry Willingham | | 2 | | | 16 | | |

| locality | ELSW | LG | LG? | LGLS | LSLS | LSLS? | LSLSOC |
|---|---|---|---|---|---|---|---|
| East Keal | | | | | 1 | | |
| Fishtoft | | | | | 6 | | |
| Flixborough | | 1 | 1 | | 4 | 2 | |
| Goltho | 1 | 21 | | | 81 | | 2 |
| Haugham | | | | | 1 | | |
| Horncastle | | | | 1 | | | |
| Middle Carlton | | | | | 1 | | |
| North Kelsey | | | | | 1 | | |
| Old Leake | | | | | 8 | | |
| Repton | | | | | 1 | | |
| Stow | | | | | 19 | | |
| West Halton | | | | | 3 | | |

There is, likewise, a late 9th century to early 10th-century phase of production at the Torksey potteries. Examples of this ware are recognisable mainly through their relatively sandy texture or the use of roller stamped decoration, particularly on the outer rim of small jars. Unfortunately, none of these features is exclusive to the late 9th/early 10th century production phase. This ware does not occur frequently in Lincoln although it has been found at sites directly east of the city: Cherry Willingham, Fulnetby and Haugham. It is, however, found on sites connected by river to Torksey: Repton, Fiskerton and York (Coppergate). In addition, there is a sherd of roller-stamped Torksey ware from Doncaster (Sample V1928).

**Table 3**

| locality | site name | cname | Sherds |
|---|---|---|---|
| Cherry Willingham | | TORK | 1 |
| Doncaster | Site DT | TORK | 1 |
| Flixborough | | TORK | 3 |
| Fulnetby | | TORK | 3 |
| Haugham | | TORK | 1 |
| Repton | | TORK | 1 |
| Torksey | Castle Farm | TORK | 1 |
| Torksey | Kiln 2 | TORK | 6 |
| Torksey | Kiln 3 | TORK | 5 |
| Torksey | Kiln 4 | TORK | 10 |
| Torksey | Kiln 6 | TORK | 1 |

| locality | site name | cname | Sherds |
|---|---|---|---|
| Torksey | Main Street | TORK | 1 |
| Torksey | Verity | TORK | 1 |
| York | 16-22 Coppergate | TORK | 13 |

It is clear, then, that the market for Torksey pottery was mainly along the Trent valley. The Doncaster find may also indicate trade along the Roman road from Littleborough to York but it would require more than a single find to confirm this.

Finally, there are three main wares produced in or around York in the late 9th or early 10th century: an oxidized gritty ware (YORKA), a gritty greyware (YORKD) and, possibly, a glazed whiteware (EGW). Of these, both York A and York D wares have been found at Sprotbrough, but not at Doncaster. Otherwise, these York wares are mainly found to the east of York, at Thwing and Beverley. By contrast, Barton-upon-Humber, just across the estuary from Beverley, produced just one, stray York D find whilst Lincoln has produced only 12 sherds of York A ware, from no more than 7 vessels, perhaps as few as 3, and all from one site, Flaxengate. A curious feature of the distribution of York A and D wares is that the latter is more common on some sites outside of York, relative to York A ware, than on sites in the city. This may be partly a feature of the date of deposits, in that there are slight variations in the percentage of York D out of the total York A and D wares in the different periods at Coppergate, but these variations are between 1 and 13%, as opposed to 52% at Beverley Lurk Lane and 67% at Thwing. Sprotbrough clearly has too few sherds to consider, although even there two of the three sherds are of York D ware.

**Table 4**

| locality | site name | YORKA | YORKD | Percent D |
|---|---|---|---|---|
| Barton-upon-Humber | | 0 | 1 | 1.00 |
| Sprotbrough | The Gardens | 1 | 2 | 0.67 |
| Thwing | | 6 | 12 | 0.67 |
| Beverley | Lurk Lane | 31 | 33 | 0.52 |
| York | Coppergate P1/3 | 14 | 2 | 0.13 |
| York | Coppergate P5B | 2057 | 256 | 0.11 |
| York | Coppergate P5A | 2231 | 240 | 0.10 |
| York | 16-22 Coppergate | 12804 | 914 | 0.07 |
| York | Coppergate P5C | 344 | 23 | 0.06 |
| York | Coppergate P4/5 | 77 | 5 | 0.06 |
| York | Coppergate P4B | 5963 | 342 | 0.05 |
| York | Coppergate P3 | 946 | 32 | 0.03 |
| York | Coppergate P4A | 1172 | 14 | 0.01 |
| Newcastle-upon-Tyne | Castle, Blackgate | 1 | 0 | - |

| | | | | |
|---|---|---|---|---|
| York | 25 Walmgate | 1 | 0 | - |
| York | 46-54 Fishergate | 2 | 0 | - |
| York | 63-67 Micklegate | 4 | 0 | - |
| York | Dixon's Yard | 1 | 0 | - |
| York | Holy Trinity Goodramgate | 1 | 0 | - |
| York | Speculation Street | 4 | 0 | - |
| York | Stubbs, 1-5 Walmgate | 1 | 0 | - |
| York | York Minster Library 1997 | 1 | 0 | - |
| Lincoln | Flaxengate | 12 | 0 | - |

A single sherd from Doncaster was tentatively identified as a Nottingham Late Saxon Sandy ware vessel. It is a jar decorated with diamond roller-stamping on the shoulder. Samples were taken for thin section and chemical analysis (V1937). Like the York wares, the Nottingham industry appears to have thrived during the years of Viking independence and collapsed in the mid 10th century.

