

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 important 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 (1989). Sprotbrough, just outside of Doncaster, has produced a handful of definitely pre-conquest sherds and a number of conquest period or later ones whilst there is undoubtedly material at Pontefract, although the Pontefract Priory finds published by Jean le Patourel have probably been lost for good. More recent excavations at various sites in Pontefract have yet to produce the same range of Anglo-Scandinavian wares that were found at the priory and this must cast doubt on le Patourel's interpretation of these finds, which was to infer that Anglo-Scandinavian-style pottery continued in use into the first quarter of the 12th century, the foundation period of the priory, at which point it was replaced by gritty whitewares. Other finds of potentially Anglo-Scandinavian date from the county consist of shell-tempered jars, found at numerous sites, and a single sherd of Torksey ware found at Bawtry (but unavailable for study in this project). The sites producing Anglo-Saxon pottery in South Yorkshire are listed in Appendix One.

In 2003 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 (forthcoming). This report starts with a general survey of the pre-conquest pottery sequence in South Yorkshire and then describes in detail the results of a programme of characterisation studies carried out by the author, mainly using samples of published Doncaster vessels.

The South Yorkshire Anglo-Saxon Pottery Sequence

Buckland, Magilton and Hayfield list eight sherds from Doncaster which are identified with more or less certainty as being of early to mid Anglo-Saxon date. Of these, five were examined under x20 magnification and re-identified by eye as Romano-British coarsewares, primarily handmade calcite-tempered vessels from the Vale of Pickering or wheelthrown shell-tempered wares from the south east midlands (of the type produced at Harrold in Bedfordshire). One sherd was clearly of Anglo-Saxon date, a stamped urn associated with a hearth excavated at the St George's Church site (DT). The remaining sherds were a small handmade shell-tempered jar (identified as chaff-tempered by Buckland

et al) which did not visually match any known east Midlands and northern British Anglo-Saxon ware but which was nevertheless sampled for petrological and chemical analysis (V1931). This analysis demonstrated conclusively that this was actually a sherd of mid Roman Dales ware (see below, *A Roman? Shelly* ware). The last sherd was a curious flat object from the Market Place site (DMP) tentatively identified by Buckland *et al* as the lug from a spouted pitcher of the type produced at Ipswich and in continental Europe in the mid Saxon period. This sherd also was sampled and proved to be made from an identical fabric to the late 11th/mid 12th-century potting waste found on the same site (V1942, see below *Medieval Doncaster wares*).

Thus, of the 8 potential early to mid Saxon sherds from Doncaster only one remains, the 6th-century stamped urn sherd (V1957, see below *Early Anglo-Saxon Greensand-tempered ware*, *ESGS*).

Table 1

TSNO	Sitecode	Context	REFNO	Ocname	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 a sharp division between those parts of the midlands and northern Britain where pottery was in frequent use in the 5th to 7th centuries and those where it was not. South Yorkshire is definitely in the latter category (Fig 00). The results of the analysis carried out on the sherd reveal an origin in the Lincolnshire Wolds, demonstrating that even when pottery was used in this period in South Yorkshire it was made elsewhere.

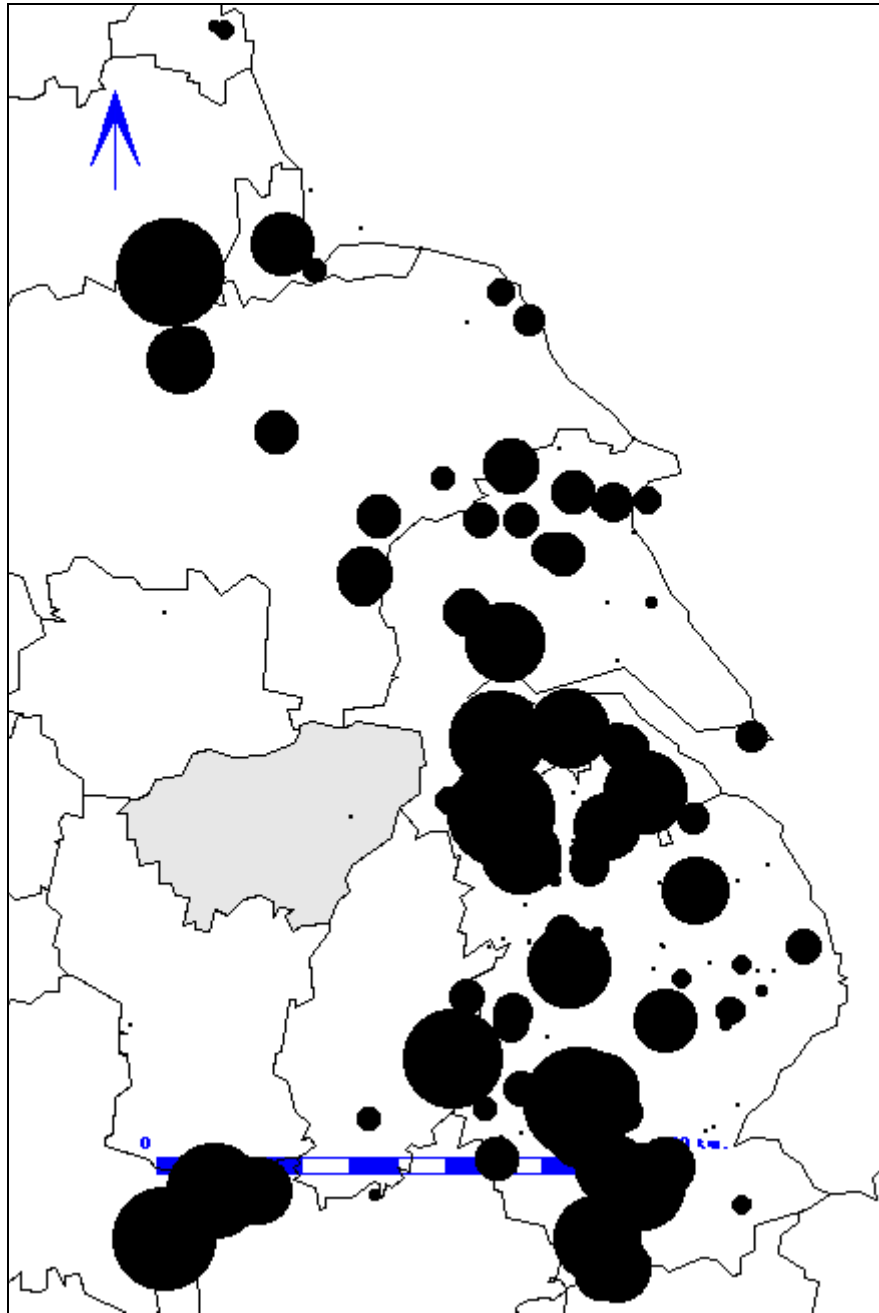


Figure 1 Distribution of 5th - to 7th-century pottery in the east midlands and northern Britain

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

Figure 2 century Stamped sherd from Doncaster

Despite this positive identification of a 6th-century vessel there is no evidence from the county for the use of pottery in the subsequent mid Saxon period, from the late 7th to the mid 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.

