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Excavations at Newcastle Quayside: Waterfront Development at the Swirle

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Summary: Excavations on the riverside in Newcastle upon Tyne by the confluence of the Tyne with the Swirle showed that after the foreshore had been consolidated behind an artificial embankment in the 13th century, a limeburning industry was established which flourished during the 14th century. After the end of the medieval period the land was divided into a set of parallel plots; buildings were constructed on top of landfill beside the Swirle during the 17th century, and later across the whole site. The context of this site on the Newcastle waterfront is considered, the technology of the kilns is reviewed and compared with other examples known from the medieval period. The sources of raw material were not local, and it is suggested that the limeburning industry was linked with the coal trade.

INTRODUCTION

Colm O'Brien

WHEN in 1298 the town of Newcastle took in Pandon, it gained a length of river frontage of some quarter of a mile between the inlet of the Pandon Burn in the west and the Swirle, the next small tributary stream flowing into the Tyne, which until 1547 formed the eastern boundary of the town's land. The alignment of the town wall, then under construction along the west side of the Pandon Burn, was altered as it approached the riverside, turning east at the Corner Tower to bring within the circuit both banks of the Burn and some adjacent land at its estuary. The rest of the land up to the Swirle remained without the walls. Archaeological investigation of this land was prompted by the announcement from the Tyne and Wear Urban Development Corporation in 1988 of the East Quayside Project, a scheme for the comprehensive redevelopment of a 25 acre riverside site occupying the area in between Milk Market at the west, extending beyond the Swirle to the mouth of the Ouse Burn at the east, from City Road at the north,

to the river edge at the south. This encompasses the whole of the medieval extra-mural area.

Studies recently completed by Colm O'Brien and his colleagues in the central part of the Quayside area, between the Lort Burn and Pandon Burn and on the east bank of the Pandon Burn, had shown that the medieval waterfront was formed as an artificially constructed platform on the river bank, created during the 13th century, on to which an infrastructure of streets and property plots was laid out and houses were built. The port area thus created was largely complete by the end of the 13th century, offering wharfage for ships and accommodation, warehousing and workshop space for the merchant community. The urban form, once established, remained stable, with a remarkable continuity into the 20th century in the street and plot pattern and even in the building forms (O'Brien *et al.* 1988; 1989).

Study of the extra-mural area offered the opportunity for comparison of the core and peripheral parts of the urban waterfront in such matters as the chronology and form of the development and any zoning of functions. Leading from the town wall, the street called Sandgate forms the axis of the extra mural area, parallel to the river bank and with nar-

row, parallel properties laid off on both sides in a way which seems typical of the suburbs of medieval towns. Only one study had previously been made of the archaeological deposits in the extra mural area when in 1972 Charles Daniels was able to carry out limited recording of an excavation for underground storage tanks on the north side of the Sandgate, about midway between the town wall and the Swirle. In difficult conditions, and at a time when little was known about the topography of the waterfront, he was able to show that there were archaeological deposits, possibly of 13th century date, at a depth of some 3 m below present ground surface, with a break in the stratigraphic sequence above these, and the re-establishment higher up of boundaries observed below. Eric Cambridge reviewed the documentary evidence for the medieval origin of Sandgate (Daniels and Cambridge 1974). There was at the time no wider context of studies on which to reach any clear understanding of Daniels' findings, in particular the deposit of sand which interrupted the sequence of deposits. Since then, geotechnical studies made for the Urban Development Corporation, and kindly made available through the good offices of Ove Arup and Partners, showed that the form of riverside development was comparable to that in the central area with a platform of made ground built up at the foot of the cliff and projecting out across the valley floor.

Reviewing both this information and a survey of cellars for the Urban Development Corporation, Barbara Harbottle and Colm O'Brien recommended two parts of the extra mural area for archaeological investigation in advance of the redevelopment. The first, on the south side of the Sandgate and the edge of the Swirle, the extreme limit of the medieval town, forms the subject of this report. The second area takes in the north side of the Sandgate closer to the town wall. This is currently under investigation (1992), and is expected to form the subject of another paper. The Corporation agreed to finance an excavation at the Swirle site, and in discussions with John Kean a budget and timetable were agreed

and other practical matters resolved. In June 1990 the Archaeological Practice of the University of Newcastle upon Tyne began the excavation under the general direction of Colm O'Brien and with Nick Taverner as Site Manager. Work on site was completed at the end of September 1990.

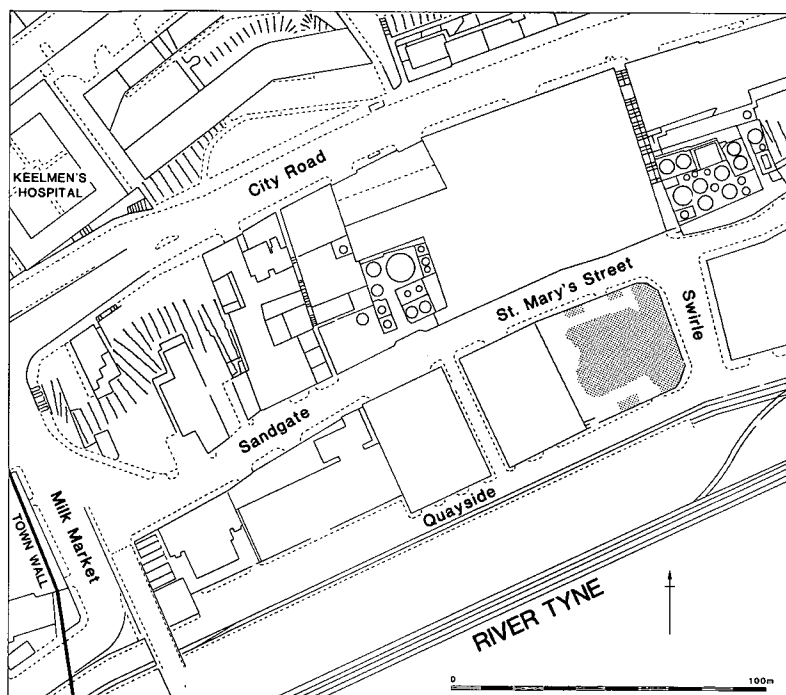
The excavation area was a plot of land bounded on the north and south sides by Sandgate and the Quayside, on the east by The Swirle, a street occupying the line of the now-culverted tributary, and on the west by a large warehouse (fig. 1). The site was at the time empty, its buildings having been demolished some time ago, and had been surfaced as a car park. A review of 18th–20th century maps showed that the space had been arranged as five properties forming parallel rectangular strips with their long axes between Sandgate and the Quayside, at right angles to the line of the river. The north and south ends had been truncated in road widening and quay edge works in the second half of the 19th century, but apart from this, the plot structure appears to have remained stable for some time.

It quickly became apparent that the division into five parallel properties was made at a relatively late stage, and that it did not originate in the medieval period when the land was in use as an industrial area for limeburning on a large scale, with kilns built on an embankment constructed at the river edge.

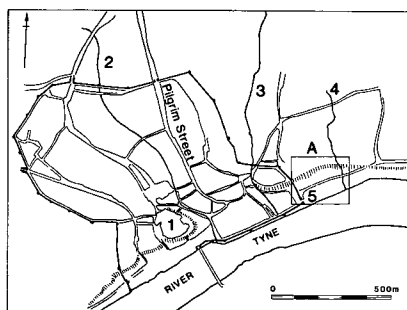
The sequence of events on the site can be summarized as follows:

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|---------|--|
| Phase 1 | Activity preceding any riverbank structures. |
| Phase 2 | The construction of a riverbank embankment. |
| Phase 3 | The completion of the embankment and beginning of limeburning. |
| Phase 4 | The construction and use of limekilns on the embankment. |
| Phase 5 | The abandonment of the kilns (5A) and apparent dereliction of the site (5B). |
| Phase 6 | The construction of the first |

A: LOCATION



MEDIEVAL NEWCASTLE



KEY:

- 1 CASTLE
- 2 LORT BURN
- 3 PANDON BURN
- 4 THE SWIRLE
- 5 SANDGATE
- AREA OF EXCAVATION

Fig. 1 Sandgate and the Swirle: Location.

buildings on landfill beside the Swirle.

- Phase 7 The division of the site and the second stage of building construction beside the Swirle and subsequent use.
- Phase 8 The final stage of buildings and use.
- Phase 9 Demolition and clearance.

EXCAVATIONS AT THE SWIRLE

Nick Taverner and Alan Williams

Phase 1 The Natural Shoreline

The excavated area sits within the intertidal zone of the pre-13th century River Tyne and on made ground overlying this, extended from the Tyne's northern shore in the early medieval

period. Attempts to reach this original shoreline during the excavation proved fruitless due to both the depth and unconsolidated nature of overlying sand tip layers. As a result, its exact form is unknown. Limited borehole evidence, however, suggests that the northern shore of the river at this point consisted of an area of tidal mudflat, similar to that postulated for the pre-Quayside shoreline to the west (O'Brien *et al.* 1988). The consolidation of this area of the Tyne riverbank as described below consists of two discrete processes (and phases), the construction of an embankment within the intertidal zone of the river and its subsequent infilling with sand.

Phase 2 Construction of River Tyne Embankment (figs. 2 and 3)

The first major human intervention within the area of the excavation was a concerted episode of ballast dumping [212], carried out in order to form a linear embankment in a forward position on the foreshore, thereby establishing a frontage south of the natural shoreline, some way over the mudflats on the north bank of the Tyne.

As mentioned above, safety considerations prevented investigations to the base of this embankment, but a number of trenches revealed that it consisted predominantly of water worn boulders of carboniferous limestone and pieces of chalk and flint; material heavy enough to be largely unaffected by normal tidal or river currents. In trench I, a horizontally banded sequence of stone, with large limestone boulders to the bottom, overlain by a mixture of smaller chalk, flint and limestone [1245], was traced to a depth of c. -0.50 m OD. A similar formation was noted in trench III to the east, in which an eight metre length of the embankment was cleared of more superficial layers to a depth of -0.80 m OD. Information on the course and frontage of the embankment was also gained from this trench. At a point slightly to the west of the confluence of the Swirle and Tyne, the embankment turned towards the north bank, creating an extended man-made western edge to the Swirle with a

face sloping consistently at an angle of c. 45 degrees to the east. To the north of trench III, limited excavation within trench V revealed no such consistency in the embankment. It would appear that as it neared dry land it became an amorphous tumble of stone intermixed with sand.

Less information was gained concerning the embankment along its south side as it ran beyond the area of excavation. It was noted in trench III, however, that the constituent horizontal stone layers of the embankment began to dip at its extreme southern edge. This slope was also evident in trench II to the south, suggesting that the face of the embankment was not too far away.

Extent and height of the embankment Due to the constraints of the area available for excavation, it is problematic to comment on either the original length of the embankment to the west, or whether the eastern bank of the Swirle had been similarly extended. However, geotechnical evidence, mentioned above, shows an anomaly in the level of "alluvial" material in a projected profile through the site, in that it is raised high above tidal level. This can now be interpreted as the build up of ballast sands (see phase 3) over the natural shoreline. No such aberration in alluvial sand is seen in a profile some 150 m to the east. As the boundary of the town of Newcastle lay at the Swirle until 1547, it is possible that the embankment did not run any further to the east than the edge of the excavation area. Subsequent to this primary phase of dumping, the top of the embankment had reached a height of c. 1.80 m OD. This would have put it above an assumed mean high water level for the early medieval period of no more than 1.50 m OD and also above the top of the phase 1 quay wall beside the Pandon Burn at 1.58 m OD, but beneath the surface of the phase 2 pier, beneath Fenwick's Entry at 2.20 m OD (O'Brien *et al.* 1988; 1989).

Date of Construction The very limited amount of pottery recovered from the layers of the above sequence of dumping suggests a date for the construction of these banks to have been some time within the 13th century.

West-East Section

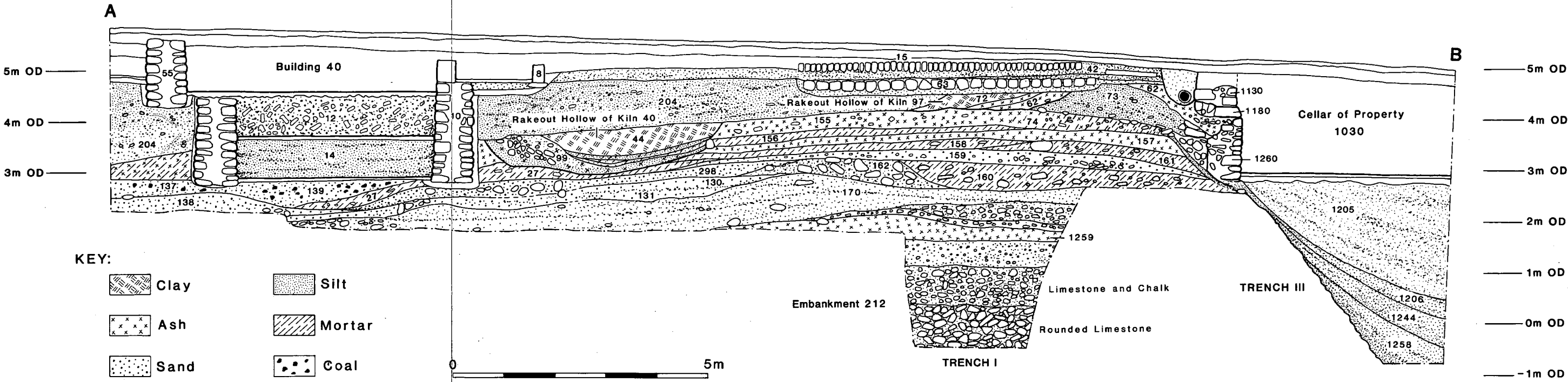


Fig. 2 Principal section, aligned west-east

Phase 3 Infilling of the Embanked Area (figs. 2 and 3)

Following the formation of the embankment in the intertidal zone of the River Tyne, an area of water would periodically have been embayed against the original north bank. The next phase of activity on the site is marked by the infilling into this area of sand clearly derived, as with the stone in phase 1, from the dumping of ships' ballast.