There remain two further phases of Anglo-Saxon pottery use in the county: wares which are of mid 10th to mid 11th-century date, i.e. they are clearly and definitely pre-conquest in origin and use, and wares which may perhaps have been in production before the Norman conquest but probably or certainly continued in use later.

In the first category we can place the majority of the Torksey ware finds from Doncaster. Most Torksey wares have a distinctive 'sandwich' firing which although present throughout is particularly common in the later phases of the industry. There is also a wider range of forms found in the later industry, including a range of open forms, such as spouted bowls and dishes, as well as large storage jars. Some of the Torksey ware kilns produced an even wider range of forms, although this is usually not matched on consumer sites.

Eight of the Torksey ware sherds published by Buckland and Hayfield were sampled (Table 00). One of these was a decorated with roller-stamping on the shoulder (V1928) and five of the remainder can be assigned to the mid 10th to mid 11th century on details of form, rim typology or decoration.

**Table 5**

| TSNO | Sitecode | Context | REFNO | Form | Action | Description | Subfabric |
|---|---|---|---|---|---|---|---|
| V1934 | DT | 85 | No.2 | SMALL JAR | ICPS;TS;PH | L10TH/E11TH C | OXID CORE;GREY SURFACES;MICRITE PELLETS |
| V1958 | DT | 105 | No.12 | BOWL | ICPS;TS | L10TH/M11TH;THUMBED BOWL RIM | MICRITE PELLETS |
| V1946 | DT | 13 | No.20 | SMALL JAR | ICPS;TS;PH | EVERTED RIM;10TH/11TH | NO MICRITE OR VOIDS PRESENT;SANDWICH FIRING |
| V1953 | DR/CJ | PIT 2 | | SPBOWL | TS;ICPS | EVERTED RIM;10-EM11C | |
| V1932 | DQ | AQ | No.439 | SMALL JAR | ICPS;TS | | |
| V1928 | DT | ABN | No.435 | SMALL | ICPS;TS;PH | SQUARE RSD | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | JAR | | | |
| V1933 | DQ | AQ | No.442 | BOWL | ICPS;TS | FLANGED RIM;POST-FIRING HOLES IN BODY | |
| V1936 | DT | BDU | No.441 | LARGE JAR | ICPS;TS | THUMBED RIM | |

A ninth sample has a fabric reminiscent of Torksey ware, but perhaps a little finer in texture, but the rim form is similar to that of Stamford ware jars of the 10th or 11th centuries (TORKT Sample V1948).

One of the earliest wares found on many medieval sites in South Yorkshire is tempered with shell. Visually they are indistinguishable from those made and used extensively in central and northern Lincolnshire. These wares are handmade and the shouldered jar with a roughly cylindrical body is the typical form. Jane Young distinguishes a central Lincolnshire group, known as Lincoln Fine-Shelled ware (LFS) from a northern Lincolnshire group, distinguished by the code NLFS. The visual difference between these wares is mainly recognised by feel, the northern Lincolnshire examples having more quartz sand temper and therefore having a rougher feel. In thin section, the shell in these wares is seen to be actually fragments of a shelly limestone, with a ferroan calcite cement. There are two potential sources for this limestone, both of which are Jurassic. The Cornbrash outcrops along the dip slip of the Jurassic scarp, including in Potterhanworth, where similar wares were produced in the 13th, 14th and 15th centuries. There are, however, shelly beds within the Great Oolite and samples of this limestone are much more similar to the material found in these pots. This limestone also outcrops on the dip slip of the scarp, and is exposed in the hillsides of the Witham Gap quite close to Lincoln. Both the shelly facies of the Great Oolite and the Cornbrash outcrop in North Lincolnshire until they get buried under Quaternary deposits (mainly blown sand) to the north of Scunthorpe. Nevertheless, it remains the case that the precise source of the temper is still unknown.

Chris Cumberpatch has found these shelly wares on several sites in the county and they occur as far west as Todwick. Examples of both the LFS and LNFS wares were sampled. The samples came from Doncaster itself, Tickhill and Warmsworth (Table 00). In two cases sufficient of the vessel remained to assign a typological date, based on occurrence in Lincoln: sample V1939 could be dated between the mid 11th and the late 12th century and sample V1962 could be dated between the mid/late 11th and the early 12th centuries. Until good stratified sequences are available in the county for this period we cannot actually say if any of this shelly ware is pre-conquest in South Yorkshire, even if the same types were used that early in Lincolnshire. The Doncaster samples were all of the central Lincolnshire type, the Tickhill samples consisted of two central and one north Lincolnshire type and the Warmsworth sample was of north Lincolnshire type.