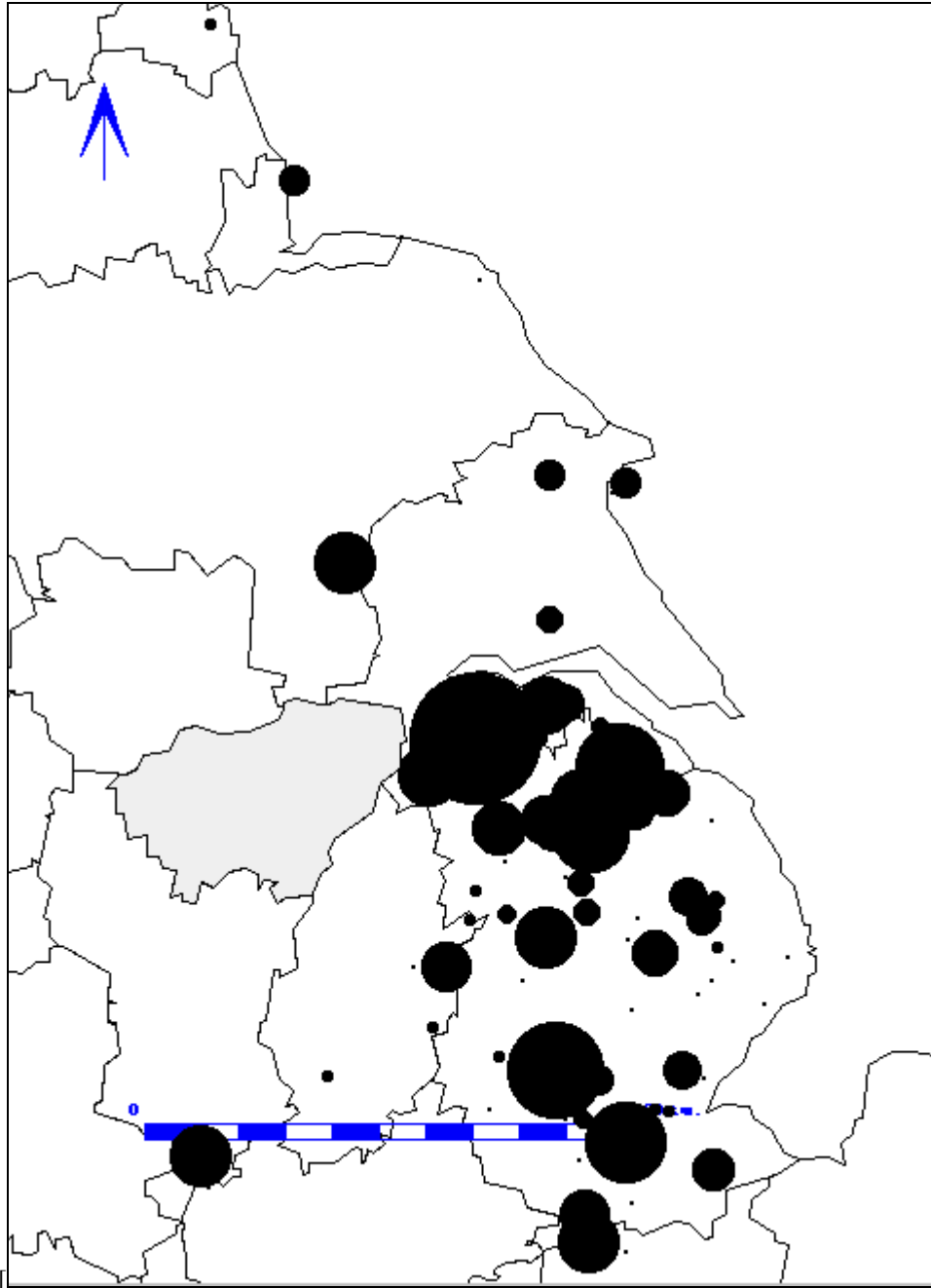


Figure 3 Distribution of Northern Maxey-type ware, Ipswich ware and mid Saxon imports in northern England

The next phase in the South Yorkshire pottery sequence is dated to the late 9th or early 10th centuries. Excavation at York, Lincoln and Nottingham 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 late 9th to early 10th-century 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 wares continued into the mid and late 10th centuries and are 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. It may be that this early Lincoln industry was also supplying the Trent to the south of Torksey, since Lincoln-made shelly wares dating to the late 9th/early 10th centuries have been identified at both Nottingham and Repton. Neither site produced either the early sandy or gritty Lincoln products.

Table 2

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

locality	ELSW	LG	LG?	LGLS	LSLS	LSLS?	LSLSOC
Old Leake					8		
Repton					1		
Stow					19		
West Halton					3		

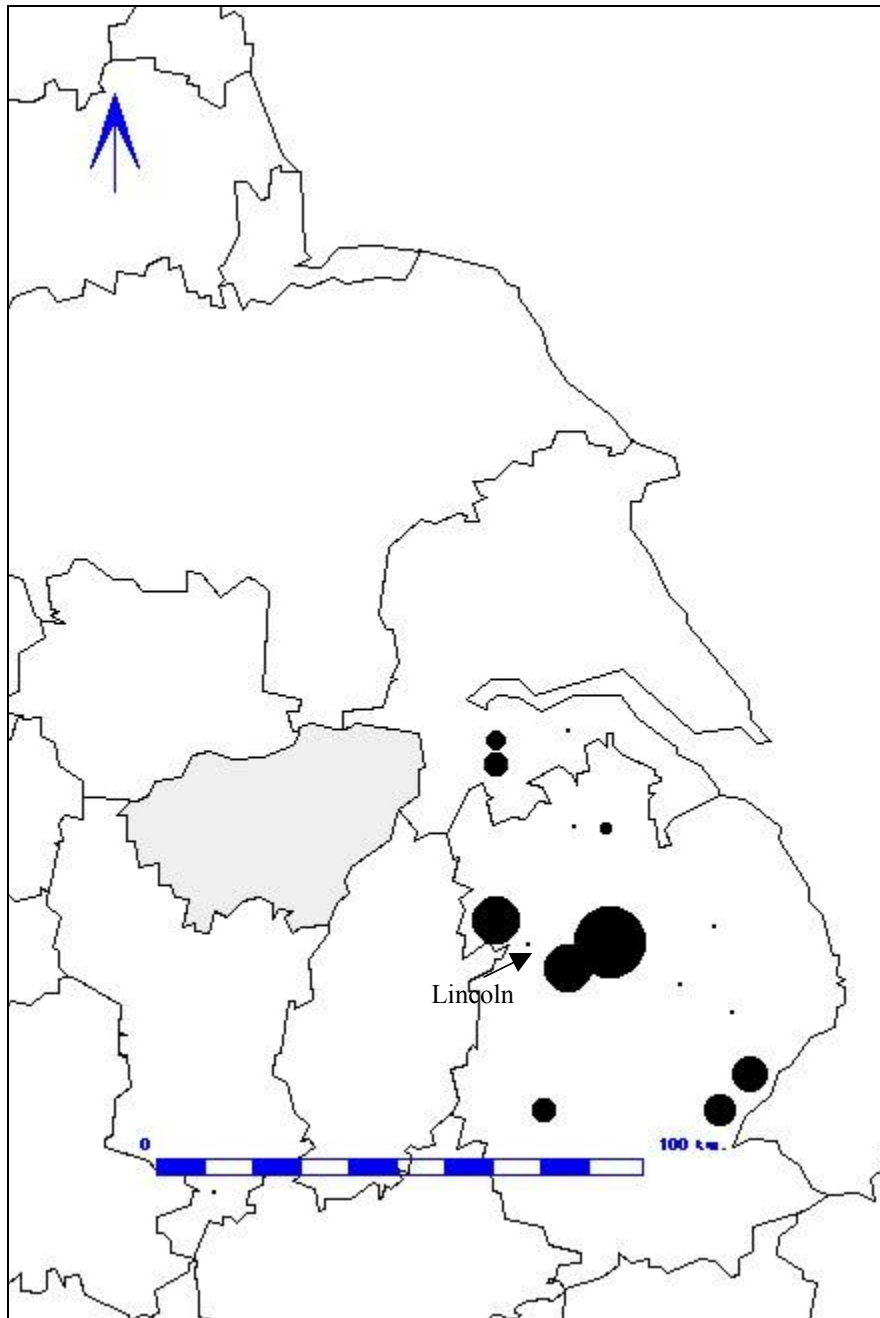


Figure 4 Distribution of Late 9th/early 10th-century Lincoln products in the East Midlands and Northern Britain

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 early Torksey 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). There is a sherd of roller-stamped Torksey ware from Doncaster (Sample V1928). It is likely that much of this roller-stamped Torksey ware is actually of mid 10th century date but definite 9th/early 10th-century sherds, identified through their typology, have been noted at Flixborough and York, emphasising that the main market for the Torksey potters was the Trent downstream of Torksey.

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
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 even if it is the case that this is a late 9th/early 10th century vessel it would require more than a single find to confirm this.