This ballast material consisted of numerous dumps of clean sand [213]. To the south of the

site, these layers [131], [138] and [170] overlapped the northern edge of the stone embankment. A profile through this sand infill would have shown it rising considerably to the north, in which area the homogeneous nature of this dumping was tested and proven in trenches VII and VIII. In the latter, an uninterrupted sequence of sand layers was recorded to a depth of 1.80 m OD. As this continual dumping raised the sand up to and over that of high water level, traces of occupation began to appear, in the form of ephemeral spreads of loam and ash

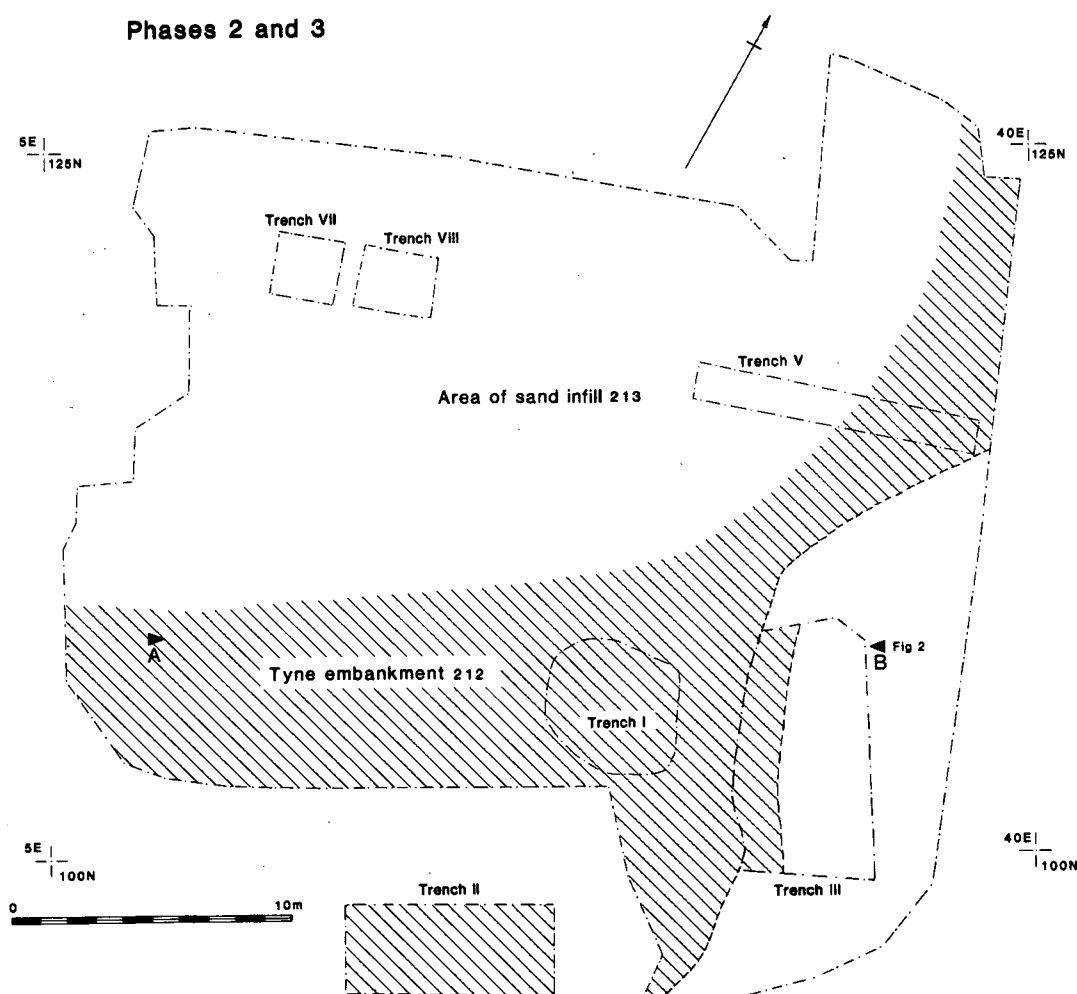


Fig. 3 Phase 2 and 3 plan of waterfront embankment and sand infill.

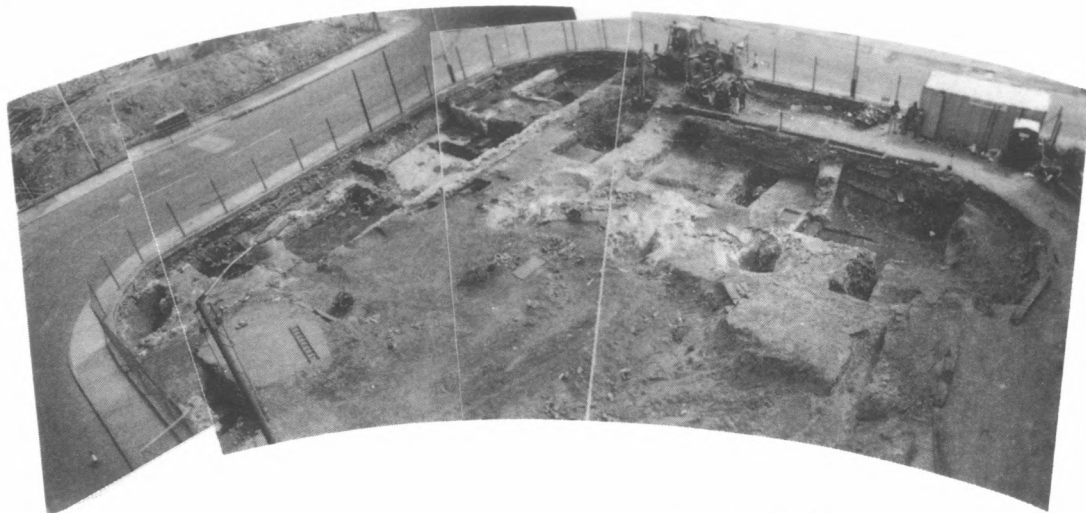


Fig. 4 Overall view of the kilns viewed from north-west. Compare Figs. 5 and 9. Photo by Terence Fletcher.

[238], [1274] and [1254]. Within these spreads, along with other artefactual material, were small quantities of pottery, all of which were manufactured between the early to mid 14th century.

Phase 4 Secondary Raising of the Embankment and Introduction of Limeburning to the consolidated shore (figs. 2, 4, 5, 6, 7, 8, 9 and 10)

This phase saw the continued raising of the embankment and continued dumping of ballast sands behind it, as well as the introduction of limeburning onto the new shore.

Evidence of early Limeburning There is evidence of limeburning on the shore prior to the use of any of the excavated limekilns. A series of ash and mortar layers, [1259], lay below the construction level of the southern kiln row (see below) but the structures from which they derived were not identified. A number of dumps overlying this material [162], [160], consisting of limestone and chalk, raised the height of the banks at least to the south of the site by around 0.60 m. Onto this surface was built the primary southern row of limekilns.

Southern Row of Limekilns Originally,

four limekilns were constructed, [106], [40], [101] and [145] (although they were not linked stratigraphically and the ceramic evidence was inconclusive, it is possible, given the archaeomagnetic evidence described below, that the Swirle kilns were later additions to the shore). As investigations were curtailed to the west by a standing warehouse, it is possible more of this southern row may have existed in that direction. How much preparatory levelling and banking for the construction of the kilns was required is uncertain but it is clear that they were cut back into ballast sand dumps sloping southwards towards the River Tyne and overlay the boundary between the stone embankment and sands. This slope would have facilitated the construction and latterly the firing of the kilns, as they would have been charged from the top and emptied from the bottom. Later alterations to and truncations of the kilns prevent a clear picture of their original appearance being established. The four kilns were tied together by a constant, if irregular, sandstone frontage wall (for context numbers, see individual kiln descriptions). This was of double-skinned construction, infilled amorously with mortar, lime, sandstone rubble and ballast sands and then plastered externally

with lime mortar. To the east, the frontage wall of kiln [145] curved to the north around the kiln pot and butted against the ballast sands. The pots of the three more westerly kilns were, however, constructed of a single skin of sandstone blocks, built into the ballast sand in an inverted cone shape. The internal face of these pots had in every case been vitrified by the intense heat of the limeburning, which had also resulted in a halo of burnt, red sand being formed around the outer edge of each pot. Almost all bonding of the kiln walls involved the use of lime mortar, again suggesting the presence of earlier limeburning in the vicinity.

Kiln [145] This was the easternmost kiln of the row. Due to the construction of kiln [97] directly above, it was quite badly preserved. A hollow had been cut back into the ballast sand in which, to east and west sandstone walls had been built [223], which would have originally met and formed the kiln frontage to the south. The walls did not link to the north of the kiln. Sand had then been infilled into this hollow sufficient to allow the inner sandstone wall of the pot, an inverted cone in shape, with a maximum surviving diameter of 3.00 m to be built against it. To the front of the kiln, the outer and inner walls were linked to form a 1.00 m long sandstone-lined flue. The structure was bonded throughout in lime and clay. The floor of the kiln was of a shallow bowl shape and unlined. The sandstone lining of the pot had been vitrified to a maximum depth of 0.08 m. The primary rakeout pit of this kiln was completely removed by the later kiln [97].

Kiln [101] The rear of this kiln had been cut away by [20], a 19th century sand extraction pit. Although probably linked to kiln [145] by a common frontage wall, this area had been truncated by modern disturbance and the association not proven. To the west, wall [100] linked it to kiln [40]. This latter wall ran on the same alignment as [171], the frontage wall to the east, for a metre before being recessed by 0.75 m. The kiln pot was a single skinned sandstone construction, of an inverted cone shape, with a maximum surviving diameter of 1.90 m. A sandstone-lined flue, 1.00 m in length and 1.00 m wide at the bottom and

widening to 1.20 m to the top, linked frontage and pot walls. As with the other kilns there was a heat reddened area of 0.30 m around the pot-lining, which had itself been vitrified internally. Bonding of all stones was with lime mortar.

Kiln [40] This kiln appears to have been constructed similarly to kiln [101] to the east. Its frontage wall [100] continued from that of kiln [101] to the east, but was lost due to the cutting of cellar [80] to the south west. The pot, of sandstone construction 2.80 m in diameter survived to a maximum height of 3.00 m on its north side where a lime spread ran out over the ballast sands. A 1.50 m long and 1.00 m wide sandstone-lined flue, which widened to the top, linked the pot and frontage walls. Bonding was all of lime mortar.

Kiln [106] This was the westernmost kiln of the primary row. Its conical inner pot wall survived to a height of 1.80 m and a maximum diameter of 3.50 m. The well preserved sandstone frontage wall [86] stood to a maximum height of 1.50 m. The area of the rakeout, however, had been lost, removed by the cut for the 18th century cellar [80] as had a portion of the frontage wall to the east of the kiln. The flue was 1.00 m wide at the base, widening to the top and was 1.00 m long.

Rakeout hollows and associated walls Running to the south from the flues of the above kilns was a series of extensive rakeout hollows, formed as the deposits of lime and ash which began to build up around the kiln entrances were cleared. They would have functioned as working areas for drawing off quicklime from the kilns and also possibly to help in maintaining an updraught in the kiln during firing. These hollows were delimited and revetted by sandstone walls running from the kiln frontage walls, which were constructed only as the rakeout hollows developed.

Lime Production of the Primary southern Row For how long all four kilns were in production is uncertain, though it was clearly long enough to produce great quantities of waste as a by-product. These materials began to build up to the south of the kilns and spread well beyond the southern extent of the excavation, possibly pushing the shore further and

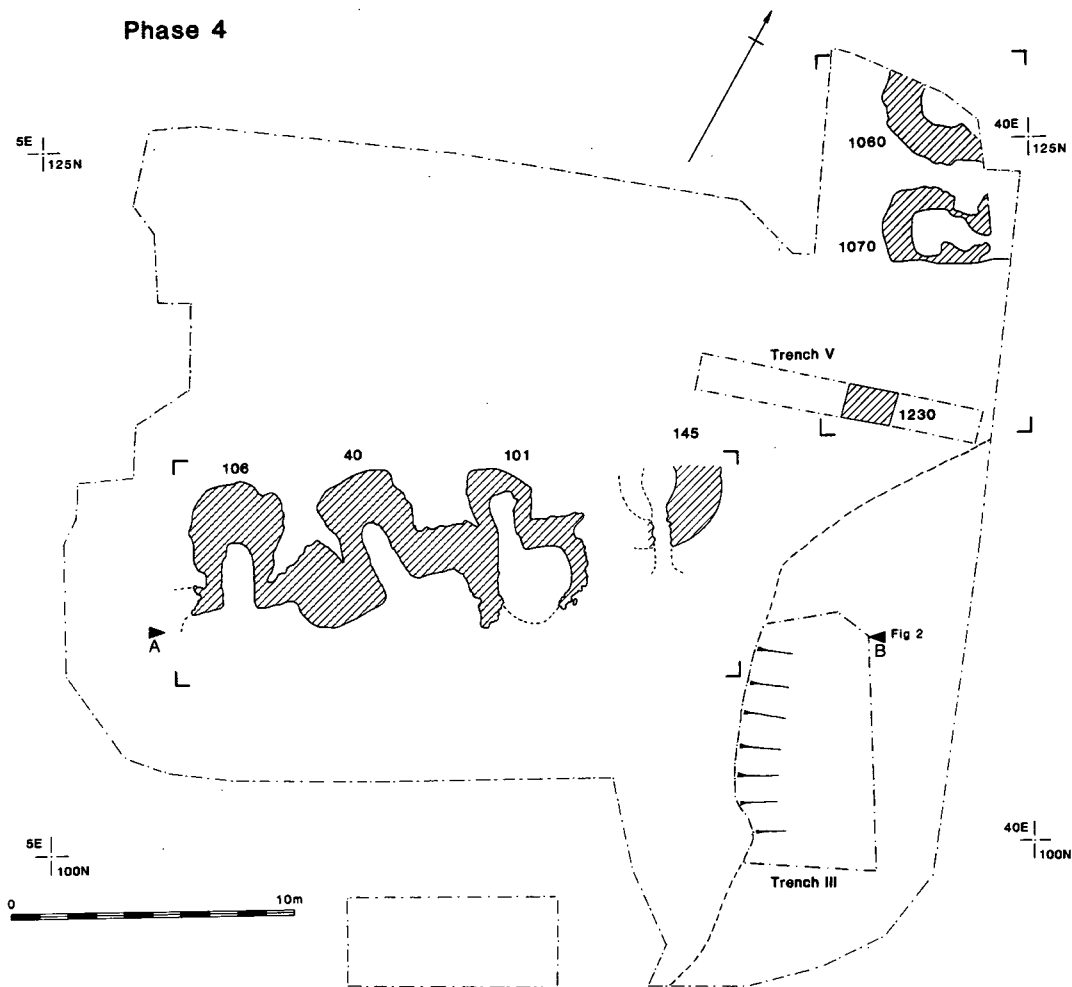


Fig. 5 Phase 4 plan of primary kilns on the southern row and facing the Swirle, general view.

further to the south. Unfortunately, only relatively superficial layers could be investigated in trench II to the extreme south of the site.

Evidence from the Swirle, however, shows a different picture; although some material was certainly running over the edge of the embankment and into the river, this was not in particularly great quantities, nor was it waste from the limekilns. It would appear in this area that there was an attempt to maintain a tidy edge to the embankment.