**Table 6**

| TSNO | Sitecode | Context | REFNO | cname | Form | Action | Description | subfabric |
|---|---|---|---|---|---|---|---|---|
| V1939 | wc | E/9 | | NLFS | JAR | ICPS;TS | HANDMADE/WHEEL FINISHED GLOB JAR;SHORT EVERTED RIM;M11/L12 | |
| V1944 | DT | 13 | | LFS | JAR | ICPS;TS | | STANDARD FABRIC (JY 14/05/2003) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| V1951 | DT | 196 | | LFS | SMALL JAR | ICPS;TS | |
| V1962 | DT | 105 | No.18 | LFS | JAR | ICPS;TS | THIN-WALLED;EVERTED RIM (PROBABLY WHEEL-FINISHED);ML11/E12TH |
| V1963 | tickhill 92 | US | | LFS | JAR | ICPS;TS | |
| V1964 | tickhill 92 | US | | NLFS | JAR | ICPS;TS | |
| V1965 | tickhill 92 | US | | LFS | JAR | ICPS;TS | |

A handmade shelly ware from Doncaster did not appear to belong to either of these types. Shell-tempered wares are, of course, extremely common in eastern England during the 11th and 12th centuries and this might be either an atypical Lincolnshire-made vessel or a stray from further afield. Samples were taken for thin section and chemical analysis (SNX, V1949).

**Table 7**

| TSNO | Sitecode | Context | REFNO | cname | Form | Action | Description | subfabric |
|---|---|---|---|---|---|---|---|---|
| V1949 | DT | 196 | No.10 | SNX | JAR | ICPS;TS;PH | HANDMADE | M SHELL >2.0MM;S RQ >1.0MM;MICACEOUS GROUNDMASS |

Two samples of stray finds of other late Saxon/early Norman wares from Doncaster were taken. Both were the only examples of their type seen and their frequency in South Yorkshire is unknown. The first was a splash-glazed vessel of a type recently recognised by Jane Young and Vicky Nailor at Nottingham. Whereas standard Nottingham Splashed ware (NSP) is clearly a post-conquest type and is dated at Nottingham, according to Charlie Young, by its stratigraphic position later than a coin of Henry I, this early Nottingham Splashed ware (NESP) is typologically earlier (Sample V1935). The second sample is a Thetford-type ware (THETT). The distinction between Thetford-type and Torksey-type wares is difficult to justify typologically or on fabric grounds but Jane Young and I have found it very convenient to distinguish between vessels which were either made at Torksey or one of its daughter industries (such as that at Newark) and the products of the East Anglian wheelthrown greyware kilns. Fabric characteristics of these East Anglian wares include rounded, water-worn quartz grains (although this is absent in Ipswich Thetford-type ware) and a fine-textured, micaceous groundmass. Within this East Anglian group the most distinctive fabric group is that produced at Grimston. It is likely that this industry either originated or at least rose to prominence following the foundation of King's Lynn in which case all examples found at coastal sites in eastern England are likely to be of post-conquest date. The Doncaster sample contains some waterworn quartz grains, but the sand temper is mostly composed of subangular quartz and it is by no means clear whether it is a Grimston product or not.

**Table 8**

| TSNO | Sitecode | Context | REFNO | cname | Form | Action | Description | subfabric |
|---|---|---|---|---|---|---|---|---|
| V1935 | DT | 85 | No.3 | NESP | JAR | ICPS;TS;PH | PRE-CONQUEST? | VISUALLY IDENTICAL TO NOTTINGHAM ESP |
| V1927 | DCH/Y | 13 | | THETT | PTCH/SJ | TS;ICPS | WHEELTHROWN STRAP HANDLE | S GSQ >1.0MM;A SA Q >1.0MM |

Finally, one of the most common Saxo-Norman fabrics in Doncaster is made from a light-firing clay, similar to those used in the later medieval period at Hallgate, Firsby and Rawmarsh but often more micaceous, and is tempered with sparse, large rounded red mudstone fragments, which are also a feature of Doncaster Fabric C, known from wasters at the 1995 Hallgate excavations and from a waster pit at the Market Hall. There are, therefore, strong grounds for suspecting that this ware is an early Doncaster whiteware. Offwhite, gritty wares are found over much of northern England in the late 11th to 12th centuries but these Doncaster examples include a number with diamond roller-stamping, either on the rim or the shoulder. Splash glaze is also sometimes found. This combination of splash glaze and roller-stamping is found locally only in the late 9th/early 10th centuries but similar wares have been found at the Dogbank kiln in Newcastle-upon-Tyne, where they are dated to the mid/late 12th century. No examples of the type were found at Sprotbrough and this might support the later date, but neither have they been found on medieval sites in the county examined by Chris Cumberpatch, where they might have been expected if they were contemporary with the Lincolnshire shelly wares. Pending the availability of stratigraphic evidence, they have been classified by me as being a subfabric within the Yorkshire Gritty tradition, and of late 11th/12th-century date (Fabric Code YG).