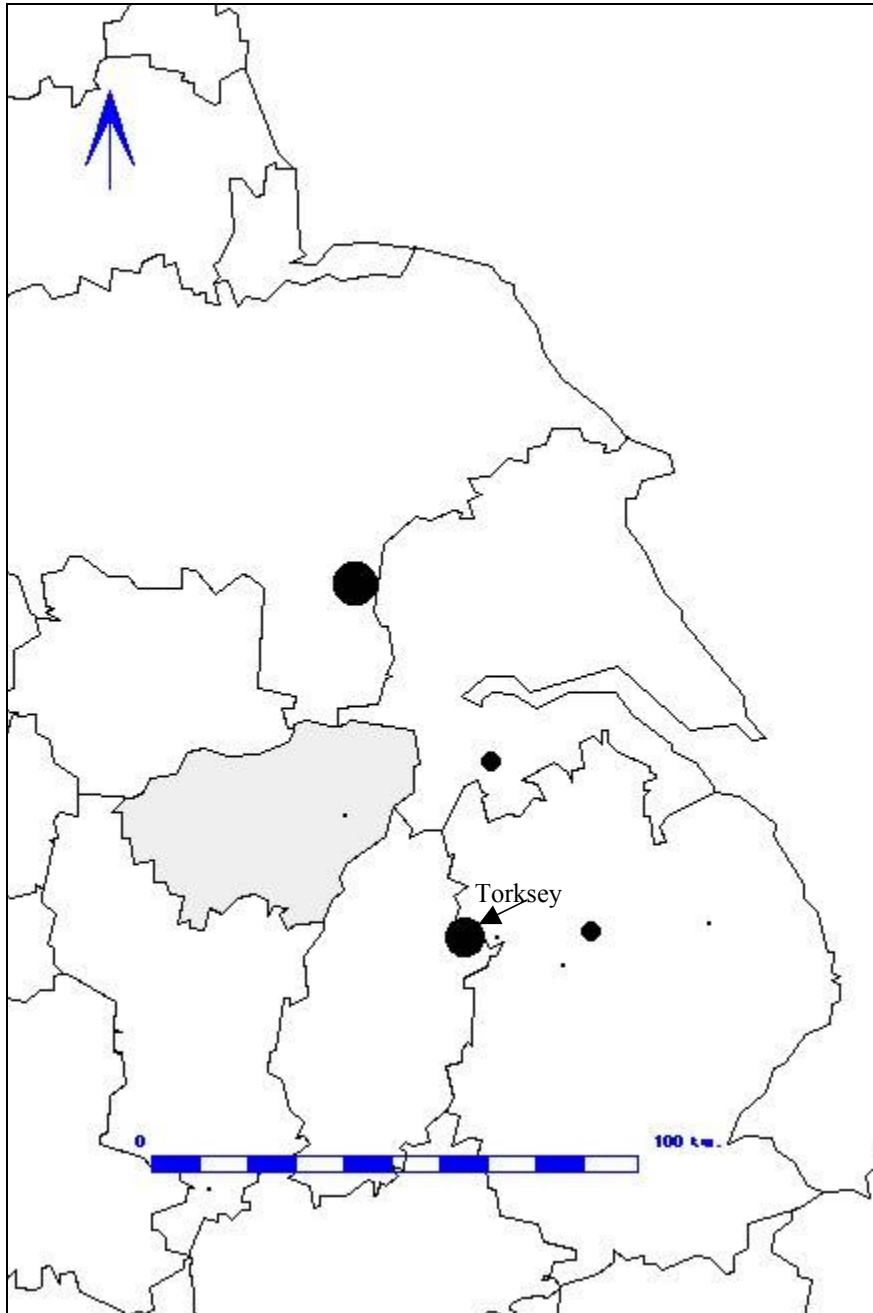


Figure 5 Distribution of Roller-stamp decorated Torksey ware in the East Midlands and Northern Britain

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	-

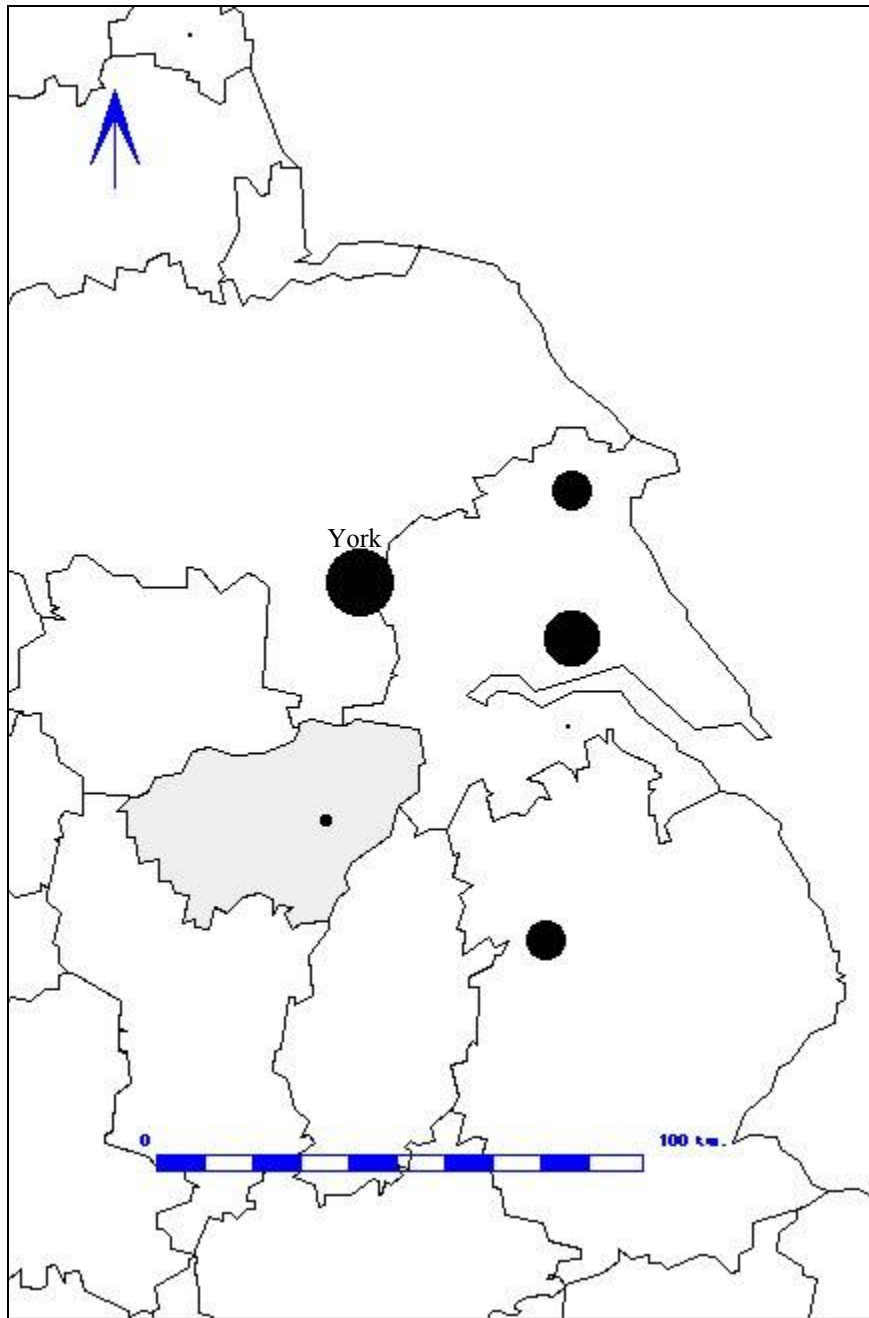


Figure 6 Distribution of York A and York D wares in the East Midlands and Northern Britain

Finally, a single sherd from Doncaster was tentatively identified as a Nottingham Late Saxon Sandy ware vessel. It is a jar in an oxidized, red-firing sandy ware 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. Sherds of NOTTS have been recognised at Lincoln, Old Leake, Holton le Clay and Newark, as well as in Nottingham itself. Recently, a pottery production site was

discovered at the Technical College in Lincoln which was operating in the mid 10th to early 11th centuries and one of the products of this kiln is visually extremely similar to the Nottingham products. It is possible, therefore, that the Lincolnshire finds are actually Lincoln products. However, the Newark and Doncaster finds are as likely to be Nottingham products. The two wares are different in date, however, and if the Doncaster find is indeed of Nottingham origin then it becomes the earliest proven Anglo-Scandinavian sherd from the town. Furthermore, some of the Lincoln finds are stratified in late 9th/early 10th-century deposits and thus pre-date the Technical College industry. These, at least, are likely to be Nottingham products, demonstrating that NOTTS vessels did travel.

To summarise, there are no undisputable sherds of late 9th to early 10th-century date from Doncaster, compared with three from Sprotbrough. Since those Sprotbrough sherds come from vessels made in the York area and presumably either carried overland along the Roman York to Lincoln road through Doncaster or arrived by boat, again almost certainly through Doncaster the absence of these wares from the town is curious. If it were not for the Nottingham vessel one might suggest that the fort at Doncaster was not occupied until later. It should be noted that in Lincoln the walled upper city seems to have been reserved for religious and elite settlement during the late 9th/early 10th century and the same holds true for the fortress at York. Perhaps, then, the fort at Doncaster held a church and perhaps a hall whilst any associated secular commercial settlement lay outside the fort. If so, the excavation campaign of the 1960s and 1970s makes it clear that it did not lie to the south of the fort.