Swirle Kilns [1060], [1070] and [1230]

Three limekilns were constructed to the north eastern edge of the site. Whether there were any more to the north is uncertain but quite possible, as St. Mary's Street had been narrower prior to 19th century road widening. How these kilns related to the southern row is uncertain, as any stratigraphic links were removed by the foundations of later buildings. Their relationship with the Swirle embankment was established in trench V, which ran to the east of kiln [1230]. It showed that they sat to the west of amorously dumped ballast stones

Limekilns 106, 40, 101 and 145

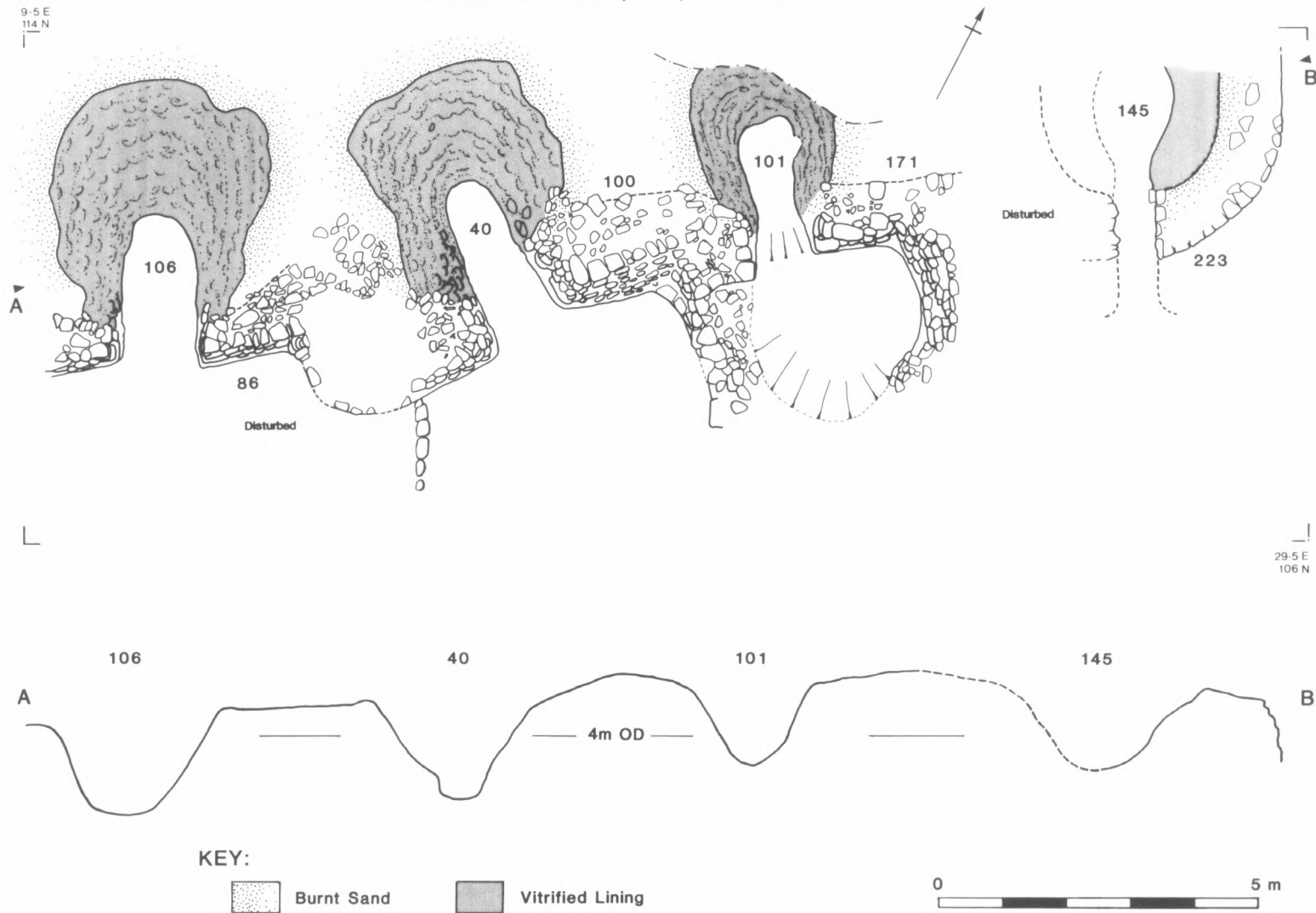


Fig. 6 Detailed plan of the primary southern row of kilns.

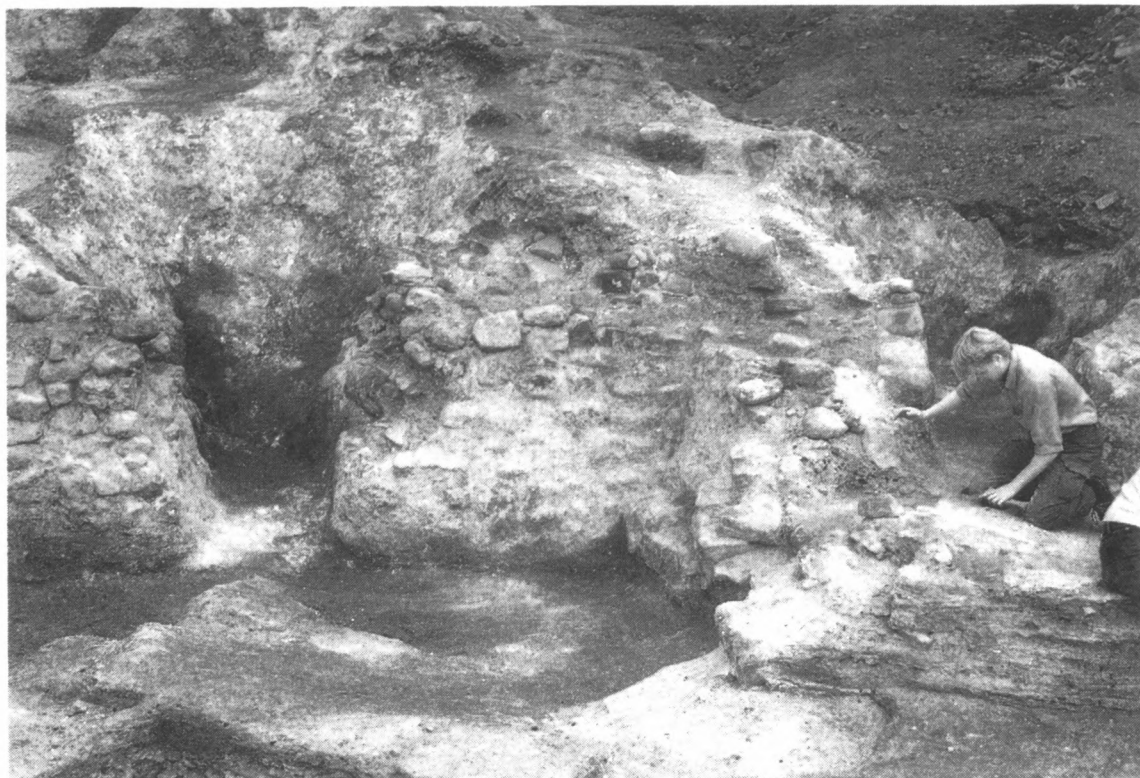


Fig. 7 Kilns 40 (left) and 101 (right) during excavation, showing frontage wall of kiln 40.

which continued to the north in a wide curve, and, as with the southern kilns, cut back into sloping ballast sand deposits, in this case falling to the east.

Kiln [1060] This was the northernmost of the kilns and only partially excavated as it ran beyond the area of excavation. Its pot was a cone shape, with a projected maximum diameter of 4.00 m and a flattish base c. 1.70 m across. Its maximum height was 1.70 m. A single flue, of an uncertain width and no greater than 1.30 m long, ran from the pot to the east. The structure had been lined with sandstone blocks, which in the pot was of reasonable workmanship but in the flue of a lesser quality. The lining had been vitrified to a depth of 0.10 m and a halo of ballast sand, into which the kiln had been cut and had been burnt to a

bright red colour during kiln firings, ran around the rear of the pot.

Kiln [1070] Lay immediately to the south of kiln [1060] and was almost certainly contemporary. Its pot was a cone shape, truncated to the south by a modern storm drain [1165] and fairly solidly constructed of sandstone blocks, although not of quite as consistent work as kiln [1060]. It had a maximum diameter of c. 2.70 m and a flattish floor 1.20 m across. The sandstone-lined flue, 1.00 m in length and 0.70 m wide, ran to the east of the kiln. As with [1060] the lining of the pot was vitrified and a halo of burnt sand ran around it.

Kiln [1230] The same storm drain which had cut away the southern edge of kiln [1070] also destroyed any stratigraphic links between the two kilns described above and this, the

most southerly of the kilns facing the Swirle. It lay beneath the floor of a 17th century building [1265] and had, consequently, been severely truncated. Although only some sandstone lining to the pot and a burnt area of sand to its west survived, it appeared to be of a similar nature to kilns [1060] and [1070] but was constructed at a much lower level.

Disuse and Demolition of kiln [145] The first kiln to fall into disuse [145] was the easternmost of the southern row. Layer [155], an ashy lime mix, was the ultimate rakeout from this kiln, overlain by a very localized area of sandstone rubble [259] lying against the reduced frontage wall of the kiln and representing the demolition of that structure.

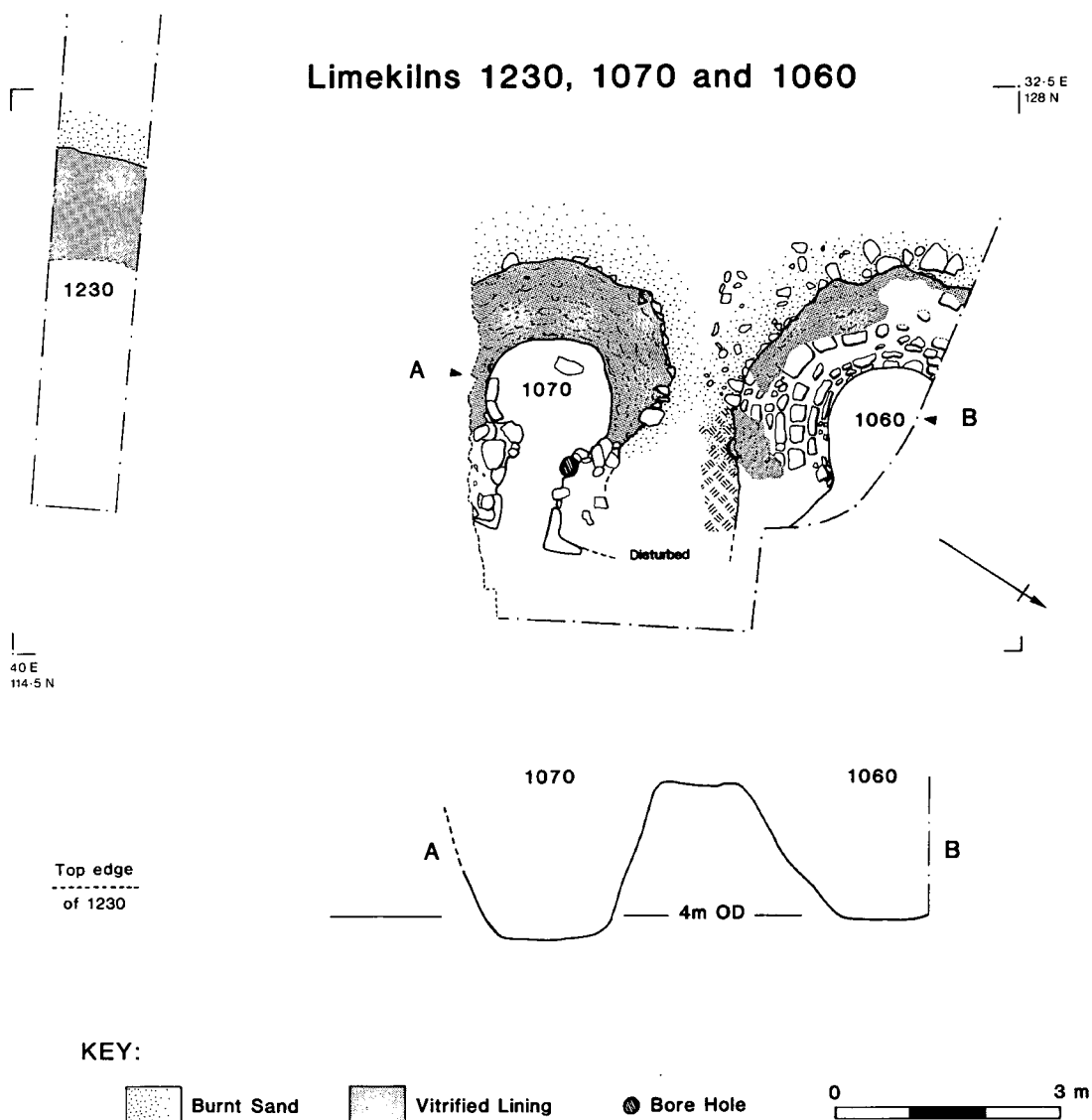


Fig. 8 Detailed plan of the Swirle kilns.

Construction of Kiln [97] and alterations to Kiln [101] A series of landfill deposits [146] and [191] levelled the remains and demolition rubble of kiln [145]. Into this material was built another limekiln [97], which, as with the rest of the row, faced south and had a rakeout pit [64] in front of it. The build up over kiln [145] and the construction of kiln [97] had also raised ground level in front of kiln [101] immediately to the east and necessitated the cutting of a new rakeout pit for it [291], which cut layer [155]. At the same time, a new dividing wall [239] was constructed between the rakeouts of both kilns, which acted as a revetment as waste deposits continued to build up to the south.

Disuse of kilns [40] and [106] Although still standing, kiln [40] to the west of kiln [101] would not appear to have been functioning at this stage, as a rakeout deposit of coal dust and mortar in front of it clearly originated from kiln [101]. A new revetment wall constructed between these kilns [294] would appear to have been related solely to the use of kiln [101]. The flue of the westernmost kiln [106] was blocked with a crude sandstone wall at the end of its production, possibly to make it a more confined receptacle for dumping.

Demolition of primary kilns [106], [40] and [101] The demolition of kilns [106], [40] and [101], the remainder of the primary southern row, is marked by the presence of sandstone rubble overlying their final rakeout deposits, sealed by layers of landfill [202] and [204]. All three appear to have been demolished in a single event.

Construction of kiln [210] To the extreme west of the excavation and cut into the levelling layers associated with the destruction of the primary kilns, was constructed a further limekiln, [210]. This sat over a metre higher than the remains of kiln [106] to its east. It was very badly damaged by later intrusions and only an area of its burnt sandstone pot survived.

It is likely that in the southern part of the site, both [97] and [210] were in operation simultaneously.

Revetment Wall [1260] and a possible Kiln Wharf Prior to the dumping of landfill layer

[73] over and immediately to the east of the truncated remains of kiln [145], a revetment wall [1260] had been inserted along the edge of the Swirle embankment, cut from layer [74]. This wall was of sandstone construction, 0.60 m thick and bonded with clay. A stone make up layer had been piled to the west of it, over which lay [73]. Ash layer [62], probably derived from kiln [97], spread over the top of the wall, suggesting that it had never stood any higher, at least where investigated. This wall was subsequently utilized as the lower courses of the western wall of a 17th century building [see phase 6] and its original extent is uncertain. It is possible that the consistently sloping frontage to the embankment noted in trench III (phase 2) may have been formed only at this time and used in association with this revetment wall [1260] as a wharf for offloading limestone and chalk to charge the kilns. The fact that no limekiln waste was tipped over the edge of the embankment in this area also tends to reinforce this idea. Certainly, the appearance of the embankment at this point and even its alignment, is at odds with it further to the north.

Early Infill of the Swirle Although, as noted above, the area to the east of the Tyne embankment was kept free from limekiln waste, some material was thrown over its edge and began the process of infilling which became so marked in phase 5. Included in this was pottery and, in waterlogged layers, what would appear to have been lopped branches and much leather, 92 pieces in all, predominantly from shoes, within layers [1206], [1244] and also [1258].