| TSNO | Sitecode | Context | REFNO | cname | Form | Action | Description | Subfabric |
|---|---|---|---|---|---|---|---|---|
| V1960 | DT | 105 | No.16 | YG | JAR | ICPS;TS;PH | ROLLED-OUT RIM GLOB BODY | RED R FE PELLETS;RED-STAINED/CEMENTED SST;MICACEOUS BODY |
| V1959 | DT | 105 | No.13 | YG | JAR | ICPS;TS | DIAMOND RSD | RED R FE PELLETS;RED-STAINED/CEMENTED SST;MICACEOUS BODY |
| V1950 | DT | 196 | | YG | JAR | ICPS;TS | | SSTMG?;DARK MUDSTONE PELLETS;MICACEOUS BODY |
| V1930 | DT | 63 | No.7 (CAT)/No.8 (FIG) | YG | JAR | ICPS;TS;PH | SPLASH GL;DIAMOND RSD | PROBABLY LOCAL MANUF |
| V1943 | DC72 | ACA | No.440 | YG | JAR | TS;ICPS | | ROUNDED RED FE PELLETS;SA Q >2.0MM;MICACEOUS WHITE-FIRING BODY |
| V1929 | DT | JF | No.432;SF65 | YG | JAR | ICPS;TS | SPLASH GLAZED;WHEELTHROWN;DIAMOND RSD ON SHOULDER ANDRIM; TYPOLOGICALLY L9/E10 BUT ALSO CF NEWCASTLE DOGBANK | RED R FE PELLETS;SA Q >2.0MM;MICACEOUS BODY, FAIRLY LOW IRON |
| L1988 | Doncaster95 | | | YG | | TS;ICPS | | |

To compare with these wares, I have samples of waste from known industries at Torksey, Doncaster Hallgate (fabric B only), Doncaster Hallgate 1995, Doncaster Market Hall, Firsby and Rawmarsh.

## Characterisation Studies

### Methodology

Thin sections were produced of all the samples by Steve Caldwell of the Department of Earth Sciences at the University of Manchester. The samples were stained using Dickson's method. This staining,

using a mixture of Alizarin Red S and Potassium Ferricyanide, distinguishes dolomite (which is the main constituent of the Magnesian limestone hills of South Yorkshire) from ferroan calcite (which forms much of the cement in Jurassic limestones, and in the Spilsby Sandstone) and non-ferroan calcite (which forms most of the shell fossils found in Jurassic limestones as well as the groundmass of the Chalk, which is composed mainly of finely-comminuted microfossils). The chemical analysis was undertaken by Dr J N Walsh at the Department of Geology, Royal Holloway College, London, using Inductively-Coupled Plasma Spectroscopy. The range of elements measured includes both major constituents of the sample and minor and trace elements. The former are measured as percent oxides and the latter as parts per million. An estimate of the quantity of silica (and organic material) present in the sample is obtained by subtracting the total oxides measured from 100%. Lead is also measured. In most cases it is present in low quantities, but in glazed wares the sample can become contaminated in which case lead can account for several percent of the sample.

## A Roman? Shelly ware

In thin section (V1931) this fabric is seen to contain abundant thin-walled bivalve shell up to 2.0mm long and mainly less than 0.2mm thick, rounded echinoid shell up to 1.0mm long and echinoid spines. Sparse rounded phosphate nodules up to 2.0mm across and rounded quartz grains up to 0.5 mm across are also present. The groundmass consists of anisotropic baked clay minerals and sparse to moderate quartz silt.

The inclusions suggest a Jurassic date for the constituents. There is no evidence for a calcite matrix and it seems more likely that the shell is naturally present in the clay. This is the case both for Dales ware and the Bedfordshire shelly ware. The slightly silty matrix is not typical of the south-east midlands ware, which is notable for its soapy feel and almost complete lack of quartz, even in thin section.

A sample of a jar with a Dales ware rim form from Peel, in Scotland, has a similar slightly silty matrix and contains similar inclusions to this Doncaster piece. It is therefore suggested that this is a Roman Dales ware vessel.

Two sets of factor analysis were carried out on the Doncaster chemical data. In the first, which included calcite and the closely-correlated strontium, this sample did not form part of the shelly ware group, presumably mainly because much of the shell has been leached out. In the second run, which omitted these elements, the sample had no close matches with any of the other samples.

Stained thin section and chemical analysis of samples of Dales ware from sites on the Transco West Hull pipeline, which is in preparation, may provide parallels for this piece.

## Early Anglo-Saxon Greensand Quartz tempered ware (ESGS)

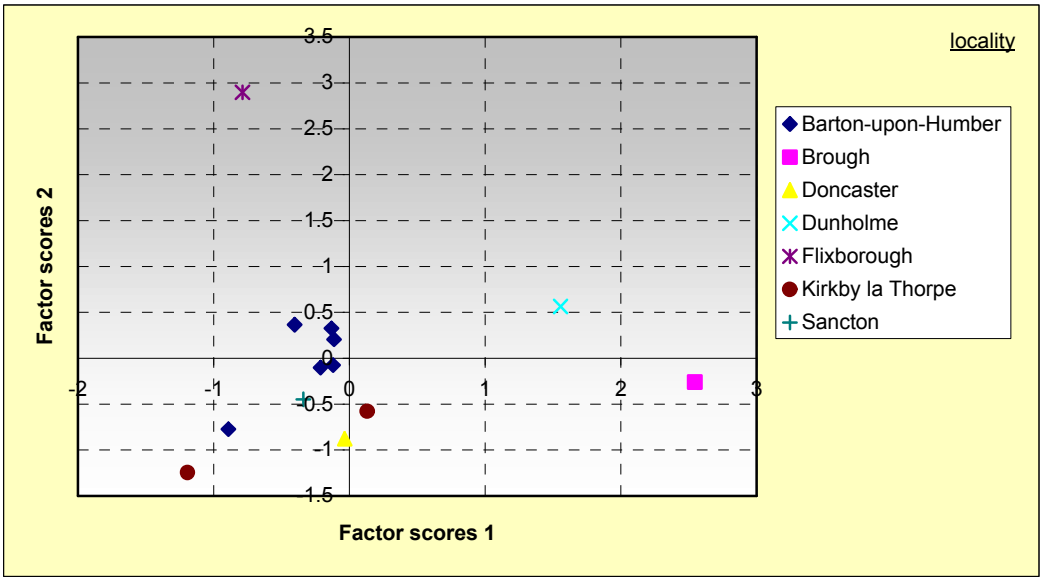
The thin section of this vessel (V1957) reveals that it is tempered with fragments of sandstone. The sandstone contains quartz grains ranging from c.0.5mm to 2.0mm across. The larger ones are well-rounded and typical in appearance of those found in lower Cretaceous deposits (or re-worked into later strata). The sandstone is cemented with phosphate, silica and ferroan calcite but whether this represents at least three different strata or one with a variable cement is not known.