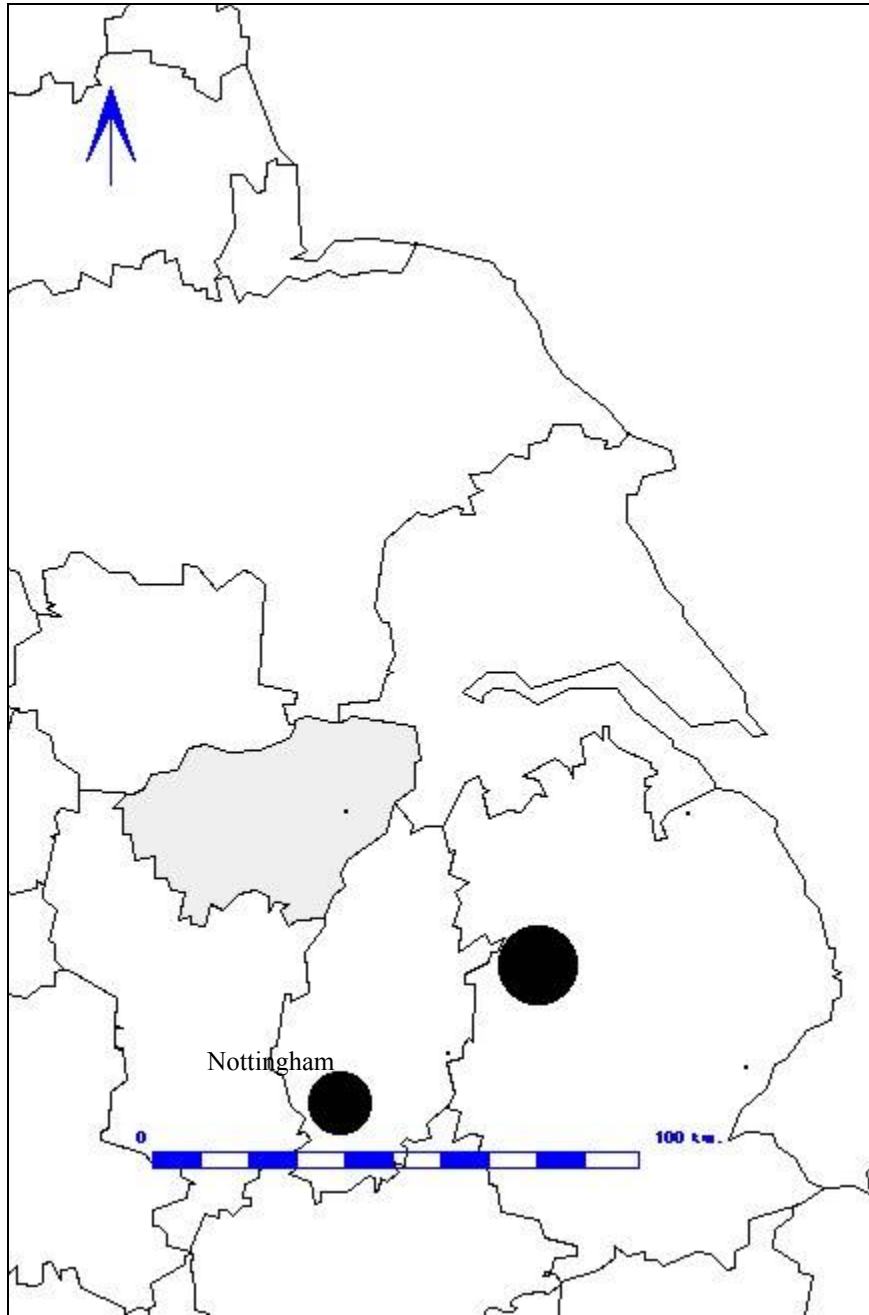


Figure 7 Distribution of Nottingham Late Saxon Sandy ware (NOTTS) in the East Midlands and Northern Britain

There remain two further phases of Anglo-Saxon pottery use in the county: firstly, 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, secondly, wares which may perhaps have been in production before the Norman conquest but probably or certainly continued in use later. In Lincoln, however, a third period is recognisable, stratigraphically sandwiched between the late 9th/early 10th century wares described above and the late 10th century, in which Torksey wares dominate city assemblages. This phase is dated to the early/mid to

mid 10th century and is characterised by a wheelthrown shelly ware, also made in Lincoln, LSH. However, since there are no typological differences between the LSH vessels in these deposits and those found in late 10th/early 11th-century deposits it is impossible to recognise this phase except where stratified assemblages are available. A possible sherd of this ware has been identified visually by Jane Young at Pontefract.

In the first, late 10th to mid 11th century, category we can place a single sherd of Lincoln shell-tempered ware (LKT) from Hellaby Hall, together with 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. Buckland *et al* note the widespread occurrence of Torksey ware on sites in Doncaster, and seven sherds have been found at Sprotbrough.

Eight of the Torksey ware sherds published by Buckland and Hayfield were sampled (Table 5). 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 JAR	ICPS;TS;PH	SQUARE RSD	
V1933	DQ	AQ	No.442	BOWL	ICPS;TS	FLANGED RIM;POST- FIRING HOLES IN BODY	
V1936	DT	BDU	No.441	LARGE	ICPS;TS	THUMBED RIM	

JAR

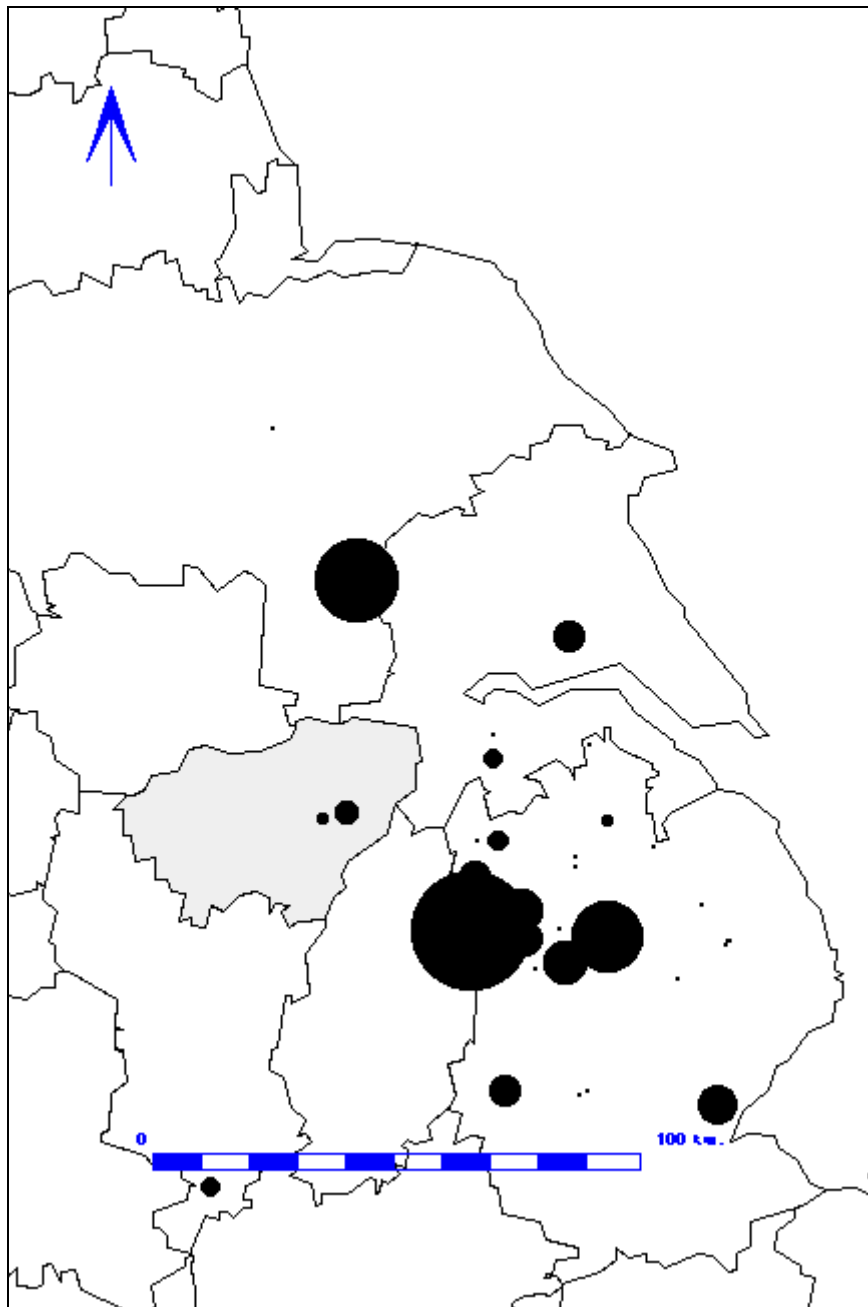


Figure 8 Distribution of mid 10th to mid 11th-century Torksey wares in the East Midlands and Northern Britain

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).

Stamford ware itself is not particularly common in South Yorkshire. A handful of sherds have been published and these include at least one definitely pre-conquest find, with a glossy yellow glaze (Buckland *et al* No.22). There were no sherds from Sprotbrough and the only sherds from Pontefract appear to have been the jugs from the priory site which were probably of mid 12th century date.