Abandonment of kilns [97] and [210] The duration of production of these kilns is, as with the primary kilns, uncertain. Although less waste was apparent than with the earlier kilns, this can have no bearing on their lifespan.

Abandonment of the Swirle Kilns This would appear to have been one event, which involved the removal of the upper areas of the kiln pots leaving c. 1.6 m high stumps remaining. Additionally, in the case of kiln [1230], much of the sandstone lining was also removed. Again, how this sequence compares

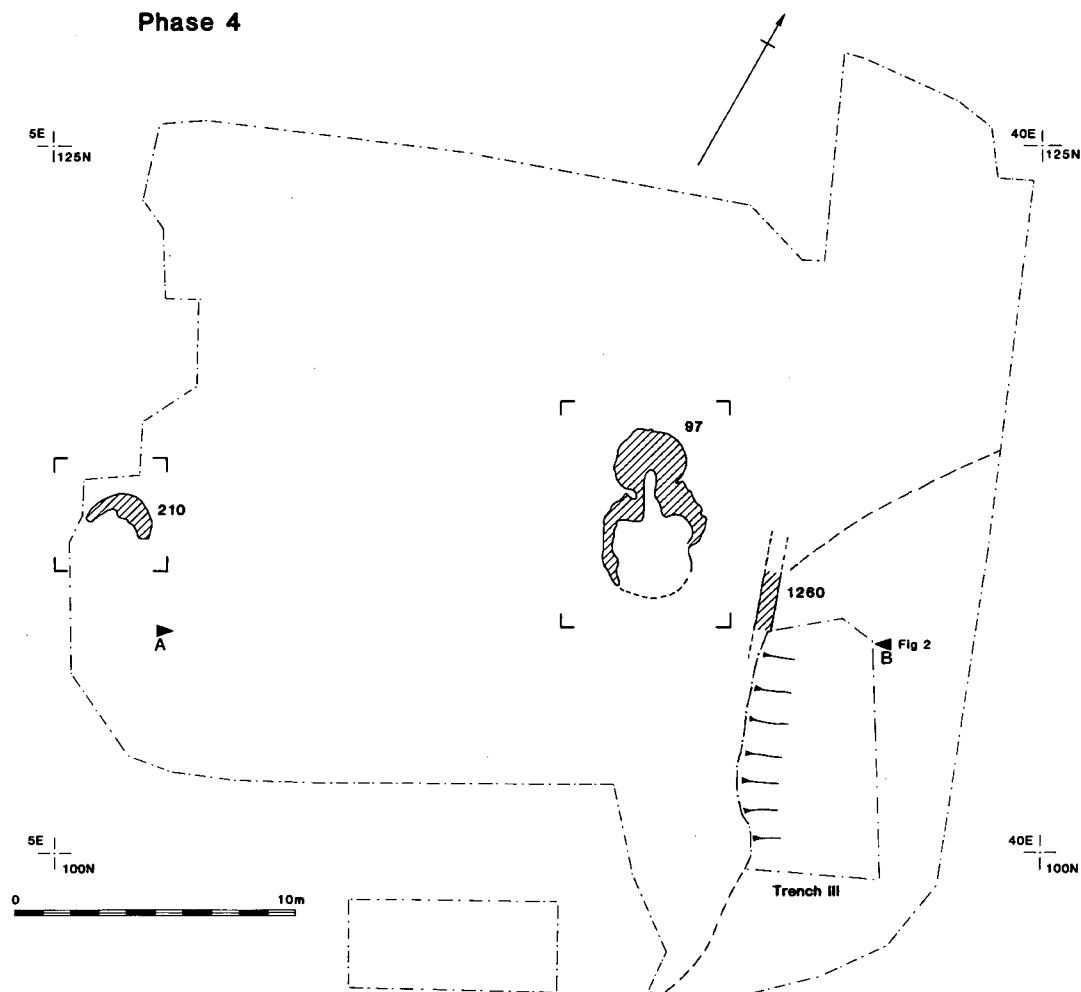


Fig. 9 Plan of secondary southern row of limekilns and wall 1260, general view.

chronologically with the southern kilns is uncertain.

Dating the Kilns

Two distinct methods have been used to date the period over which the kilns were in production; ceramic evidence and archaeomagnetic dating of the fired walls of the kilns, utilizing their remanent magnetism (carried out by Dr. Mark Noel of The University of Durham).

As argued in the pottery report (Ellison,

below), although the ceramic assemblage associated with the usage of the kilns is relatively meagre, the absence of diagnostic late 13th and early 14th century pottery types would tend to argue for limeburning, at least associated with the excavated kilns, not to have been taking place much before the early decades of the 14th century and to have ceased by somewhere around the end of the third quarter of that same century.

The archaeomagnetic evidence, although

Limekilns 210 and 97

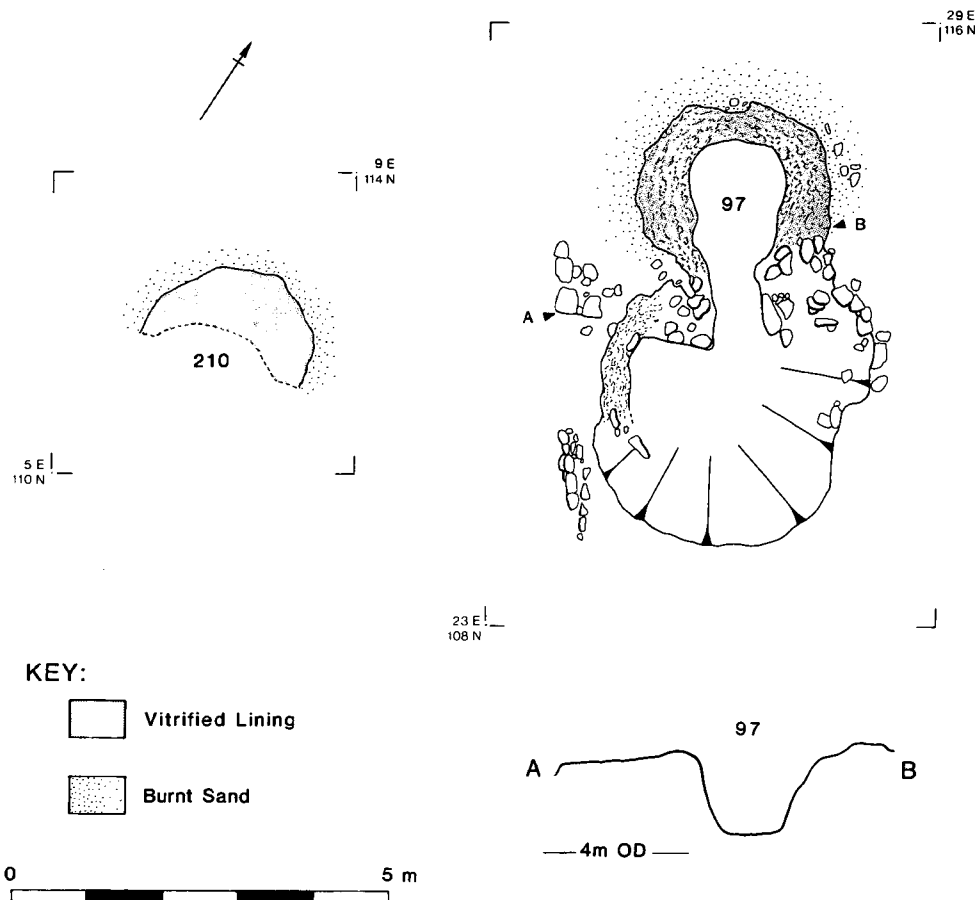


Fig. 10 Detail of secondary kilns.

somewhat contradictory in detail, suggests a slightly wider date range for the usage of the limekilns. The principles and methods used to determine this chronology are detailed in a report held with the site archive. The process is based upon the assumption that the natural remanent magnetism within the fired lining of each kiln, can be compared with a calibrated reference curve to give an absolute dating for the last firing of the kilns.

Four limekilns were chosen for analysis, [97], [106], [145] and [1060], and the results

give a range of dates for last firings of the southern row of kilns as follows:

Kiln [145]	A.D. 1330–1350
Kiln [106]	A.D. 1280–1320
Kiln [97]	A.D. 1300–1330

An anomaly has occurred in the sequence in that kiln [97] postdates kiln [145] but has an earlier range of dates for its last firing. That both kilns were in physical contact, kiln [97] directly overlying kiln [145] may explain this aberration.

Swirle kiln [1060] produced a slightly later date for its last firing of A.D. 1380–1400.

Phase 5 (fig. 2)

The two sub-divisions of phase 5 represent the use of the shore for dumping and the probable extension of the shoreline to the south and its certain extension to the east into the Swirle. Pottery evidence suggests that this phase encompassed the late 14th, 15th and early 16th centuries. A gap in the ceramic sequence prior to the buildings of phase 6, in the mid 17th century, may represent a period of truncation.

Phase 5a Landfill

As stone suitable for use in lime production was consumed by the limekilns and the quicklime they produced removed from the site, sand ballast was still being deposited on the shore, as witnessed by the interleaving of ballast and rakeout deposits [160] and [159] and [158]. Clearly, the primary use of the shore remained that of receiving ballast. The increase in landfill and tipping on the site and the final disuse of the kilns are signs that this function had begun to move elsewhere.

The shore where limeburning had taken place, indeed virtually the whole of the area investigated, was now subjected to a massive landfill operation [204]. This seems to have commenced from the northern edge of the site and included the dumping of much domestic and some industrial refuse, including pottery and other artefactual material. This dumping moved southwards into and over the demolished kilns, eventually extending the shore further to the south. The already partially infilled Swirle bank was also dumped over [1267] and its channel pushed well beyond the area of excavation to the east. The resulting ground surface over the derelict site sloped gently to south and east.

Phase 5b

The ground surface established after the landfill described above was largely removed by 17th and 18th century terracing and construction. A number of truncated pits which cut into the landfill, however, show that some

activity was taking place during the 15th to early 17th centuries.

The evidence from the excavation is that after the medieval period the land use on the site changed radically; only then was the area divided into plots as shown by Thomas Oliver in 1831. One feature alone can be traced through the archaeological sequence from the period of the limekilns to the present century; this is the north–south revetment wall [1260] inserted along the edge of the Swirle embankment (figs. 2 and 9).

The land to the east of this was consolidated by tipping only gradually during phases 5a and 5b. This area of secondary consolidation may from the beginning have been identified as a separate landholding, distinct from that to the west which was on and behind the primary embankments where the limekilns were sited. Later, this wall probably marked the western boundary of a 17th century property immediately adjacent to the Swirle (phase 6). There is no evidence of construction to the west of this during phases 6 and 7, but it is uncertain whether this reflects a true difference in usage to either side of the boundary or merely differential preservation. There is at least an hiatus in the record. The pottery record for phase 5b, with little material subsequent to the 16th century, lends support to the idea of an episode of truncation on the site. The cutting away of the rakeout pit [64] of kiln [97] on its western edge would tend to reinforce this idea. To the east of wall [1260], where there is no evidence of truncation, the building sequence began in the 17th century as described below.

Phase 6 (figs. 2 and 11)

This phase details the first known structures to be built on the site subsequent to the limekilns. “A vennell called the Sworrell” was certainly in existence by 1638 (as noted in McCombie, below). Whether the Swirle was culverted beneath or ran down the street in an open channel is unknown. The coherent remains of a sandstone structure [1265] sat at the east of the area of excavation and a less complete structure [1064] was revealed to the south east.

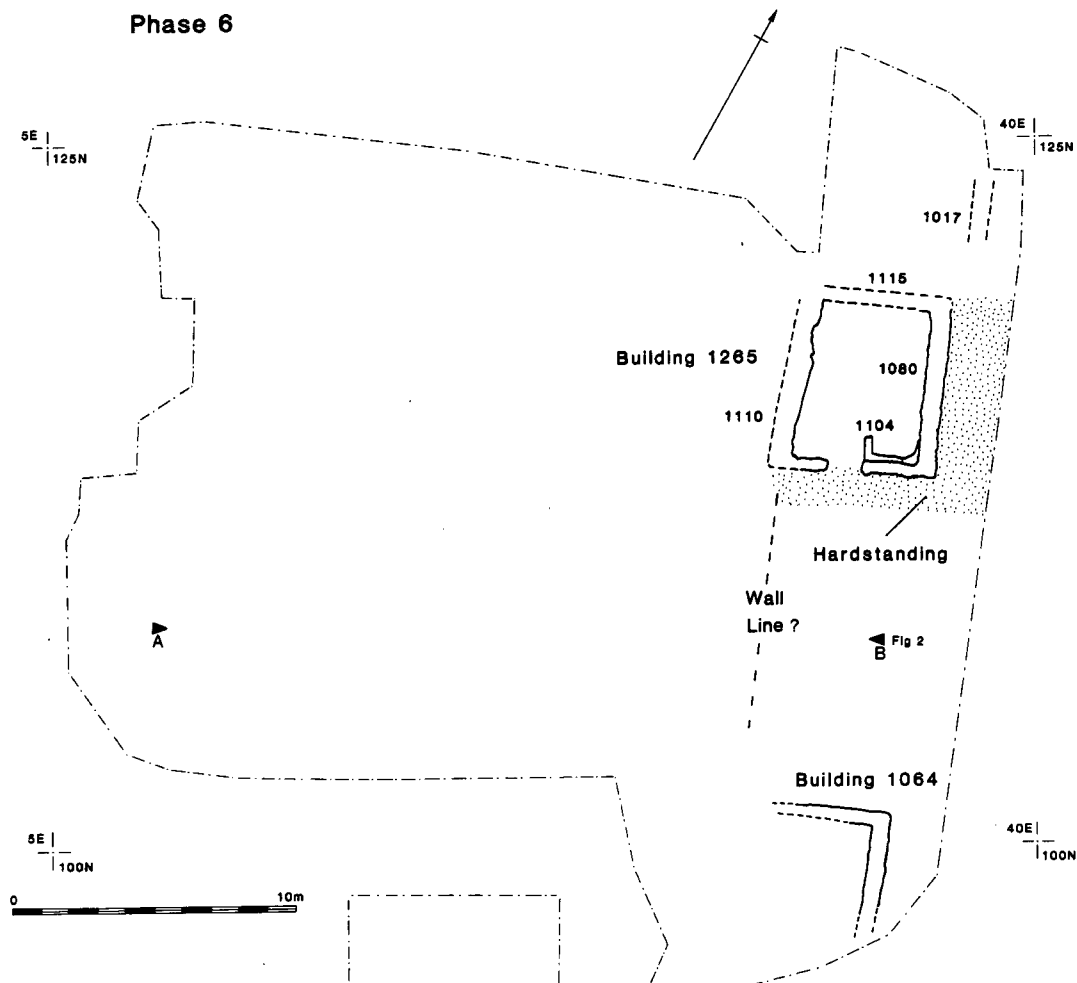


Fig. 11 Phase 6 Buildings, Plan.

Further lengths of wall, although not producing comprehensible plans, suggest that these structures were not isolated.

Unassociated walls

A number of walls would appear to have pre-dated structure [1265]. How much earlier is uncertain as there was no associated dating material. They certainly post-date the complete levelling of the Swirle bank as they are cut into its upper infill.