The groundmass consists of anisotropic baked clay minerals with few inclusions (i.e. none more than 30microns across).

The sandstone is almost certainly Spilsby Sandstone, which outcrops along the western side of the Lincolnshire Wolds but is not present in the Yorkshire Wolds. There is therefore little doubt that this vessel was produced in Lincolnshire. Similar fabrics were noted at Barton-upon-Humber.

The chemical analysis (with calcium/strontium) groups this sample with Torksey and Nottingham products rather than with the other calcareous wares and the re-analysis without those elements separates the sample from the Nottingham products but the similarity with the Torksey wares remains.

Thirteen samples of this fabric group from various sides on either side of the Humber have been analysed using ICPS and a factor analysis of the data (omitting Ca/Sr) shows that the Doncaster sample is closest in composition to one from Kirkby la Thorpe, found on the Hatton to Silk Willoughby pipeline and is generally similar to samples from Barton-upon-Humber, Kirkby la Thorpe and Sancton but not to samples from Dunholme and Brough (between Lincoln and Newark). The latter samples come from vessels which contain Lower Cretaceous quartz sand grains but not still cemented together as sandstone grains. A sample from Flixborough is an outlier in this analysis. This is due in part to a high iron, nickel and cobalt content, together with a low Zr count. It is just possible that this may be due to the hard burial environment at that site although the more reasonable explanation is that the Flixborough sample too comes from a different source.




## Nottingham Late Saxon Sandy ware (NOTTS) and Nottingham Early Splashed ware (NESP)

In thin section the sample of NOTTS (V1937) is seen to contain moderate subangular grains of quartz up to 0.5mm across and fine-grained sandstone and chert fragments of similar size. There are also moderate rounded brown clay pellets in a groundmass of anisotropic baked clay minerals with few inclusions.

The sand inclusions are typical of those found in the Trent valley and the Witham terraces and presumably originate in the Triassic strata of Nottinghamshire. There is no gypsum and no ‘millet grain’ quartz (i.e. well-rounded grains with a high sphericity).

These characteristics are very similar to those of Torksey ware.

The thin section of the NESP sample (V1935) reveals a similar quartzose sand (quartz, fine-grained sandstone, chert), with two additions: some of the fine-grained sandstone fragments are cemented with haematite and there are sparse rounded off-white mudstone fragments present, up to 0.5mm long.

Both of these additions are potentially of Coal Measures origin but are clearly detrital grains. One would not imagine that the mudstone fragments would have survived for long in a river sand however.

The chemical analysis shows that with Ca/Sr the samples are most similar to the early Nottingham Splashed ware (NESP) and to the Torksey ware. Without Ca/Sr the NESP and NOTTS samples are separated, slightly from the Torksey ware samples.

The similarity in chemical composition and petrology between these samples and the Torksey ware samples either indicates that the vessels are in fact Torksey products or that Nottingham red earthenwares and Torksey wares are very, very similar in the raw materials used to make them, which is likely to be the case. However, the red sandstone and off-white mudstone fragments might be visible by eye using x20 magnification.

The two Doncaster samples were then compared with the chemical data from a range of Torksey kilns, two groups of medieval potting waste from Nottingham and a sample of a Nottingham floor tile from Hull. Factor analysis showed that the Nottingham kiln waste was quite distinct from the remaining samples but that the Hull floor tile and the Doncaster Nottingham-type fabrics grouped with the Torksey wares. Using another pair of factors (F3 and F4) on the same dataset the two Doncaster samples and some of the Torksey samples, from Kiln 2 were distinguished from the remainder, which included the Nottingham and Hull samples.

To investigate the source of these wares further would require samples of the Nottingham types themselves for comparison.

## Torksey ware (TORK)

The eight thin sections of Torksey ware all contain a quartzose sand with a very similar composition to that of the NOTTS sample described above: subangular and rounded quartz grains, fine-grained sandstone fragments and rounded fragments of chert. Most of the samples also contain rounded clay pellets up to 1.0mm across with a irregular iron or manganese staining. The groundmass consists of anisotropic baked clay minerals with some angular ferroan calcite grains, less than 0.1mm across. These grains may have been inorganic concretions or microfossils, although no structure was noted.