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 6). 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
							HANDMADE/WHEEL FINISHED GLOB JAR;SHORT EVERTED	
V1939	wc	E/9		NLFS	JAR	ICPS;TS	RIM;M11/L12	
V1944	DT	13		LFS	JAR	ICPS;TS		STANDARD FABRIC (JY 14/05/2003)
					SMALL			
V1951	DT	196		LFS	JAR	ICPS;TS		
V1962	DT	105	No.18	LFS	JAR	ICPS;TS	THIN-WALLED;EVERTED RIM	

(PROBABLY WHEEL-
FINISHED);ML11/E12TH

tickhill
V1963 92 US LFS JAR ICPS;TS

tickhill
V1964 92 US NLFS JAR ICPS;TS

tickhill
V1965 92 US LFS JAR ICPS;TS

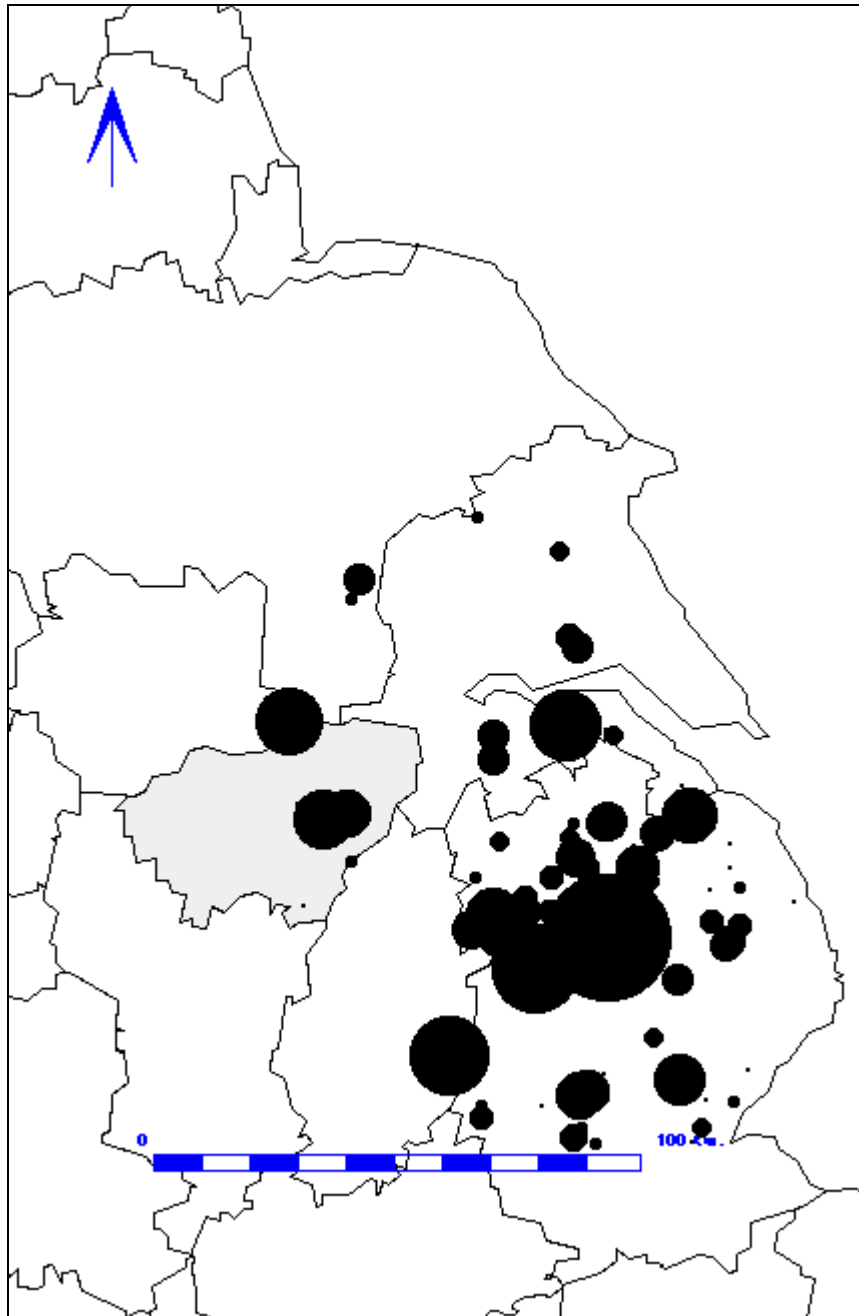


Figure 9 Distribution of Lincoln Fine-Shelled ware (LFS) in the East Midlands and Northern Britain

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, probably mid 11th to mid 12th century in date (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/SJTS	ICPS	WHEELTHROWN STRAP HANDLE	S GSQ >1.0MM;A SA Q >1.0MM

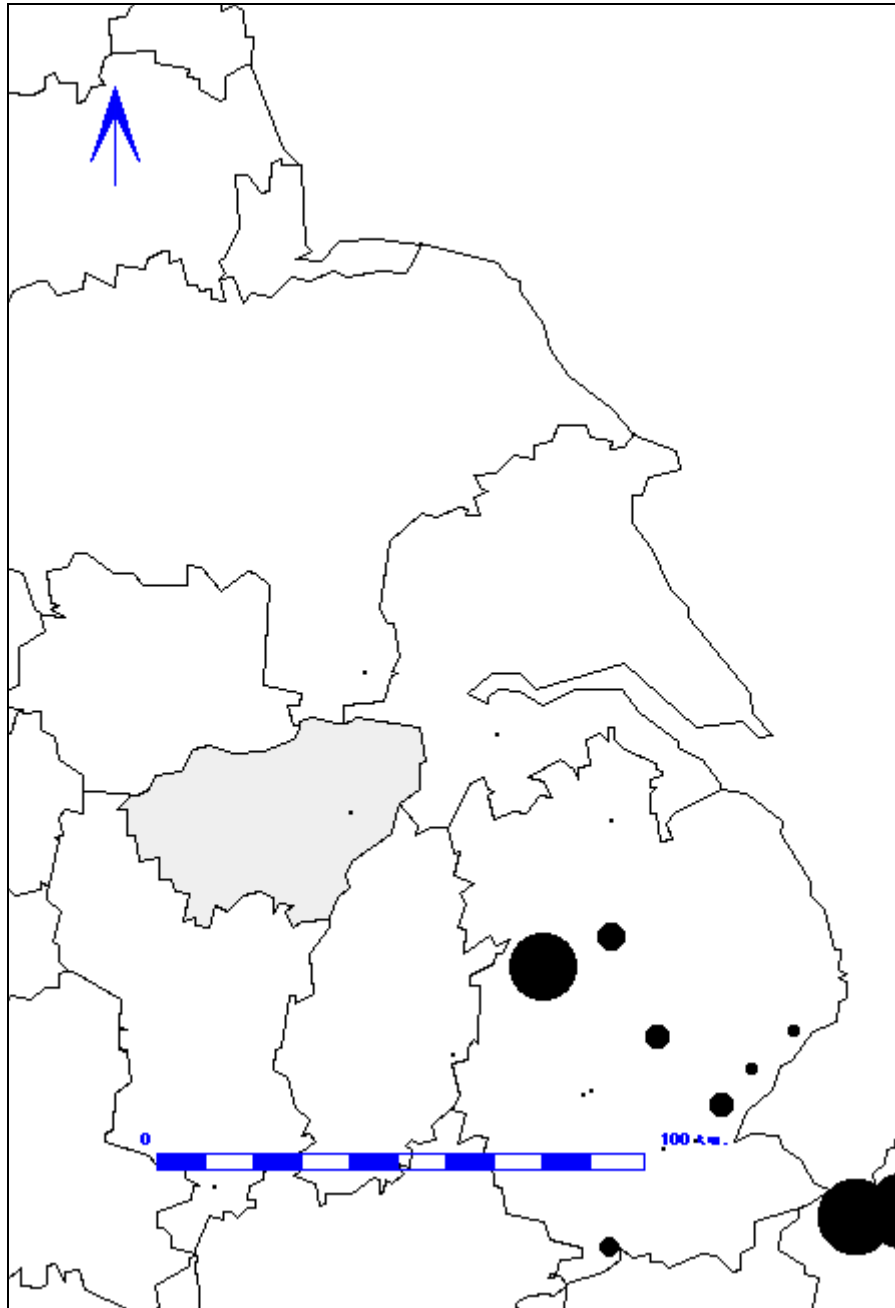


Figure 10 Distribution of Grimston Thetford-type ware (THETT G) in the East Midlands and Northern Britain

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. As Buckland *et al* have pointed out, these red mudstone fragments 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. The question is, how

early? Buckland *et al* argue strongly that the decoration of diamond roller-stamping and the shouldered jar forms are a pre-conquest phenomenon in the east midlands and northern Britain and this appears to still hold true. There are exceptions, such as at Newcastle upon Tyne, where the Dogbank kiln has been dated to the mid 12th century by archaeomagnetic dating and typology, but by and large the typology of these sherds is consistent with a pre-conquest date. Furthermore, the vessels are splash glazed. At both York and Lincoln it seems that splash glazing was a technique which was used experimentally in the late 9th and early 10th century but given up by the mid 10th century, perhaps as the Stamford glazed ware industry began to take off. However, another equally close parallel for the Doncaster vessels can be found in Canterbury, where the Pound Lane kiln is dated to the mid 12th century and is interpreted as the work of French potters. In fact, the squared rims of some of the Doncaster vessels, with roller-stamping on the exterior of the rim, are more closely paralleled by the Pound Lane vessels than they are by either late 9th/early 10th-century vessels in the area or by the Dogbank kiln products.