Building [1265] A terrace was cut into the landfill and underlying sand ballast immediate-

ly to the east of the levelled Swirle bank at a height of c. 4.50 m OD. Constructed on this terrace was [1265], a sandstone building, bonded with clay and lime mortar. The west wall of this structure [1110] was built on the same line as revetment wall [1260] to the south which had been associated with the later phases of limeburning on the site. The precursor of the Back Swirle alleyway (also known as Half Moon Lane) may have run to the west of this wall and dictated the location and alignment of the structure.

Building [1265] consisted of a single room,

8 m north-south by approximately 5.50 m east-west, which narrowed slightly to the north. Its northern wall, [1115] had been almost entirely truncated by a modern storm drain [1165], which ran on the same alignment, whilst the western wall, mentioned above, was overlain by the wall of a succeeding 18th century property. A doorway 1.20 m wide with a decayed timber sill beam [1173] and a stone threshold [1222] provided access to the building from the south.

Internal Features A hearth [1104], roughly constructed of brick and sandstone and bonded with lime mortar was set into the south east corner of the building. A brick bowl-shaped structure, also set into the wall, sat immediately to its east and was probably associated. Both would seem to have been original features. The eastern wall of the building [1080] retained some remnants of internal plastering.

Floor Surfaces A series of floors accreted in building [1265]. The earliest [1131] which only survived around the doorway, was of beaten clay. Overlying this was a layer of compacted coal ash [1127] which extended out beyond the door to the south and contained much artefactual material, including a bone comb (illustration 130), and three Scottish turners. Adjacent to hearth [1104] and overlying the above layer was an area of irregular sandstone flagging [1134].

External Surfaces It is clear that building [1265], for much of its life, sat up against a hardstanding of some nature, which ran to both south and east of the building. This consisted in some areas of six successive make-up layers of cobbles, pebbles, sandstone and ash. An extensive series of stake and post holes cutting from one of the above layers to the east of the building, suggests that the area may not have been a formalised street or alleyway.

To the north of the building [1265] a pit, [1176], the pottery in which included some Tudor greenware, was overlain by a loam landfill deposit [1096] and a floor made up of black and brown ash [1094]. These in turn were overlain by an industrial waste dump [1093] consisting of ash, coal and slag. This dump was

of unknown extent as it ran beyond the edge of excavation to the east.

To the east of wall [1017] (which ran from [1265] to the north) and running beyond the eastern edge of the excavation was a dark brown loamy soil [1016] up to 0.30 m deep and possibly contemporary with the above layers. No industrial structures were identified in this phase.

Structure [1064] This lay towards the south-east edge of the excavation and was only poorly preserved, with little associated dating evidence. The eastern walls of this building and building [1265] were aligned similarly, suggesting that they were of a similar date. [1064] formed a right angled structure with a doorway to the north-west and almost certainly had a contemporary western wall underlying the western wall of the later property [1040]. Unfortunately, the cutting of a cellar for property [1030] prevented the linkage of any stratigraphy between structures.

Demolition of Building [1265] Layers of sandstone rubble and loamy soil [1035] overlay the floor within and hardstanding external to building [1265] and clearly represented its demolition. Subsequent to this process the walls of the structure were left standing to over a metre high (see below). No equivalent information was gained for the demolition of structure [1064] but clearly its walls also remained standing to a considerable height.

Date of the structures The pottery associated with structure [1265] suggests that it had been built sometime towards the mid-17th century and demolished in the early 18th, immediately before the construction of the properties described below.

Phase 7 (figs. 2, 12, 13 and 14)

This phase deals with the construction and subsequent use of a row of brick-faced shaped gable buildings.

The demolition of structure [1265] and other possibly contemporary buildings to the east of the area of investigation was immediately succeeded by the construction of a row of buildings along a now formalized Swirle street or lane. These are clearly the shaped gable build-

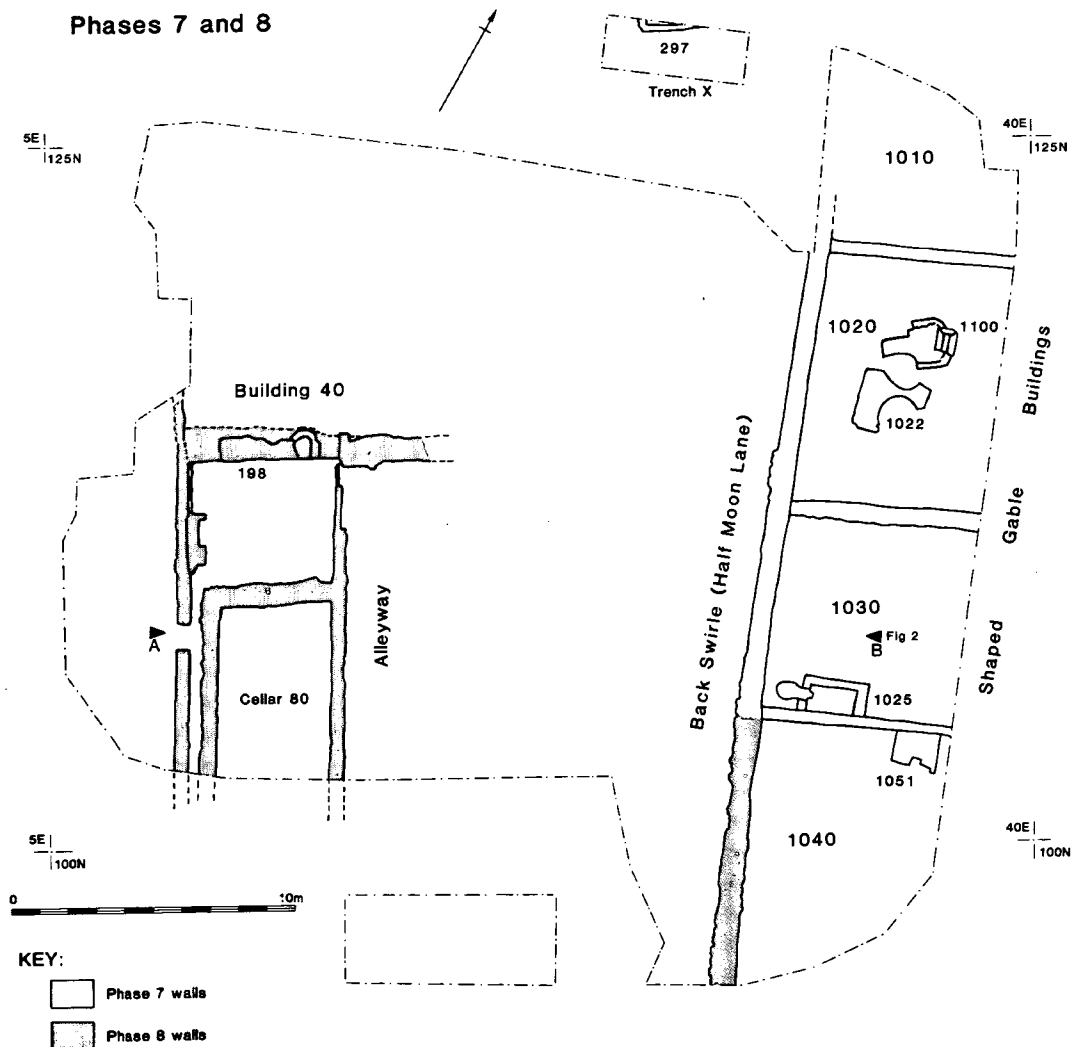


Fig. 12 Phases 7 and 8 Buildings, Plan.

ings, seen in Figs. 13 and 14. No documentary references have been discovered relating to their construction (see McCombie, below), but both architectural style and the pottery record suggest a date in the 18th century. At some stage in its life, at least by 1830, when Half Moon Lane is noted by Oliver, property [1030] (below) became the Half Moon Inn.

It seems likely that buildings were constructed at the same time as the above along

the southern frontage of Sandgate to the north (this was not known as St. Mary's Street until some time in the 19th century).

Shaped Gable Buildings [1010], [1020] and [1030]

The Swirle buildings [1010], [1020] and [1030] were constructed on a landfill deposit of more than a metre deep, above the previous building [1265] whose partly demolished walls were left



Fig. 13 *The Swirle* c. 1880 (from the *Monthly Chronicle of North Country Lore*) showing the shaped gable buildings of phase 7. Note the Half Moon Inn

standing as high as the top of this dump. The frontage walls of these buildings lay beneath the modern pavement, 1.50 m beyond the east wall of structure [1265] and although inside elevations of these walls could be drawn it was not possible to plan them. The full internal extent of these buildings was, however, investigated. To the west, the buildings had a common rear wall [1050] of sandstone bonded with mortar which overlay and carried on the alignment of embankment wall [1260] and that of the west wall of buildings [1265] and [1064]. The presence of the Back Swirle alleyway would appear to have prevented extension of

the buildings to the west and so, as noted above, they extended to the east. The excavated row of buildings was divided transversely by sandstone walls into what were probably three individual properties, [1010], [1020] and [1030].

Property [1010] This was the northernmost property excavated, although when the row had been constructed in the 1700s another had lain to the north at the junction of Sandgate and the Swirle. This had been demolished in street widening c. 1900, which had also involved the angling of the frontage of this property at 45 degrees to the line of the Swirle.



Fig. 14 The Swirle c. 1926. Compare with the view fig. 13 and note demolitions north and south.

With the additional damage caused by terracing into the area for the construction of the Swirle cafe in 1943, this has meant that little archaeological information was gained from this property.

Property [1020] This property overlay [1265]. It had a centrally placed double fireplace [1022] of brick construction, probably an original feature, to the east of which sat a remnant of a contemporary brick floor [1085].

Property [1030] Survived only as a cellar, which had been cut down 2.20 m to a level of 3.20 m OD and lined with sandstone walls. A probably original, though only partially surviving floor in the cellar [1164], was composed of

irregularly shaped sandstone flagstones. The western wall of this structure incorporated within it embankment wall [1260], which was associated with the limekilns. Although no structure contemporary with [1265] to the north was noted in this area, the continuation in use of wall [1260] suggests that prior to the cutting of the cellar, a structure may have existed which has been completely lost.

Features [1025] and [1100] Two similar rectangular brick-lined features, both with steps leading down to a lowered floor surface in properties [1020] and [1030] (the latter in the cellar) were of uncertain usage, possibly storage. Much pottery infilled these features.

Sandgate Frontage

Trench X, cut to the extreme north of the area of excavation, revealed the south western corner of a brick building [297], clipped by the 19th century quarry [20]. The bricks were of a very similar type to those used in the Swirle buildings. Widening of Sandgate in the 19th century had destroyed any evidence as to the northern extent of these structures. A further trench cut immediately to the west revealed no evidence of further structures.

Phase 8 (figs. 2 and 12)

Towards the middle of the 18th century, the Swirle frontage was completed by an addition to the south, building [1040]. At approximately the same time another building, [40], which would appear to have had buildings or at least boundary walls pre-dating it to the west, was constructed facing south towards the northern shore of the River Tyne. At some unspecified date this became the Sun Inn. This phase deals with the construction and subsequent use of these buildings.

Building [40]

This was the only formal property within the area to face south towards the River Tyne. To the east of this building and west of the Back Swirle, only 19th century features survived, and these may have been responsible for the truncation of earlier buildings. The southern limit of excavation ran to the north of the street or lane contemporary with this building and consequently only a proportion of it was investigated, comprising one complete room and the greater proportion of a second of what would appear from plan evidence to have been a structure with a ground floor three rooms long. The construction of the property was preceded by the cutting of a level terrace [200] into the sloping landfill and ballast deposits. The building was of sandstone construction, just over 6 m wide with an unnominated alley or chare running to the east.

The sequence of construction of this building is uncertain; [55], the western wall, is earlier than the rest of the building and was possibly part of an earlier boundary wall or building to

the west. Unlike the other walls in the structure which were lime bonded, it was bonded with clay and loam. A cellar was cut to the east of wall [55] and its lining wall [10] ran above ground and formed the eastern wall of the structure, clearly these are contemporary with one another. It is probable that wall [30], to the north, was contemporary with these latter walls.

Cellar [80] This cellar took the form of a rectangular cut, 4.0 m east-west by 5.0 m north-south, 1.60 m deep, to 2.80 m OD. All the walls were of sandstone bonded with mortar. The eastern wall of cellar [10], as mentioned, continued above ground as the eastern external wall of the building. The walls to west and north terminated at ground level. A primary floor of yellow mortar [26] sat over the bottom of the cut.

Internal Features

A fireplace [198] had been inserted into the northern wall at the time of its construction which included a brick bowl-shaped construction placed over it to the east. The original floor surface to the north of the cellar was of roughly laid mortar [59], which possibly remained in use until the 19th century.

Pottery recovered from floor layers within the buildings constructed on the Swirle suggests that they were in use by the early 18th century, immediately after the demolition of building [1265] and possibly associated structures. The pottery assemblage recovered from the construction and primary floors of building [40] suggests that it was built at a roughly similar date.

Building [1040]

A further building, constructed during the 18th century, completed the Swirle frontage to the south. This was in a simpler style than the shaped gable buildings, as shown by a number of late 19th century photographs. That the foundation trench for wall [1050] was dug through early 18th century layers associated with property [1030] to the north, proves it was not contemporary with the rest of the row, as do photographs taken in the 1900s which show

it to have been a very different structure to the shaped gable buildings to the north. It was of sandstone construction and ran beyond the area of excavation to the south and east. As with property [1010] to the north, its eastern wall had been cut away and the frontage angled during road widening in the 1900s. The rear, eastern wall of the structure, [1050], carried on the line of the properties to the north. The northern wall [1084], [1072] was common to both [1030] and [1040]. Wall [1064], although certainly re-used within [1040], almost certainly represented the front and north walls of an earlier building, as described in phase 6.

An original brick fireplace [1051] sat against the northern wall of the building.

Pit group A series of pits, datable to the early usage of the building, were dug into its floors. They contained much industrial waste. Pit [1157] was filled successively with a grey ashy loam [1161], a mixed clay loam backfill [1159], a deposit of soft brown clay [1153] which contained ash, clinker, slag, mortar and numerous iron nails and [1148], a soft brown silty clay with coal ash over which lay the decayed remnants of a wooden trolley chassis. All these were sealed by a clay layer, [1154].

Alterations to all Structures from the 18th to 19th Centuries

This description briefly covers the usage and alterations to all the structures on the site.

The Shaped Gable Buildings Various 19th century concrete floors were added to the buildings, including to the cellar of [1030]. Additionally, a series of other minor refurbishments took place, such as the alterations to the frontage and bar rooms of the Half Moon Inn as shown in drawings by Hill and Watson recorded in McCombie, below.

Building [40] As with the Swirle buildings, various minor alterations were carried out on the structure, leaving the building largely in its 18th century state.

Cellar [80] was filled to a height of 0.60 m with a silty, loamy soil with mortar lenses and brick [14], above which a floor was laid down [13]. Subsequently the cellar was levelled with brick rubble.