Factor analysis of the chemical data groups the samples together but in three sub-clusters:

Sub-cluster 1) V1933, V1936, V1946 and V1958

Sub-cluster 2) V1928, V1934 and V195

Sub-cluster 3) V1932

It is unlikely that these groupings are meaningful.

The Doncaster Torksey ware chemical data were then compared with that from a range of Torksey ware production and consumer sites. Vessels thought to be Torksey ware from Selby and Beverley Eastgate but subsequently shown not to be were excluded. The remaining samples showed a high degree of similarity and the Doncaster samples could not be distinguished from those from the kiln sites, Barton-upon-Humber, Beverley, or York. The Flixborough samples had slightly different

compositions, which is interpreted as post-burial alteration, as did a sample from early 11th-century levels at Viborg, in Jutland.

Attempts to assign the Doncaster sherds to a specific kiln based on the similarity of the chemical data have not yet been successful. Cluster analysis, for example, does show that the chemical composition of the Torksey wares does vary between kilns but there are clearly patterns of enrichment and depletion which reflect burial conditions. Cluster analysis shows that there are four major clusters in the data, of which one is formed by the Viborg sherd. The remaining three clusters vary significantly between the kilns. Although it seems most likely that these clusters reflect variations in the clay rather than the temper, there is a variation in the 'silica' content between the four clusters (Table 00).

**Table 9**

| locality | Sitecode | 1 | 2 | 3 | 4 | Grand Total |
|---|---|---|---|---|---|---|
| Barton-upon-Humber | BH83 | 2 | 3 | | | 5 |
| Barton-upon-Humber Total | | 2 | 3 | | | 5 |
| Beverley | be84 | 1 | 1 | | | 2 |
| | bll79 | 8 | 6 | 4 | | 18 |
| Beverley Total | | 9 | 7 | 4 | | 20 |
| Doncaster | DQ | 1 | | 1 | | 2 |
| | DR/CJ | | | 1 | | 1 |
| | DT | | 2 | 3 | | 5 |
| Doncaster Total | | 1 | 2 | 5 | | 8 |
| Flixborough | flx89 | 3 | 3 | | | 6 |
| Flixborough Total | | 3 | 3 | | | 6 |
| Torksey | Kiln 6 | 8 | 2 | | | 10 |
| | Kiln 2 | 9 | 1 | | | 10 |
| | kiln 1 | 4 | 3 | 2 | | 9 |
| | Kiln 4 | | | 10 | | 10 |
| | Kiln 3 | 4 | | 6 | | 10 |
| | Kiln 5 | 2 | 1 | 7 | | 10 |
| | Kiln 7 | 2 | 8 | | | 10 |
| Torksey Total | | 29 | 15 | 25 | | 69 |
| Viborg | vsm88 | | | | 1 | 1 |
| Viborg Total | | | | | 1 | 1 |
| York | COPPERGATE | 10 | 4 | 4 | | 18 |
| York Total | | 10 | 4 | 4 | | 18 |
| Grand Total | | 54 | 34 | 38 | 1 | 127 |

The Cluster 2 samples contain the least 'silica', followed by Cluster 1, then Cluster 3 and finally Cluster 4 (Table 00).

**Table 10**

| SiO2 | 1 | 2 | 3 | 4 | Grand Total |
|---|---|---|---|---|---|
| 66-67 | 4 | | | | 4 |
| 67-68 | 7 | 8 | 2 | | 17 |
| 68-69 | 8 | 10 | 1 | | 19 |
| 69-70 | 12 | 3 | 2 | | 17 |
| 70-71 | 8 | 3 | 7 | | 18 |
| 71-72 | 4 | 9 | 11 | | 24 |
| 72-73 | 7 | | 7 | | 14 |
| 73-74 | 2 | 1 | 4 | | 7 |
| 74-75 | 2 | | 3 | | 5 |
| 76-77 | | | 1 | | 1 |
| 78-79 | | | | 1 | 1 |
| Grand Total | 54 | 34 | 38 | 1 | 127 |

## Torksey-type ware (TORKT)

The thin section of the Torksey-type jar from Doncaster (V1948) shows that it contains abundant quartzose sand consisting of quartz, sandstone and chert grains similar in all respects to that found in the Torksey wares except perhaps in quantity. The groundmass, similarly, consists of anisotropic baked clay minerals with few visible inclusions.

The chemical composition, however, is more similar to that of the light-firing, presumably Coal Measure clays used at Firsby, Rawmarsh and Hallgate (Fabric B). This similarity is found both with and without Ca/Sr. It may be, therefore, that the parent clay is actually a Coal Measures rather than a lower Jurassic clay or Triassic clay as presumably used at Torksey. The sand, however, is clearly similar to that found in Nottingham products, Torksey wares and other Trent valley wares.

## Lincolnshire Fine-Shelled ware and North Lincolnshire Fine-Shelled ware (LFS and NLFS)

All seven thin sections of LFS and NLFS reveal a similar shell sand temper. The shell is thick-walled bivalve shell, often with a nacreous structured (i.e. like mother-of-pearl). These shells contain bore holes, either from fungal or other biological attack, and these boreholes, the shell sufaces and sometimes broken shell edges are coated with sparry ferroan calcite. There are no gastropods, brachiopods, echinoid shell fragments or echinoid spines present. There is no evidence for a mixed ferroan calcite/clay matrix. There are sparse rounded quartz grains up to 0.3mm across and sparse angular brown-stained flint up to0.5mm long. The groundmass consists of anisotropic baked clay minerals with no visible inclusions.