Therefore either a late 9th/early 10th or a late 11th to mid 12th century date is possible. No examples of the type were found at Sprotbrough, where there appears to be a hiatus in activity in the late 11th/early 12th century, 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. Furthermore, even within Doncaster the sherds are found only on sites within the area of the Norman castle. A case could therefore be made for the presence of a Norman potter operating at Doncaster, whose wares were destined mainly for the occupants of the castle. Conversely, the castle was built over one quarter of the Roman fort, which was certainly occupied in the mid 10th to mid 11th centuries, and perhaps this pottery is evidence for its occupation in the preceding period too? Pending the availability of conclusive stratigraphic evidence, they have been classified by me as being a subfabric within the Yorkshire Gritty tradition, and of late 11th/12th-century date but the earlier date is perhaps just as likely (Fabric Code YG subfabric DONC 1).

To confuse matters even further, there are also sherds of typical northern white gritty wares from Doncaster, including one sherd from the 1995 Hallgate kiln (sampled for Chris Cumberpatch, sample L1988) and one sampled for this project (V1950).

TSNO Sitecode	Context REFNO	cname Form Action	Description	Subfabric
V1960DT	105 No.16	YG JAR ICPS;TS;PHROLLED-OUT RIM GLOB BODY		RED R FE PELLETS;RED- STAINED/CEMENTED SST;MICACEOUS BODY
V1959DT	105 No.13	YG JAR ICPS;TS	DIAMOND RSD	RED R FE PELLETS;RED- STAINED/CEMENTED SST;MICACEOUS BODY
V1950DT	196	YG JAR ICPS;TS		SSTMG?;DARK

						MUDSTONE PELLETS;MICACEOUS BODY
V1930DT	63	No.7 (CAT)/No.8 (FIG)	YG	JAR	ICPS;TS;PHSPLASH GL;DIAMOND RSD	PROBABLY LOCAL MANUF
V1943DC72	ACA	No.440	YG	JAR	TS;ICPS	ROUNDED RED FE PELLETS;SA Q >2.0MM;MICACEOUS WHITE-FIRING BODY
V1929DT	JF	No.432;SF65YG	YG	JAR	ICPS;TS SPLASH GLAZED;WHEELTHROWN;DIAMOND>2.0MM;MICACEOUS RSD ON SHOULDER ANDRIM; TYPOLOGICALLY L9/E10 BUT ALSO IRON CF NEWCASTLE DOGBANK	RED R FE PELLETS;SA Q BODY, FAIRLY LOW
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.

The chemical data were analysed using Factor Analysis (using the Winstat for Excel™ add-in). Initially the entire South Yorkshire dataset was analysed, including all measured elements normalised

to Al₂O₃ (Fig 3). This, however, emphasised the difference between the shell-tempered LFS samples and the remainder which was due, almost entirely, to their CaO and Sr content. The dataset was then re-analysed omitting these two elements (Fig 4). In this analysis too the difference between two of the samples (DWSH and THETT) caused all the remainder to cluster close together, obscuring the detail of their relationships somewhat.

For selected groups of samples, where there was comparative evidence from other sites outside the county sub-sets of the South Yorkshire data were analysed alongside these comparative samples.

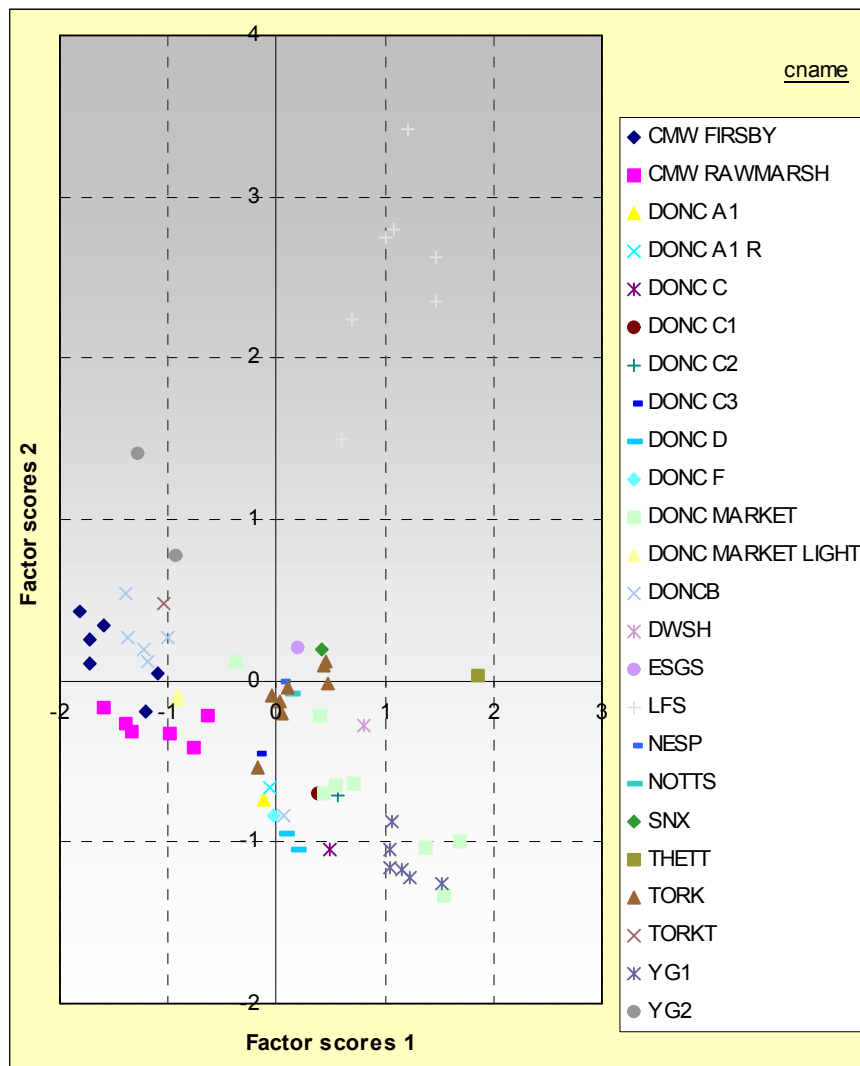


Figure 11

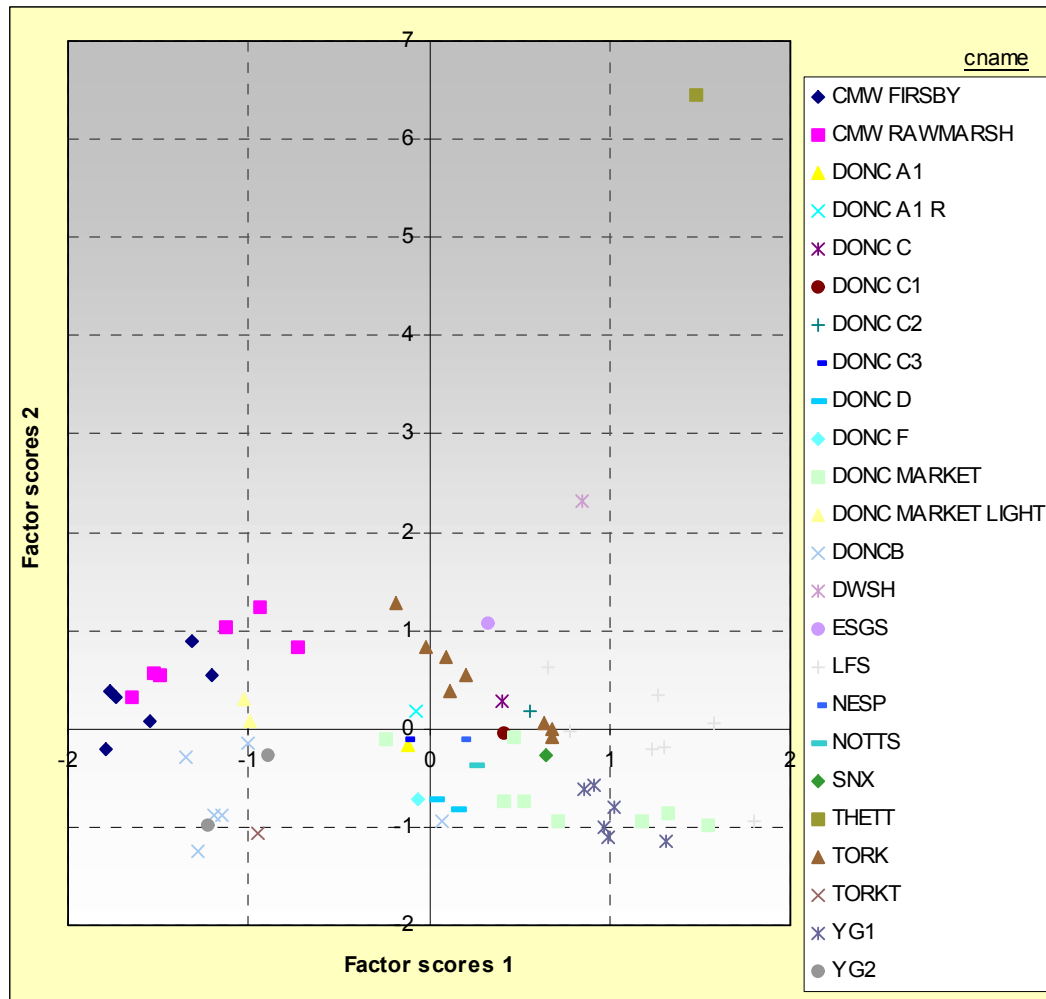


Figure 12

A Roman? Shelly ware (DWSH)

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 (DWSH).