Building [1040] The building was split into two distinct areas, with the east room at a higher level. Some time in the 19th century a brick wall [1045] reinforced this division. The main floor in the room to the north [1069] was of herringbone brick construction which underlay a build up of coal ash. The floor of the room to the south [1052] was a mixture of brick, sandstone flags and granite setts. A number of what have been interpreted as machine settings, constructed of brick and concrete were laid over these floors. It is clear that throughout much of its use this building was dedicated to industrial use.

The Sand Quarry Pit A pit for the extraction of sand [20] had been cut to the north of the site in the middle of the 19th century to extract ballast sands, possibly for road construction. It was c. 25 m in diameter and in places over 2.5 m deep. It had been backfilled with much rubble and loamy soils, the former possibly originating from the demolition of the Sandgate buildings. This process of levelling had certainly been carried out by 1886 when a photograph of the area shows no sign of any depression.

Oil Storage Yard This lay to the east of building [40] and to the west of the Back Swirle. It is possible that levelling for this complex removed earlier structures, of which cobbling [63] may be an undated remnant. A yard constructed of stone setts [15] was laid, upon which open-sided buildings set on timber posts had been constructed, as seen in photographs of the early 20th century. A brick boundary wall [8] ran around the yard. The complex is mentioned in a document concerning the installation of an oil warming tank for James Arnott, the proprietor, in 1886.

Phase 9

As mentioned above, it would seem likely that the buildings on Sandgate, or St. Mary's Street as it became known, had been removed during road widening in the 19th century and the northernmost Swirle property demolished in the 1900s. The remaining 18th century Swirle buildings were demolished by 1943, when the Swirle cafe was constructed to the north east of

the site. By then, [1040] had already fallen into decay and was as early as the 1920s standing open to the elements as shown in Fig. 14.

Subsequent to this demolition, the Swirle cafe was accompanied on the site only by the Sun Inn. The remainder of the area stood empty as hardcore surfaced parking space for trucks, until in the 1970s both public house and café were demolished and the area re-surfaced for use as a car park.

THE BUILDING HISTORY

Grace McCombie

Before 1700

Documentary and cartographic evidence, with which the structures recovered on site can be compared, begins to become available at about A.D. 1600, but not before the 18th century is it possible to identify particular buildings.

The Cotton Manuscript map in the British Library, probably drawn around 1590 (Cott. Coll. Aug.II f.2 and published in *Arch Ael*¹, III, 124), shows the town wall running east from Sandhill and along the Quayside, and turning north at its east end, with the Sand Gate across the Quayside street. Outside the wall there are a few houses near the gate and set back from the shore. Behind them the ground rises steeply. Speed's map of Northumberland published in 1610 has, in one corner, a plan labelled "Newe:castle" "Described by William Mathew". It too shows the Quayside town wall with "Sandgate yate". Houses are shown in the suburbs of the other main gates but none are shown outside Sand Gate.

The first historical and topographical account of Newcastle, Grey's *Chorographia* (1649) does not mention the Swirle, either stream or street, at all, and he describes the walls and gates of the town including "Sandgate" which is "east of the towne" and "built upon the river side. Without this gate is many houses, and populous, all along the water side; where ship-wrights, sea-men, and keel-men most live, that are employed about ships and

keels." About damage to the suburbs in the Civil Wars he says "The suburbs of Sandgate escaped the fury of these warres, except some neer the walls of the towne, which was fired."

Although Grey's account of past events is only as reliable as his sources, there is no reason to doubt his description of the town as it was in his own lifetime, and his account can be accepted as confirming that there were houses along the road outside Sand Gate despite the fact that William Matthew shows none.

For further evidence of the existence of houses along Sandgate at this time there are two C17 maps which show the Tyne. One is reproduced in *A History of Northumberland* volume IX (1909) as plate II. It is of Castle Ward around 1600 and it clearly shows houses between the town wall and Ouseburn. The other, of the River Tyne, was published in 1654 as part of Ralph Gardner's case against the town council. It shows houses along Sandgate nestling at the foot of a steep cliff.

Grey does not mention the Swirle in 1649; but it is referred to and quite clearly placed in Sandgate in a deed of 1638 which concerns property "in a street or laine . . . being in Sandgate and leading from Sandgate forestre-at towards the river of Tyne and is the fifth chaire or passage eastwards . . . [from] a vennell called the Sworrell . . ." (Twas 575 29/1/50). The vennel had the name of the stream; it may be that the stream itself was already culverted beneath the surface.

The Calendar of the Common Council Book (Twas 589/4, 5, 6) has no indexed references to Swirle or its other spellings in the 17th century, and no property mentioned in documents of this period relating to Sandgate could be identified with the Swirle.

The 18th Century

Old photographs and drawings of the Swirle held in the Newcastle upon Tyne Central Library (see, for example, figs. 13 and 14) show a row of unpretentious brick houses with floor strings, sash and casement windows, and steep pantiled roofs with roof dormer windows. Their only decoration is elaborate shaping to the roof and dormer gables which have flowing

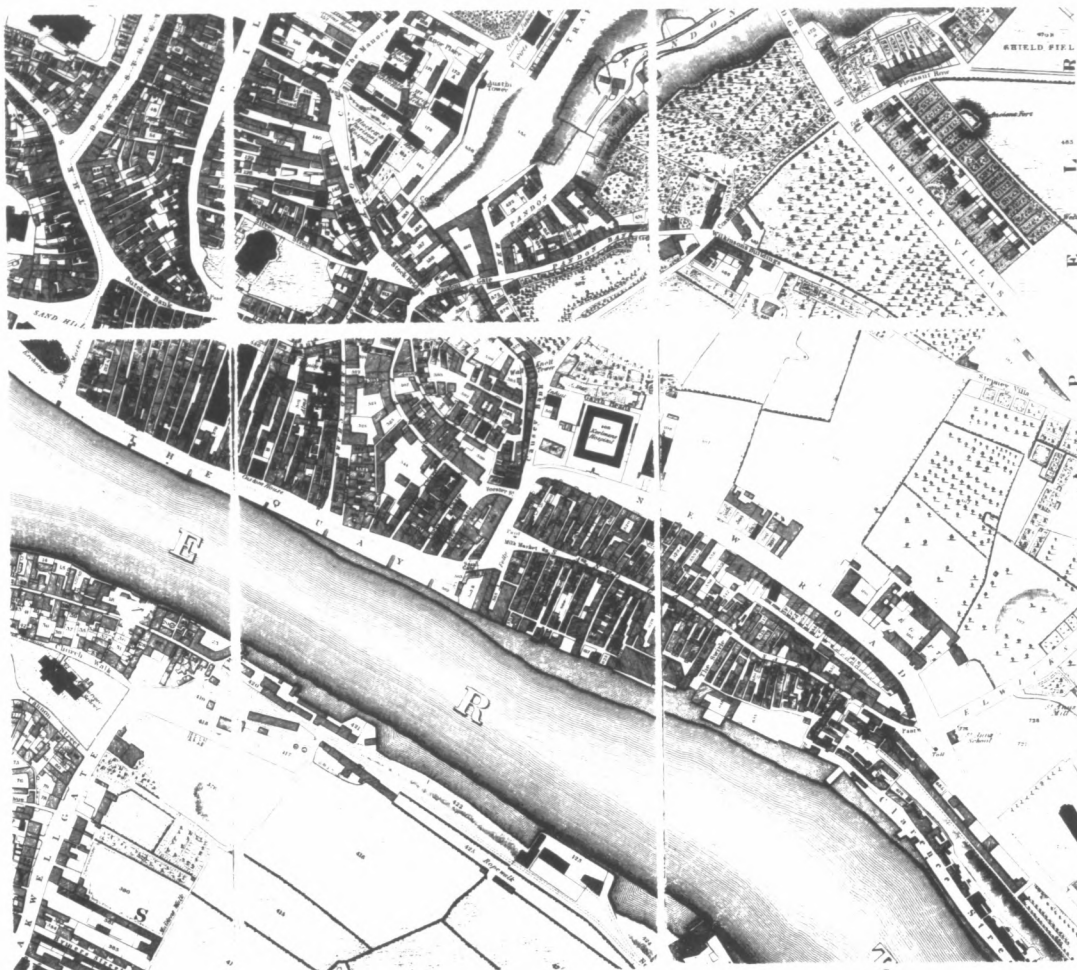


Fig. 15 The Riverside in 1831, Map by Thomas Oliver.

convex and concave curves to the edges. Such features are characteristic of houses built around 1700, but no references have been found to any spurt of building activity which could be tied to this site.

The Swirle itself gave its name to the street which lay over it and eventually to the row of houses which lined its west side. They must have been regarded only as part of Sandgate for many years. The Common Council book has many indexed references to Sandgate at this period, but none to Swirle or Swerle, and only misleading references to a Squirrel in

another part of the town. [To the Squirrel Close and the Swirl Close, a field near Sidgate (later Percy Street) which derived its name from the squirrel, swirl or little stream which ran through it. This identification is confirmed by a reference in Brand to old houses in the Swirle near the Dissenters' burial ground in Sidgate (Brand 1789 I, 423 n.).] The Swirle, then, seems still to have been considered as part of Sandgate rather than to have had its own identity.

Development along the shore, meanwhile, was increasing. In the Common Council Book

of Newcastle (TWAS 589/13) for 1718–1743 there is a record of several complaints made to Council on 13 April 1719 by the inhabitants of Sandgate who “live towards the river”. Carts were “carrying along by the front of their houses”. It was decided to investigate the complaint and if necessary the appointed Aldermen would designate some other way to be a highway for that purpose, so it seems likely that it was around 1719 that a route was formalized along Sandgate shore.

Henry Bourne, whose history of Newcastle was published in 1736, three years after his death, referred to Swirle by the name Squirrel. There were clearly many chares or lanes off Sandgate by his time for he said that the street and its lanes were crowded with houses where several thousands of people lived, mostly the families of men who worked upon the water and especially the keelmen. It is particularly interesting that he thought that Sandgate was the common sand or shore of the river (Bourne 1736, 154).

“Of the Suburbs of SANDGATE

About the middle of this Street is an open Place called the *Squirrel*, from a little Brook of that Name, which runs through it into the River *Tyne*, which was the ancient Bounds of the Towne of *Newcastle*. From this, as far as the House of Jeremiah Cook, Shipwright, is the Street of *Sandgate*, then we enter St. *Ann*’s Street . . .”

The plan of Newcastle in Bourne’s *History* is similar to that published in 1723 by James Corbridge (fig. 16A) which shows the lay-out of Sandgate and the many chares off it, and “Sandgate key side” now formalized along the shore. The Swirle is shown as a wide lane, wider than the chares, from the shore of the Tyne to the middle of Sandgate. As in Corbridge’s plan, it is not marked Swirle, but “Wharf”. This is a word Bourne uses elsewhere as an alternative to quay, as for example when describing a disputed right to erect a ballast quay in 1697 (1736, 164), but in his text there is no mention of a wharf at Sandgate. The use of wharf to mean key is also found in a deed of 1730 relating to limekilns and a coal hole at the east end of Sandgate (TWAS

802/17), where there is a reference to “a key or wharf” at the front of the messuage. “Wharf” seems to indicate the use of Swirle or perhaps of its mouth as a quay. In saying that the Swirle runs through the open place of that name Bourne may have meant it ran beneath the ground, or it may be that it flowed along a channel down the street surface. It is odd, if the latter is the case, that it is never shown on any map.

About 20 years later a map of Newcastle was drawn by Isaac Thompson and dedicated to the Duke of Cumberland. Dated 1746, it is a manuscript map now in the British Museum. It shows Sandgate continuing at its east end as St. Ann’s Street. The high ground behind is shown, with the prominent twin towers of the Keelmen’s Hospital. The Squirrel is the name he uses for the Swirle and he shows a long strip of building on its west side. Like James Corbridge, he does not show the stream at all.

Thomas Hutton’s 1772 map of Newcastle (surveyed 1770) clearly shows the stream he calls Swerle rising some 500 yards from the shore, flowing to the boundary of the property on the north side of Sandgate, and not shown in the built-up area. He also shows the town boundary stones following a line which includes St. Peter’s quay to the east and then goes along Sandgate Street. These positions are confirmed by Thomas Oliver’s survey of 1831 (fig. 15) which also marks the town boundary stones. The river’s edge south of Sandgate was Sandgate Shore, and downstream to the Ouseburn the North Shore.

In 1789 when John Brand published his *History* he had access to more documents than were available to Bourne. He said the street Sandgate was named in deeds of 1485, 1487 and 1491, and the runnel which divided the street near the middle was called the “Squirrel”. Beyond this the street was called St. Anne’s Street. The plan by Beilby, apparently based on Hutton’s survey, was published in Brand’s *History*, and this too shows the course of the Swirle (fig. 16B).

The 19th and 20th Centuries

At a date not yet identified the part of Sand-



Fig. 16 *The Changing Riverside: A 1723 by James Corbridge (top left); B 1788 by Ralph Beilby (top right); C 1859 Ordnance Survey (bottom left); D 1919 Ordnance Survey (bottom right).*

gate just west of the Swirle was called St. Mary's Street although the traditional name was often still used. Quay improvements around 1840 and 1900, and street-widening around 1900, removed the irregular buildings which had developed along the river frontage of the block between Milk Market and Swirle,

making a very wide quay, and removed the north and south buildings of the row along the west side of the Swirle. The survey of Newcastle made in 1830 and published in 1831 by Thomas Oliver shows the area as it was before any of this work was begun, and in a book of reference identifies property owners. Those on

the west side of the Swirle, from south to north, were

- 636 Matthew Wheatley, who owned large buildings on the shore and the first building along the west bank of the Swirle;
- 637 Jacob Robertson
- 638 Mrs. Anne Moralee
 - a James Mackenzie

638a runs east-west along the front of Sandgate, the others run north-south and meet the water's edge next to an inlet which must represent the mouth of the stream. A lane behind the houses of the Swirle is unnamed, but other maps and documents of the 19th century call it Half Moon Entry or Half Moon Lane. On the Goad Insurance Plans of around 1927 it is shown as Back Swirle (Newcastle Central Library L912.2 N536).

The large block marked by Thomas Oliver as the property of Matthew Wheatley lay next to the river. Wheatley was an ironmaster who lived nearby, in Shieldfield. He owned other property in the Sandgate area but this block is clearly identified in a valuation made for him in 1847 by Thomas Bell (Newcastle Central Library, Seymour Bell portfolio 20). It was described as being at the Swirle and adjoining the New Quay, and consisting of a forge with two iron warehouses, a smith's shop and a small office all occupied by Wheatley's company; and property on the Swirle with 11 rooms and 3 attics or workshops let to 7 tenants. There was a letter to Wheatley accompanying the valuation explaining that in cases of compulsory purchase a seventh of the gross value should be added.

Knowles and Boyle, illustrating and writing in 1890, were setting out to show remains of the old town. They said that Sandgate Shore, between Milk Market and Swirle, was improved in 1840 and became the New Quay, shown on the first Ordnance Survey of 1859 (fig. 16C). They showed the Swirle with the Half-Moon Inn, recognizable as the same building in the old photographs in Newcastle Central Library, and the Half Moon Lane. They also commented on the squalor of the

chares. They showed an illustration (facing p. 89) of the buildings on the west side of the Swirle, very similar to the view shown in *The Monthly Chronicle of North Country Lore* (Vol 2, 1888, 24) reproduced here as Fig. 13.