These features are identical to those found in vessels from the Lincoln area, and there is no evidence for a higher amount of quartz in the two supposed north Lincolnshire samples. It is likely, therefore, that all of these samples are actually Lincoln-area LFS.

Chemical analysis separates these samples from the remainder by their high calcium and strontium contents. Re-analysis without these two elements reduces the distance between them and the remaining samples, but there is still a chemical difference between them.

The South Yorkshire LFS/NLFS chemical data were then compared with a group of samples from Barton-upon-Humber, Beverley and a sample of Lincoln-made LKT from Flixborough, a dataset of 19 samples in total. Factor analysis of this data showed that there was no difference between the samples from the different sites, except for the Flixborough LKT sample, when examining Factors 1 and 2. Factors 3 and 4, however, showed that the Flixborough and Barton samples have negative F3 scores whereas the remainder have positive F3 scores. This difference is due, amongst other things, to high values for two rare earth elements, La and Ce. It is suspected that these two elements are enriched in samples that have been buried in organic, anaerobic conditions and if this is the case with the Barton samples then there is no reason to believe that they were actually from a different source.

Strangely, considering that NLFS is meant to have a higher quartz content than LFS, the Barton samples consistently have lower 'silica' contents than the remainder. This is also the opposite of the result one would have expected if, indeed, the samples had adsorbed organic matter after burial. Given that the Beverley samples fall into the South Yorkshire group and given that the petrology indicates a source to the west of the Ancholme rather than the east, it makes more sense for all the samples to be Lincoln area products. However, without comparative chemical data from Lincoln itself the study cannot progress much further.

## A Saxo-Norman Shelly ware (SNX)

The thin section of the Saxo-Norman shelly ware (V1949) reveals that it contains a similar shelly limestone sand to that found in LFS. However, the amount of ferroan calcite matrix compared with non-ferroan bivalve shell fragments is higher, and there is a small amount of brown clay intermixed with the sparry calcite. The sample also contains a moderate quantity of quartzose sand, with rounded quartz grains, fine-grained sandstone and chert up to 0.5mm across. The groundmass consists of anisotropic baked clay minerals with moderate quartz and muscovite silt.

The similarity of the shelly limestone to that in LFS and of the quartzose sand to those of Torksey and Lincoln sandy wares suggests a central or northwest Lincolnshire origin. The silty, micaceous clay can be paralleled in the Middle and Upper Lias, which outcrop along the Lincoln Edge but similar clays occur widely.

Factor analysis of the chemical data shows that the sample has a similar composition to the Torksey/Nottingham products rather than the LFS wares which are the closest comparisons in petrology. This similarity can be seen whether the dataset contains CaO/Sr or excludes those elements.

## Thetford-type ware (THETT)

The thin section of the Thetford-type ware vessel (V1927) reveals an abundant quarztose sand, consisting of well-rounded and subangular quartz grains, some of which have haematite veins. The larger grains, up to 1.0mm across, have outlines which identify them as being of lower Cretaceous origin ("Greensand quartz"). The sample also contains moderate quantities of altered glauconite and brown, almost opaque grains which are probably iron-replaced glauconite. These grains are well-sorted and c.0.4mm across. Sparse rounded dark brown clay pellets up to 1.5mm across are also present. The groundmass consists of light-coloured anisotropic baked clay with few visible inclusions.

The petrology of this sample indicates a source in an area of lower Cretaceous rocks, and the quantity of glauconite does not suggest a great deal of transportation from this source. Potential sources exist along the west and north sides of the Yorkshire Wolds, the west side of the Lincolnshire Wolds and then a wide swathe of eastern England, from northwest Norfolk running southwest. Within that potential source area the only known production site for Thetford-type ware is at Grimston.

The factor analysis of the chemical data indicates a very different composition from that of any of the other South Yorkshire samples.

The chemical data for this sample were then analysed together with those from other Thetford-type ware sherds and other wares from Norfolk. These consist of two Iron Age/Roman fabrics from Saham Toney (fabrics 27 and 99), Samples of Grimston Software (GSW) from Kings Lynn and three Thetford-type ware samples: that from Doncaster (THETT), a sample from Selby, identified as Grimston Thetford-type ware following thin section analysis (THET G) and a sample from Barton-upon-Humber (THETT?). Fig 00 shows that the Grimston Software samples form a cluster together with the sample from Barton whereas the Doncaster and Selby samples for a separate group, with the Saham Toney samples having compositions intermediate between the two. This may suggest that the Doncaster and Selby vessels come from another source but it may be that clays with different chemical compositions were being exploited at Grimston.

More samples from the Grimston production site and from consumer sites are required to take this analysis further.