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 sites 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.

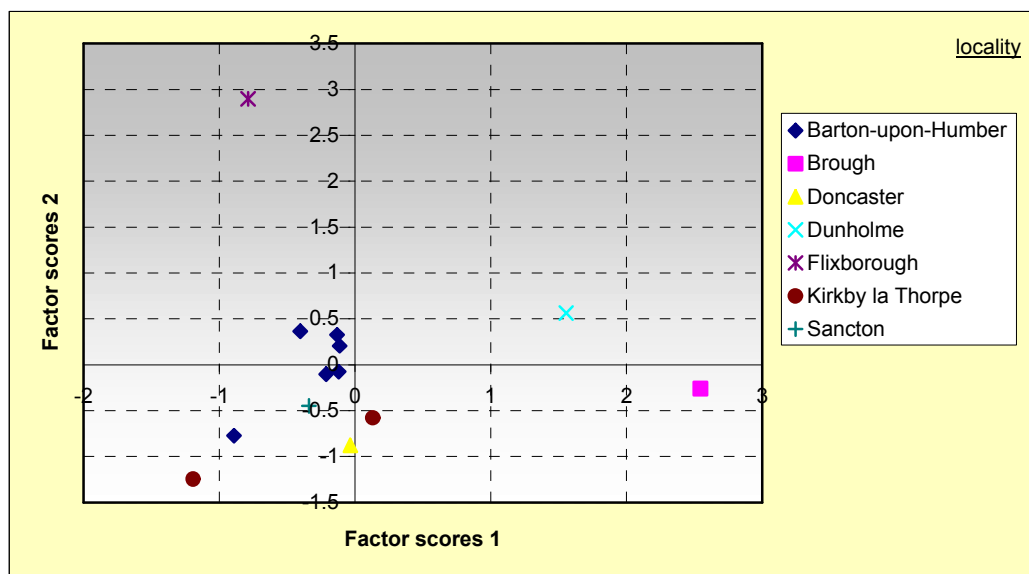


Figure 13

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 (Table10).

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
	bl179	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 10).

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 surfaces 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 to 0.5mm 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 quartzose 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 5 shows that the Grimston Software samples form a cluster together with the sample from Barton whereas the Doncaster and Selby samples form 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.

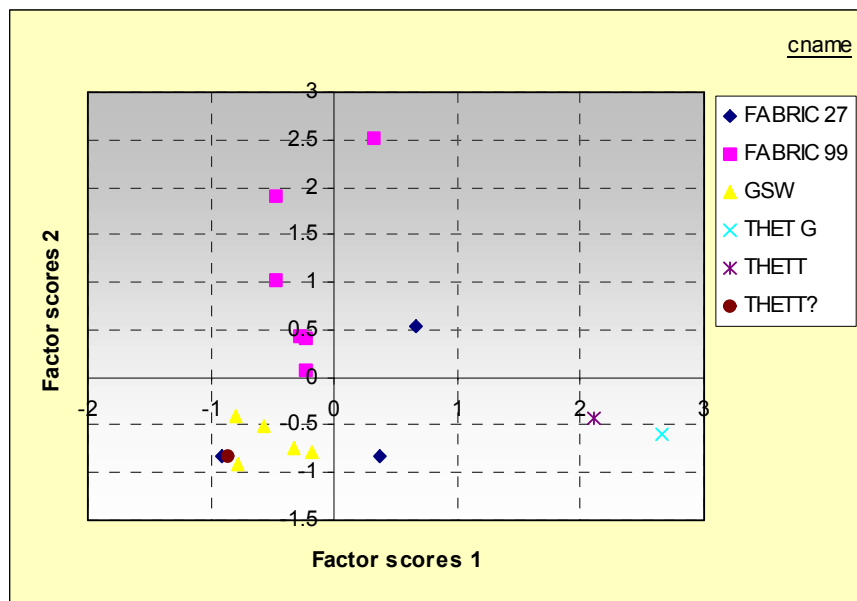


Figure 14

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 – and 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.

The samples of this subfabric include roller-stamped and splash glazed vessels.

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. The forms of these samples are consistent with this York Gritty attribution, coming from wheelthrown cylindrical-bodied jars.

A case can be made for this subfabric being a local product. However, the difference in petrology and lack of an exact chemical match with material of known Doncaster area origin makes this uncertain.

Medieval Doncaster wares

An added bonus of this analysis has been to allow the source of the raw materials used by medieval Doncaster potters to be compared. Samples of products from three production sites in the town have been analysed: Doncaster Market Hall, Doncaster Hallgate 1995 and Doncaster Hallgate. At each of these sites there is evidence for the production of distinctly different fabrics: at the Market Hall these consisted of a gritty handmade ware and a light-bodied gritty handmade ware. Samples of wheel-finished vessels from a consumer site in the town indicates that they were produced using identical clay, as was a jar made with an external slip containing shell fragments (Table 11). Unfortunately, the shell-rich slip could not be seen in thin section.

Table 11

TSNO	Sitecode	Context	REFNO	cname	Form	Action	Description
V1945	DT	13		DONC MARKET	JAR	ICPS;TS	WHEEL-FINISHED SHOULDER;SHELL FRAGS IN EXT SLIP

V1947 DT	13	No.21	DONC MARKET	JAR	EVERTED SQUARED RIM;REDUCED ICPS;TS;PHSURFACES;WHEEL-FINISHED RIM
V1952 DT	16	No.19	DONC MARKET	JAR	WHEEL-FINISHED HM;LID- ICPS;TS;PHSEATED;ML11/E12TH?
V1961 DT	105	No.17	DONC MARKET	PTCH/JAR	SPLASH ICPS;TS;PHGLAZE;HANDMADE;ML11/E12TH?

The 1995 Hallgate fabrics were divided into eight sub-fabrics by Chris Cumberpatch: A1, A1R, C, C1, C2, C3, D and F. A sample of gritty ware from the site was also examined but was not thought to have been made on the site. Finally, three fabrics were found on the Hallgate site: A, B and C. Of these, only fabric B has been analysed by the author.

The factor analysis of the entire South Yorkshire dataset shows that the whiteware produced at Firsby, Market Hall (light firing), Hallgate and Rawmarsh are all very similar to each other but can generally be distinguished. The redware Market Hall products and the 1995 Hallgate samples, on the other hand, are similar to each other but they too can be distinguished.

Factor analysis of just the production waste indicates that the Rawmarsh products are chemically distinct from the rest but that the Firsby, Hallgate B and light firing Market Hall samples form one diffuse cluster whilst the remaining Market Hall samples and all the samples from the 1995 Hallgate site form a second cluster. These clusters are shown on Fig 6. Since the Market Hall light firing and red firing wares differ solely in the colour of the groundmass and have the same, iron-rich coarse sand temper, it is clear that this distinction is due to the composition of the clay. Furthermore, since the gritty ware Sub-fabric 1 samples have a light-firing body but are chemically similar to the Market Hall redwares this distinction is not simply due to the colour of the matrix either. It seems, therefore, that there are three chemically distinct potting clays in the Don valley.