During the middle decades of the 19th century the population of Newcastle grew rapidly. There were many workers who needed cheap accommodation near the river and the workshops. Old property in the chares of the Quayside and Sandgate was split into many tenancies. The Census enumerators' book gives precise information about the numbers living in the west side of the Swirle and in Half Moon Entry: in 1841, 29 families and 153 people; in 1861 27 families, 127 people; and in 1871 19 families and 107 people. In the 1861 Census enumerators' books the streets of the Sandgate area are listed and a comment is added: "This locality in former years one of the most populated parts of the town has now very much decreased the poorer or working classes having a great desire now to remove to the higher parts of Newcastle." Evidently such a luxury was unattainable for most of those in this street and its back lane.

Between 1843 and 1864 the Corporation purchased all the property on the west side of the Swirle. The corporation Rent Roll (TWAS 32/2) shows plans and addresses: Mr. Moralee's at the north, 3 Half Moon Lane and 2, 4 and 6 Swirle in 1846; E. Hutchinson's at 5 Half Moon Lane in 1846; Jacob Robinson's, the Half Moon Inn at 10 Swirle, in 1843. Mr. Wheatley's property at 16 Swirle and 137 Quayside was acquired in 1864.

The buildings on the site of the present excavation cannot have changed very much before the end of the 19th century. The outlines shown by Oliver in 1831 are there still in 1894—except that the narrow north-south strips have been truncated by the widening of Sandgate and Quayside and building of transit sheds along the quay, which took place around 1900 after plans were drawn in 1897 (TWAS T94/797). But the central buildings survived into the present century, as shown on the third Ordnance Survey of 1919 (fig. 16D) and the photograph held in the Newcastle Central Lib-

rary (Accession No. 3831), believed to date from 1926 (fig. 14). On the north side of the block a whole front range of buildings has gone leaving only the north end of the Swirle houses jutting out into Sandgate. On the south side of the block everything south of a little alley which ran east-west has been demolished, including that part of the Swirle frontage which had an archway through it to this alley.

For some parts of the site more detailed plan information is available. In the City of Newcastle Engineer's building plans there are drawings for minor alterations to the Half Moon Inn in 1889 (TWAS T186/13030) and to the centre of the block on the other side of the Half Moon Lane in 1886, when James Arnott installed a tank for warming oil (TWAS T186/1668). The alterations to the Half Moon Inn, by Hill and Watson, were to provide a bar with bar front in the south half of the building and a new shop front in the north part. The drawings of the existing building show the small-paned shop window which can be seen in old photographs of the Swirle. They also show that there were diagonal corner fireplaces, typical of around 1700, in the four ground floor rooms.

In the City of Newcastle's Estates and Property Department documents there is a book of plans of property owned by the Corporation (TWAS 32/2) which gives the date of purchase of some of Wheatley's land at 14 The Swirle and 137 Quayside as 1864, and of Mr. Moralee's land at 3 Half Moon Lane and 2, 4 and 6 Swirle as 1846, and shows the boundaries of these plots. The records of the City of Newcastle (Housing Act 1930. Individual Unfit Houses. No. 2) show that Nos. 1 and 3 Half Moon Entry were reported in 1937 to be unfit and were demolished in 1943. It has not been possible to find exactly when the other C17 houses in the Swirle were demolished, but the Goad plans show that the Half Moon was "under alterations June 1927", while on a set revised up to June 1942 only the northernmost building, shown as formerly 3 Half Moon Entry, is standing. Temporary dining rooms, known as The Swirle Cafe were built for Mrs. Moran (TWAS T186/A2793) at the north end of the site after 1943 and survived at least until

1968. The site then lay empty and used as a car park until excavation began in 1990.

Appendix 2 lists documentary and cartographic sources for the buildings.

THE POTTERY

Margaret Ellison

Medieval Pottery:

Related to the stratigraphy of the site

The medieval assemblages in phases 2-5, especially those associated with the kilns, can be equated with phases in the fill of the Castle Ditch (Harbottle and Ellison 1981), on the basis of the range of wares present and their proportions in the assemblages. Thus, the small group from phase 2, which pre-dates the kiln construction, contains the same range of wares as phase 3 at the Castle Ditch, which immediately post-dated the construction of the Black Gate by c. 1250. The group from phase 3 on this site is not statistically significant but the majority of the fragments are late reduced greenwares which occur for the first time in phase 4 of the Castle Ditch (suggested date, mid-14th century).

The deposits associated with the use of the kilns (phase 4) and their backfilling after use (phase 5A) are closely similar to the pottery assemblage from the infilling of the drawbridge defences of the Black Gate (Castle Ditch phase 5A). The same three common types (one local, two imported) occur in both assemblages and in similar proportion. The same common vessel forms also occur in both assemblages.

The conditions of deposition of the infill of the drawbridge defences at the Castle and the backfill of the kilns are also very similar. In both cases deposition appears to have been a single fairly rapid operation. Although the deposits are clearly secondary, the pottery is

not as fragmented and dispersed as, for example, material from the rubbish dumping levels of the same period in the Castle Ditch itself and only small quantities of residual material occur.

The fill of the counterweight slots at the Black Gate (5A) was dated to the late 14th to early 15th century on two grounds. First, the backfilling of this defensive structure was unlikely to occur unless the Castle had come to be regarded as obsolete. This could only have been the case after the completion of the circuit of the town walls, probably by c. 1370 (Harbottle 1989). The second criterion for dating the fill was on the basis of the Low Countries and Rhenish imported pottery with close parallels with kiln material in their countries of origin. On the basis of this evidence and further parallels between the Low Countries wares on this site and for example, the Utrecht II kiln site, it seems reasonable to suggest that phase 5A at the Castle Ditch site and phase 5A on this site are roughly contemporary dating to between c. 1375 and the mid-15th century.

This leaves the question of the dating of the actual use of the kilns (phase 4). The pottery assemblage from these contexts is smaller but not significantly different from phase 5A in terms of the proportions of fabric types. Only small quantities of pottery were closely associated with the kilns themselves and in many cases these fragments were not diagnostic of vessel forms, only of fabric type. Two Low Countries vessels, which could be of early 14th century Flemish origin (nos. 37 and 44) are associated with kilns [106] and [97] (archaeomagnetic dates 1280–1320, 1300–1330). However, other identifiable vessel forms are late 14th century types. This and the absence of any of the common local wares of the late 13th and early 14th century and the presence of large quantities of late reduced greenwares (mostly RG4), make it difficult, on the ceramic evidence, to place the use of the kilns much before the mid-14th century. This is to some extent at odds with the archaeomagnetic evidence, or at least suggests that the upper date ranges are the more appropriate. That is,

a suggested period of kiln activity from the early 14th century up to c. 1375.

The main pottery types and their proportions in phase 5B are similar to those in 5A but a few fragments of wares dating to the late 15th century or early 16th century occur. This is similar to the pottery assemblages from phase 7 at the Castle Ditch (suggested date late 15th century).

Importance for local pottery studies

The medieval pottery assemblages contribute to the dating of two important local pottery types: buff/white wares and late reduced greenwares (RG4 in particular).

First, the lack of residuality in phases 4 and 5 is marked.

Prior to the construction of the kilns there was no occupation of the site, merely the dumping of largely sterile deposits of sand and stone (phase 2). The occasional fragments of pottery that found their way into this dump are typical of late 13th and early 14th century groups from elsewhere in Newcastle and include the dominant ware of this period, buff/white ware. The start of intensive industrial activity on the site is marked by a clear break in the local pottery sequence. About 80% of the pottery from these contexts is made up of late reduced greenwares, no buff/white wares are present and only a few fragments of other earlier local wares.

This confirms the view that the production of buff/white wares and late reduced greenwares did not overlap, in spite of the fact that on most sites in Newcastle buff/white wares make up a significant proportion (10% or more) of late 14th and 15th century assemblages. Interestingly, the phase 5A group from the Castle, which is most similar to this assemblage, only contained about 4% buff/white wares.

Secondly, the lack of residuality also provides clear further confirmation that the dominant late medieval local pottery type (RG4) and certain late 14th and early 15th century Low Countries and Rhenish wares are contemporary.

The archaeomagnetic evidence may indicate that RG4 was in production, and that buff/white wares were no longer in production at a rather earlier date than previously supposed.

Post-medieval pottery

In relation to the stratigraphy of the site

Just as the different phases of activity in the medieval period are clearly differentiated in the pottery sequence, so the domestic occupation of the site in the post-medieval period (phases 6 and 7) is marked by distinctive pottery assemblages.

Some residual medieval material is inevitably present and in large quantities in contexts associated with construction and alterations of the buildings, but each of the successive activities relating to the occupation of the buildings from the late 17th century to the end of the 19th century is marked by a distinctive, closely datable group of pottery. At least one (1021) appears to be a primary deposit of vessels broken and discarded more or less *in situ*, datable to the mid-18th century.

Phase 8 is characterized by large quantities of mainly late medieval, residual pottery and rather small quantities of pottery contemporary with the period of occupation from c. 1750–1900. Both this phase and phase 9 produced rather large groups of burnt and worn fragments that were unidentifiable. This evidence suggests that the pottery assemblages do not reflect the day to day occupation of the site so much as construction and alteration, or in the case of phase 9, demolition and landfill.

The late 19th century material in the landfill in phase 9 produced evidence (in the form of kiln wasters and glass cullet) of clearance of nearby industrial sites (potteries and glass-houses) that are known to have gone out of use by the end of the 19th century.

Methodology

Quantification

There is still no entirely satisfactory method for

quantifying pottery assemblages. As in the past, I have found that a maximum vessel count can at least be applied consistently and objectively to all types of pottery, vessel forms and assemblages, which is an advantage compared to vessel equivalent calculations which require either measurable circular rim forms or knowledge of the size (weight and volume) of vessel forms represented. Neither of these criteria are satisfied by late medieval and post-medieval assemblages so far excavated in Newcastle.

I have used the additional statistic of weight as a means of checking the maximum vessel count. In most cases there is no significant difference between the two measures. Where large discrepancies occur, they seem to be due to the following:

1. In a primary deposit, such as 1021, where a large number of fragments of one pottery type join to form a small maximum vessel count, or where the majority of vessels of a particular fabric type are large heavy vessels (late reduced greenwares, late post-medieval redware kitchen vessels). In both these cases the weight count may significantly exceed the maximum vessel count.

2. Conversely, in groups of small fragments of residual wares, where each fragment represents one vessel, or where the majority of the vessels represented are small fine wares. In these cases the maximum vessel count may be significantly larger than the weight count.

Clearly the relative densities of different fabric types (e.g. stoneware compared to soft earthenware) probably also has some distorting effect on the statistics.

Bearing these factors in mind, I have also considered the maximum number of vessels (M) as a proportion of the total number of fragments recovered (S). If the number of fragments is significantly larger than the maximum number of vessels, then clearly a number of fairly complete vessels are present, which may explain a discrepancy between weight and maximum vessel counts.

The use of these three statistical measures side by side in conjunction with information on the types of vessels produced in each fabric, do

seem to give a fairly reliable indication of the relative importance of the various pottery types in each assemblage.

The M:S statistic is also an indicator of the degree of dispersal of vessel fragments after breaking and can be used to identify secondary or primary deposits.

Using this statistic in conjunction with other evidence, I have defined the following types of assemblage as a rough guide to interpreting the evidence:

a) M:S is less than 0.5. This suggests a *primary* deposit, not far removed from the spot and time where the vessels were broken and discarded. Hardly any assemblages on this site fall into this category, e.g. 1021 M:S = 0.2.

b) M:S is between 0.5 and 0.8. This suggests a *secondary* deposit but of roughly contemporary material, probably not disturbed more than once. Most of the deposits related to the various activities on the site, especially the backfill of the kilns, fall into this category.

c) M:S is 0.9 or more. This almost certainly indicates *residuality*, that is material removed in time and space from the original point of deposition and other fragments of the same vessels. Essentially each fragment (which is usually small) represents one vessel. The occasional joins are often simply cases of sherds broken in excavation. Examples of this type of assemblage are associated with disturbance of earlier deposits by construction (e.g. block 1270, phase 7) or demolition and landfill (phase 9).

Presentation of the findings

The data have been presented in two ways, which are intended to be complementary.

First of all, the illustrated catalogue gives a detailed account of each fabric type, its vessel forms and distribution, as well as references to previously excavated examples and published syntheses of current knowledge of each type.

The statistical evidence has been presented in a series of summary graphs (tables 1–14 held within the site Archive). The purpose of these is to give a clear visual summary of the composition of each pottery assemblage, mostly on a phase by phase basis, but where appropriate

context and block groups are represented separately.

Given the pattern of periods of activity followed by demolition and landfill that the stratigraphy represents, I felt this was the most appropriate form of representation.

For statistical purposes, fabrics of the same general type (or period in the case of residual wares) have been grouped together. The fabric group codes on the left of the graphs can be used to relate the graphs to the descriptions in the catalogue. The fabric groups from each assemblage are presented showing those with the highest incidence (based on the maximum vessel count) at the top.

For purposes of comparison, I have also included a graph representing the pottery assemblage from phase 5A at the Castle Ditch (table 4).

A catalogue of numbered pieces follows, of which most are illustrated. The number at the head of each entry is the catalogue number, an asterisk indicates that it is not illustrated. Cross referencing of catalogue numbers to vessel numbers is provided in the archive. The full archive (including the detailed statistical record) and the pottery itself, is deposited at the Museum of Antiquities, University of Newcastle upon Tyne.

RESIDUAL ROMAN WARES

CODES: ROC ROS

GROUP NO. 1.0

Two fragments were recovered from phase 6: 1 coarse grey ware; 1 samian ware.

DOG BANK TYPE 1

CODE: DB1

GROUP NO. 2.0

A coarse quartz tempered fabric with little iron content. A detailed description is given in the report on the excavation of the kiln site, which was located in the quayside area (Bown 1988). The excavated kiln is dated to the late 12th century but examples of this ware have been recovered in contexts at Jarrow dated to the mid-10th to early 12th century (Information S. Mills).

1 Rim of a cooking pot. Medium hard, pale buff fabric with very fine quartz and mica, sparse medium iron oxide inclusions and added abundant rounded coarse quartz temper. Externally sooted. The form is similar to vessels excavated at the kiln site. A thickening of the rim on one edge possibly indicates that it had a handle. Phase 5B: upper infill of the Swirle.

Another fragment in a pinkish buff fabric occurred in the lower infill of the Swirle (phase 5A).

BUFF/WHITE WARES

CODES: BWO F BWGR BW NL
GROUP NO. 4.0, 4.1, 4.2

Most are local wares first defined in the Castle Ditch report (Ellison 1981) but found on all Tyne-side sites of this period. The production period seems to run from the early 13th century to the early 14th century.

DISTRIBUTION

PHASE 2

Fragments of 4 vessels.

PHASES 5B, 6, 9

Fragments of 3 vessels.

The group in phase 2 was recovered from the upper levels of the sand pile. A base fragment and a splashed glazed fragment, probably from large jugs, are overfired and partly vitrified. This is more common towards the end of the production period of this ware. A fragment that is quartz tempered and also splash glazed is probably earlier. An unglazed fragment in this group in a fine quartz tempered yellow/buff fabric is not from the same production centre, though it could be from the local region.