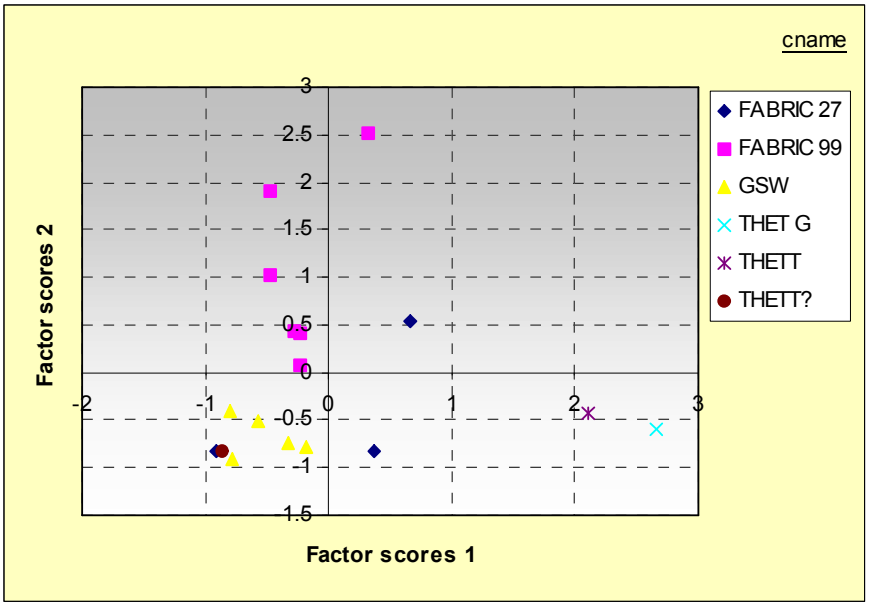



**Figure 1**

## Yorkshire Gritty ware (Doncaster variant) (YG)

In thin section the eight thin sections of this gritty ware can be divided into two groups. The first consists of samples V1929, V1930, V1938, V1943, V1959 and V1960 and the second consists of sample V1950. These have been given the sub-fabric codes 1 and 2.

### Sub-fabric 1

The inclusions in this group consists of a range of rounded iron-rich pellets – opaque with no inclusions, opaque with fine quartz sand inclusions and opaque vesicular, sedimentary rock fragments ranging in texture from brown siltstones to coarse sandstones with a haematite cement. Quartz grains which probably originated in the coarse grained sandstone include fragments with noticeable straining (a sign of metamorphism, but also induced by firing) and rare rock fragments composed of quartz and plagioclase feldspar. All the inclusions range from c.0.3mm to 2.0mm. Sample V1938 contains a lesser quantity of the iron-rich inclusions than the remainder but is otherwise comparable.

The groundmass is anisotropic baked clay minerals with sparse to moderate quartz silt inclusions. Muscovite, although noted by eye in some samples, is rare to sparse.

The inclusions are probably all derived from Coal Measure siltstones and sandstones but it is noticeable that no light-firing kaolinitic clay pellets are present given that the groundmass is likely to originate in the Coal Measures. There is, likewise no evidence for variegation in the groundmass, a common feature in Coal Measure clays.

Factor analysis of the chemical data indicate that this group has a different composition from that of Sub-fabric 2 but that it is very similar to the samples from Doncaster Market. Visually, however, the two groups are easy to distinguish, since the Market Hall products have a higher iron content. This is probably masked in the chemical data because of the high amount of iron in the inclusions, which are present in both groups. Unlike the gritty wares, the Market Hall samples do show variegation in the groundmass.

It is therefore almost certain that these gritty whiteware vessels were produced at Doncaster and it is probable that more care was taken with these vessels to obtain an uncontaminated, light-firing clay. Typologically and technically, however, the two groups are very different and it is unlikely that the same potters produced both groups. There is, indeed, a light-firing Market Hall fabric, from which two samples were taken (V1940 and V1941). These vessels have an slightly finer, less iron-rich temper

than the remaining products but have a distinctly lighter groundmass. Their chemical analyses distinguish them from both the gritty whiteware and the other Market Hall products. They are, instead, comparable with the Doncaster B whitewares from Hallgate and the samples from Firsby.

Factor analysis of the chemical data from these Doncaster gritty wares was analysed alongside samples from York, Beverley and Prudhoe Castle. This analysis showed that the sub-fabric 1 samples are chemically different, confirming the petrological evidence which indicates that they come from a different source, which the comparison with the Market Hall wasters suggests was in or around Doncaster.

## Sub-fabric 2

The thin section of sub-fabric 2 (V1950) contains moderate rounded fragments of organic shale and a coarse grained quartz sandstone (quartz grains up to 1.0mm across). The groundmass is light-coloured and consists of anisotropic baked clay minerals, moderate quartz silt and moderate muscovite laths up to 0.1mm long.

The shale fragments are probably Coal Measure shale and the groundmass could also be a Coal Measures white-firing clay. There are, however, no rounded off-white kaolinitic clay pellets present.

The petrological characteristics of this clay are rather different from those found in York Gritty ware, where the sandstone is probably of lower Carboniferous origin (identified by the presence of overgrown quartz grains, variable quantities of orthoclase feldspar and kaolinite cement) and there is no organic shale in the fabric. The groundmass, however is very similar.

Factor analysis of the Doncaster data shows that this sample, and a similar sample from the 1995 Hallgate excavations, do not group with the sub-fabric 1 samples, and are similar but not identical to samples of Hallgate Fabric B, Firsby and Rawmarsh wares.

When analysed alongside other gritty whitewares, the two Doncaster samples cluster with those from York.