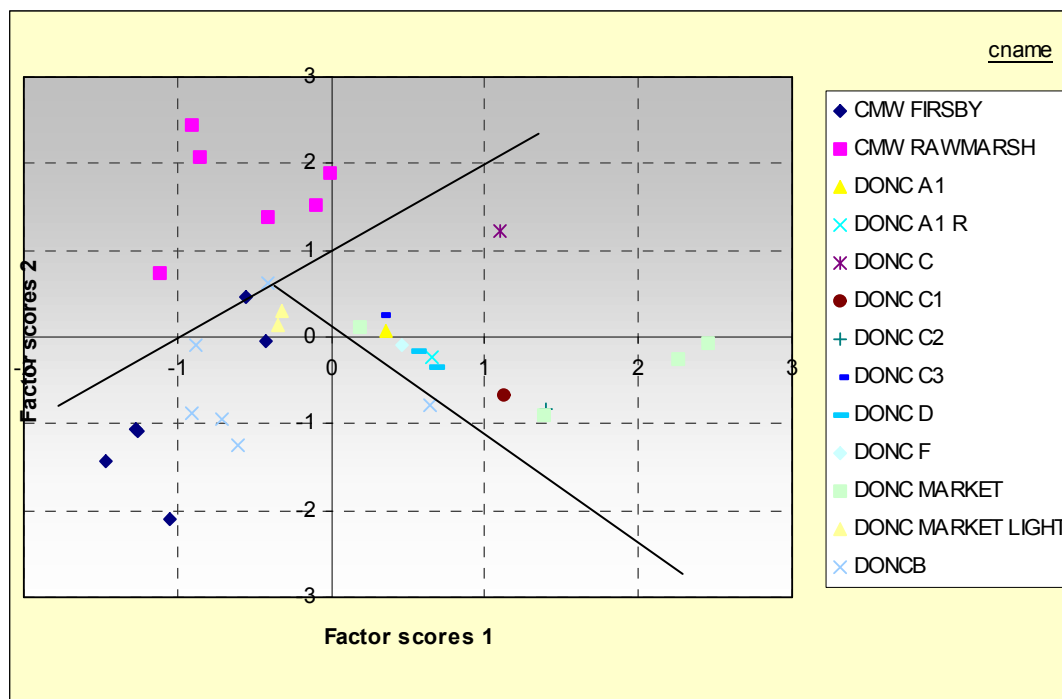


Figure 15

One was being exploited by the Market Hall and 1995 Hallgate potters, and by the producers of the gritty whiteware roller-stamped splash glazed wares, one was being exploited by the Firsby, Hallgate and Market Hall potters and one solely by the Rawmarsh potters. Several of these wares are of the type loosely termed Coal Measures Whiteware and it would seem likely that the second and third of these chemical groups represent wares made using Coal Measures white-firing clay. The first group, however, includes both light firing and red firing wares and is likely to have been local to Doncaster. Perhaps it was an alluvial clay from the Don valley formed primarily from reworked Coal Measures clay outcropping further upstream. Here too, further clarification would be possible if samples of alluvial and Coal Measure clays from the Don valley were collected and sampled.

Conclusions

The use of thin section and ICPS analysis has helped to confirm some initial identifications and modify or disprove others. In almost every case there are grounds to believe that further sampling, both of material from South Yorkshire and of comparative samples from elsewhere, will be able to tie up a number of the loose ends revealed by this study. The present study has, however, disproved a tentative Anglo-Saxon date for a shell-tempered vessel, which is now identified as a Dales ware. It has identified a sherd of early Anglo-Saxon date from Doncaster as a product of the Lincolnshire Wolds area.

There is a complete lack of mid Saxon pottery in the county despite the presence of both coins and metalwork of this date from Sprotbrough. There are, however, three definite sherds of late 9th/early 10th century date from Sprotbrough. If the identification of the NOTTS sherd from Doncaster can be

confirmed then this sherd too would be of early Anglo-Scandinavian date. However, it is also possible that it is a late 10th/early 11th-century Lincoln product (SNLS). The lack of York A and D wares in Doncaster is surprising and either suggests that these wares were not identified by Colin Hayfield, which would be surprising, or that no sites of this date have been excavated in Doncaster, which in turn casts doubt on the identification of the NOTTS vessel. One possible solution is that the roller-stamped splash glazed gritty whiteware was produced in Doncaster at this time and used in preference to York products (but if so then why not at Sprotbrough). Clearly, new evidence is desperately needed for this period.

Mid 10th to mid 11th-century Torksey wares from Doncaster have been confirmed as Torksey products, but the similarity in fabric between these wares and those of supposed Nottingham origin has been recognised, leading to a call for further work. The shell-tempered ware which is found extensively in the county in the 11th and 12th centuries has been shown to have a Lincolnshire origin and the existence of two groups, a northern and a central Lincolnshire group, has been called into question. Another shell-tempered ware, visually quite distinct from the LFS group, has been shown to also have a Lincolnshire origin. A Thetford-type ware from Doncaster has been compared with examples of Grimston Software and Thetford-type wares from consumer sites in the Humber estuary. It is similar to one from Selby but distinct from a vessel from Barton-upon-Humber, which does, however, match the Grimston Software. It is suggested therefore that although the Doncaster and Selby vessels may be Grimston products this is unproved, whereas the Barton sample is almost certainly from Grimston.

A group of roller-stamped and splash glazed gritty whitewares has been shown to be of Doncaster manufacture, being very similar to material from the Doncaster Market Hall waste although it is not possible to place this material into the South Yorkshire Anglo-Saxon pottery sequence and there are two alternative typological dates: late 9th/early 10th century and late 11th/mid 12th century. All the examples known come from a single site, St George's 1970-2 and are found in association with mid to late 11th-century LFS and late 11th/mid 12th-century Doncaster Market wares however, they could easily be residual and there are parallels for short-lived late 9th-early 10th-century pottery industries whose products are rare, for example at Leicester and Nottingham.

Finally, it has been shown that the medieval Doncaster wares were made from two distinct chemically clays, but that this difference in composition is not the expected difference between white-firing and red-firing clays. Rather it is suggested here that some of the white-firing clays were indeed Coal Measure whitewares, obtained from the same clay beds that the Firsby potters were exploiting in the later 13th century and later, but that some were obtained locally, from Don valley alluvium.

Acknowledgements

This work was carried out with the help of a grant from English Heritage as part of the Kingdom of Northumbria Anglo-Saxon Pottery Survey (NASP). I am very grateful to Jane Young and Chris Cumberpatch for sharing their knowledge of the county's Anglo-Saxon and medieval pottery with me

and to Peter Robinson and Doncaster City Museum for permission to sample finds in their care. Sample preparation was carried out by Peter Hill. The thin sections were produced by Steve Caldwell of the Department of Earth Sciences, University of Manchester, and the chemical analysis was carried out by Dr J N Walsh, Department of Geology, Royal Holloway College, London.

Bibliography

Buckland, P C Magilton J R and Hayfield, C (1989) *The Archaeology of Doncaster. 2 The Medieval and Later Town*. Brit Archaeol Rep 202 Oxford, Tempvs Reparatum.

Young, Jane and Vince, Alan (forthcoming) *A Corpus of Anglo-Saxon and Medieval Pottery from Lincoln*. Lincoln Archaeological Reports Oxford, Oxbow.

Appendix One: List of Sites Producing Anglo-Saxon Pottery in South Yorkshire

Locality	Site Name	Grid Reference	Site Code	Finds Location
Bawtry	16-20 Church Street	SK 6500 9200	Baw/2	Doncaster Museum (and one sherd in Sheffield Museum)
Doncaster	Church Street 1967	SE 5800 0300	DC67	Doncaster City Museum and Art Gallery
Doncaster	Church Street 1972	SE 5800 0300	DC72	Doncaster City Museum and Art Gallery
Doncaster	Clergy House	SE 5800 0300	DCH/Y	Doncaster City Museum and Art Gallery
Doncaster	Hallgate	SE 5800 0300	dhg95	Doncaster Museum and Art Gallery
Doncaster	Church Way 1971	SE 5800 0300	DQ	Doncaster Museum and Art Gallery
Doncaster	Church Way 1971	SE 5800 0300	DR/CJ	Doncaster Museum and Art Gallery
Doncaster	St George's Church 1970-2	SE 5800 0300	DT	Doncaster Museum and Art Gallery
Doncaster	Church Street	SE 5800 0300	DY/DR	Doncaster Museum and Art Gallery
Doncaster	Various	SE 5800 0300	Hayfield Dn	Doncaster Museum and Art Gallery
Hellaby Hall	Hellaby Hall	SK 5950 9220	HH/1	
Hickleton	Church	SE 4800 0500	hk83	
Pontefract	Spink Lane	SE 4600 2200	osa01wb23	
Sprotbrough	The Gardens	SE 5300 0200	osa01ev07	Doncaster Museum and Art Gallery
Sprotbrough	The Gardens	SE 5300 0200	osa01ex03	Doncaster Museum and Art Gallery
Tickhill	Castle 1992	SK 5900 9300	tickhill 92	Doncaster Museum and Art Gallery
Todwick	Near Church	SK 4900 8400	Tod/1	Sheffield Museum (reference collection)
Warmsworth	Church 1977	SE 5400 0000	wc	Doncaster Museum and Art Gallery