The three fragments occurring residually are all quartz tempered and unglazed, probably from cooking vessels.

ORANGE BUFF/WHITE WARE

CODE: OBW
GROUP NO. 5.0

A very similar ware to the local buff/white wares in a more iron-rich clay. Very probably from the same production centre. On stratigraphic evidence from Blackfriars (Ellison forthcoming) it seems to appear towards the end of the buff/white ware production.

DISTRIBUTION

One fragment occurred in the sand pile in phase 2 and two fragments residually in phase 5.

LOCAL IRON-RICH QUARTZ TEMPERED FABRICS

CODES: BGP OGRF ERG JE21
GROUP NO. 6.1, 6.2

These are moderately fine to medium quartz tempered. The unglazed margins are oxidized pink or light red. Glazed margins and the core are reduced to a mid or dark grey. Glaze is applied by dusting producing a splashed and pitted appearance. This combination of glazing and temper is characteristic of 13th to early 14th century wares in the area.

A number of fabrics are present. Several are similar to Durham rather than Newcastle types of this period.

DISTRIBUTION

PHASE 2

Fragments of 2 unglazed and 3 glazed vessels.

PHASE 5A

Fragments of one unglazed base and 4 glazed vessels.

PHASE 9

Fragments of 2 glazed vessels.

SCARBOROUGH WARE

CODE: SCT2
GROUP NO. 11.0

One fragment possibly type 1 in phase 2.

Three small fragments of type 2 fabric (Farmer 1979) were recovered in phase 5.

SAINTONGE/SOUTH WEST FRENCH WARES

CODES: SA SWF
GROUP NO. 12.0, 12.1

Most of the few fragments recovered are typical of the mottled green glazed and unglazed wares associated with the Saintonge production centres in the late 13th and early 14th centuries. Others are probably from sources in the region and possibly of later date.

For summaries, in English, of the evidence for fabric, forms and provenance, see Chapelot 1983 and Hurst *et al.* 1986.

DISTRIBUTION

PHASE 2

1 fragment of unglazed ware in the sandpile.

PHASE 4

Fragments of 10 vessels associated with the use of the kilns.

PHASE 5

Fragments of 9 vessels.

PHASE 8

Fragments of vessel no. 42 (see below).

THE VESSELS

2 Fragment of the rim and handle of a jug. Hard, unglazed cream/buff fabric with pale grey reduced core. Phase 5B: upper infill of the Swirle.

A fragment of a much smaller vessel of the same form in a hard pinkish/buff fabric occurred, phase 5A, lower infill of the Swirle.

3* Fragment of the body, what may be the base of a spout, and a cut opening. Probably a vessel such as the globular jar from Hull (Watkins 1987, no. 275). Phase 5A.

4 Fragments of a skillet with a short solid handle. Hard cream/buff fabric with sparse iron oxide and fine mica inclusions. External unglazed surfaces darker buff. Internal mottled copper-green stained yellow lead glaze. I could find no parallel for this form as a Saintonge ware but as Chapelot notes (1983) our knowledge of the vessels in use in the 14th and 15th centuries is very limited. In other respects the vessel seems to be typical of the region. Phase 4: use of kiln 97, part of the vessel and a fragment of a second, almost identical, vessel were recovered from a context contemporary with the abandonment of the kilns.

LOCAL TRANSITIONAL WARES

A technological transition from tempered to mainly untempered fabrics and from "splashed" to slipped glaze accompanied by greater consistency of firing, took place during the 14th century. Wares of this period were produced by a combination of some new and some old practices.

TRANSITIONAL REDUCED GREENWARE

CODE: RGT

GROUP NO. 7.0

The fabric of these wares may be untempered or still contain moderate quartz. Glazing is more extensive than on earlier wares and more commonly slipped.

DISTRIBUTION

One fragment in phase 4, 2 in phase 5A, one in phase 7.

5 Rim and handle fragment of a small jug. Hard mid-grey fabric, untempered but with moderate very fine and occasional coarse quartz inclusions. Internal buff margin. External dusted green lead glaze partly destroyed by chemical action probably of lime. Phase 4: use of kiln 210.

BUFF/ORANGE WARES

CODE: BO

GROUP NO. 7.2

An untempered oxidized ware. The fabric is often made up of mixed iron-rich and less iron-rich clays. Firing temperatures and therefore hardness, are inconsistent. Glazing is by the dusting method and usually not extensive.

Large groups of this ware were recovered at the Blackfriars (Ellison forthcoming).

DISTRIBUTION

Fragments of one vessel in phase 4, 2 vessels in phase 5.

6 Rim and handle fragment of a jug. Soft orange/buff fabric with iron oxide and fine quartz inclusions but untempered. Unglazed except for drips on the underside of the handle (from other vessels during firing). Surfaces are a darker red/orange.

Probably the common balluster form with simple rounded rim, common at Blackfriars in the first half of the 14th century. Phase 5B: upper infill of the Swirle.

7 Jug rim fragment with the edge of the spout and base of the handle just visible. Medium soft orange/buff fabric with moderate very fine quartz and occasional large quartz and iron oxide inclusions, reduced in places. External splashed glaze probably applied by dusting. The lid seated form and harder fabric are characteristic of the end of the production period of this ware which overlaps the start of production of late reduced greenware type 4. Phase 4: use of kiln 145.

TEES VALLEY WARE

CODE: TVL?

GROUP NO. 5.1

DISTRIBUTION

Two fragments in the upper levels of phase 4 may

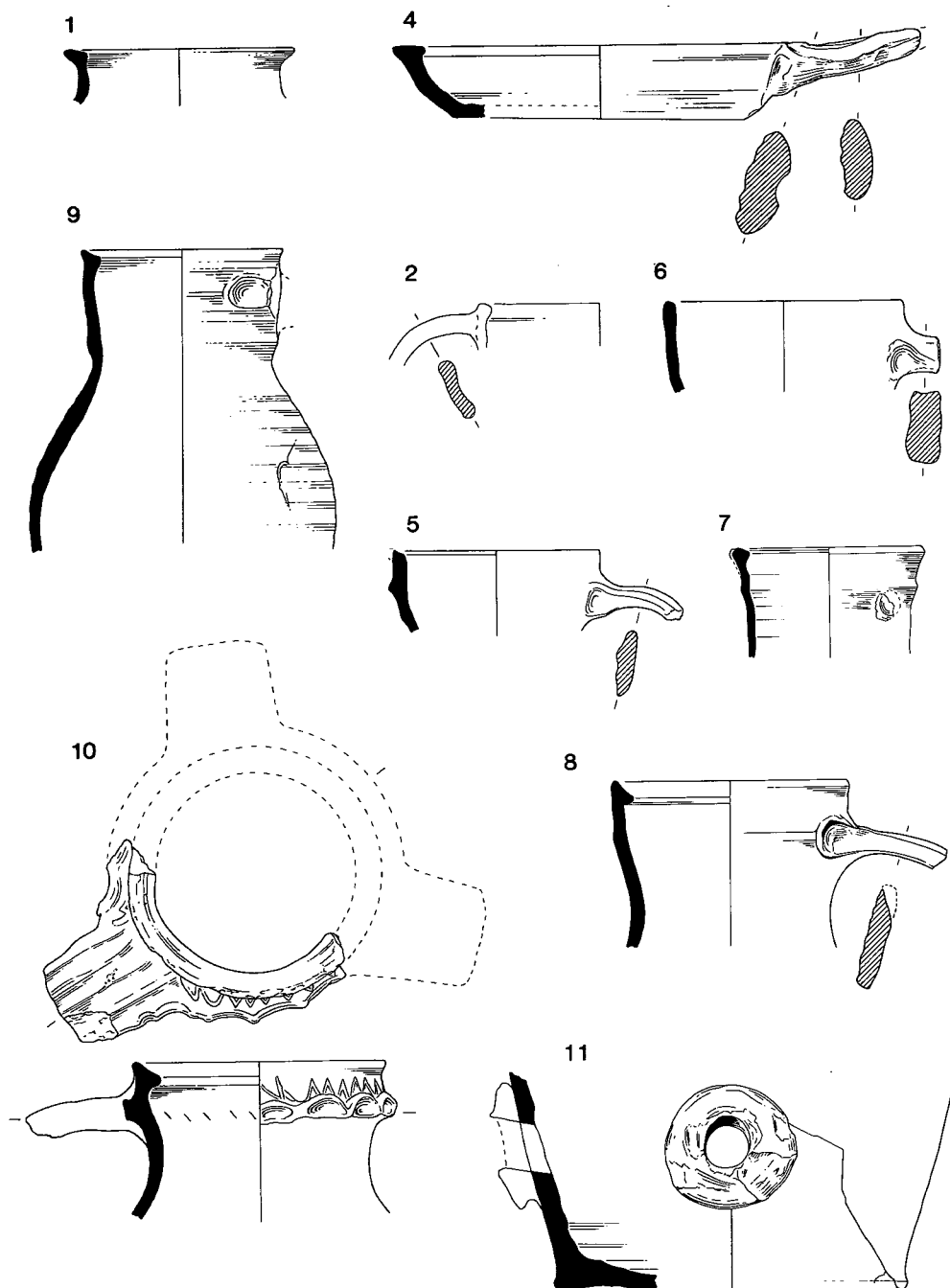


Fig. 17 Pottery scale 1/4.

be Tees Valley wares of the later hard red fabric type (comparison with vessels excavated in Hart Village). They are characterized by a sandy texture of abundant fine rounded quartz, hardness of firing and a distinctive pink/red colouring, but can be difficult to distinguish from the Low Countries wares in this period.

LATE REDUCED GREENWARES

By the end of the 14th century, technological developments had led to a remarkably standardized local production of almost exclusively reduced greenwares, most of which are probably from the same production centre.

These wares are characterized by a hard consistent mid to dark grey fabric usually with no visible inclusions. Glazing is extensive, usually a full external cover, applied in a lead glaze slip. Vessel forms are limited to three large heavy vessel types: jugs (in at least 2 sizes), cisterns (varying sizes) and storage jars. There are only occasional examples of other forms.

The tradition continued into the 16th century with some changes in fabric and potting styles and internal as well as external full glaze.

Large quantities of these wares were recovered from the Castle Ditch in late 14th to 16th century contexts and associated, as here, with Low Countries and Rhenish imports (Ellison 1981).

REDUCED GREENWARE TYPE 4

CODE: RG4

GROUP NO. 8.1

This is the dominant ware in phases 4 and 5. It was first described in the Castle Ditch report (Ellison 1981, p. 108), as the dominant ware in phases 5–8 (late 14th–early 16th century), but occurs from phase 4 (mid-14th century).

It has been identified on all sites on Tyneside with contexts of this period (including other sites on the Quayside and at the Jarrow monastic site).

DISTRIBUTION

PHASE 4

A maximum of 242 vessels.

PHASE 5A

A maximum of 535 vessels.

PHASE 5B

A maximum of 101 vessels.

PHASE 6

A maximum of 36 vessels.

PHASE 7

A maximum of 33 vessels.

PHASE 8

A maximum of 19 vessels.

PHASE 9

A maximum of 15 vessels.

THE VESSELS

JUGS

8 Fragment, rim, neck and handle, of a large jug. Hard, mid-grey fabric with grey/black internal surface. The underside of the handle is partly oxidized and unglazed. Otherwise full external green/brown glaze. Phase 5A: lower infill of the Swirle.

9 Part of a smaller jug in the same form as 8. Fabric and glaze are also the same. Internally sooted. Phase 5B: upper infill of the Swirle.

8 & 9 represent the common jug form of this period with a lid-seated rim. Castle Ditch 23 is a complete example. (Only two late reduced greenware jug rim fragments that were not lid-seated were recovered, residually.)

Fragments of 26 other vessels of this form were recovered (all but three in phases 4 and 5A): 19 reduced greenware type 4 fabric; 2 in other late reduced greenware fabrics; 5 in late oxidized fabrics.

CISTERNS

10 Fragment, rim, neck, one handle, of a cistern with characteristic "pie crust" cordon and scratched decoration. Hard dark grey fabric with oxidized patches under the handle. Full external green/brown glaze, thin under the handle. Phase 5A: backfill of the kilns.

11 Fragment, base, lower body and bung-hole, of a cistern. Hard dark grey fabric oxidized on the unglazed inner lip of the bung-hole. Full external green/brown glaze including under the base. Phase 5A: backfill of the kilns.

10 & 11 represent the common cistern form of this period. Castle Ditch 45 is a complete example. The cistern first came into use in the later 14th century.

Fragments of 18 other vessels in this fabric were recovered from phases 4 and 5A and 3 residually in later phases. One similar oxidized greenware vessel occurred in phase 5B.

STORAGE JARS

12 Fragment, rim, shoulder and handle, of a stor-

age jar. Hard mid-grey fabric with grey/black internal surface, oxidized in patches on the rim and beneath the handle where unglazed. Otherwise, full external green/brown glaze. Scratched decoration above the "pie-crust" cordon on the shoulder.

Castle Ditch no. 35 is a more complete (4 handled) example but the lower body form has still not been identified. Phase 5A: kiln backfill.

Fragments of 8 other vessels, mostly in the backfill of the kilns, and in the infill of the Swirle, were recovered in phase 5 and 1 in phase 7.

13 Fragment, rim and shoulder, of a jar similar to 57. Hard mid-grey fabric with internal, grey/black surface. Full external green/brown glaze, "pie-crust" cordon and scratched decoration. Phase 5A: kiln backfill.

14 Fragment, rim (badly chipped), shoulder and handle of a urinal. Hard dark grey fabric with lighter grey external margin. Lower edge of the handle unglazed and oxidized. Otherwise full external green glaze. Internal and some external scale. Not a common vessel type. Only three urinals were recovered from the Castle Ditch. Phase 5A: kiln backfill.

15* Two very heavy bases, 20–25 mm thick, approximate diameters, 260 and 190 mm. Hard mid-grey fabric, some surface areas oxidized. Splashes of glaze externally and in one case a stacking scar. Some traces of external sooting. A base of this thickness and similar diameter recovered in the Castle Ditch (no. 90) is thought to be a mortar, but these are very roughly finished internally and show no signs of wear. They may have had some other industrial function. Phase 5B and phase 8.

OTHER LATE REDUCED GREENWARES

CODE: LRG

GROUP NO. 8.0

Fabrics which are similar to RG4 but either not from the same production centre or, in some cases, possibly from an earlier production phase of the same centre.

DISTRIBUTION

PHASE 3

Fragments of 2 vessels.

PHASE 4

A maximum of 11 vessels.

PHASE 5A

A maximum of 21 vessels.

PHASE 5B

A maximum of 12 vessels.

PHASE 6

A maximum of 7 vessels.

PHASES 7–9

A maximum of 6 vessels.

THE VESSELS

16 Fragment of a cup? Hard light grey fabric with occasional quartz inclusions. Full internal and external crazed green glaze. Phase 5A: kiln backfill.

17 Fragment, rim and handle, of a cup? Same fabric and glazing as 63. Phase 5A: kiln backfill.

18 Pedestal base. Hard mid-grey fabric with light grey margins. Under-base oxidized to pale buff. Full internal and external green glaze except under-base. Internal and external sooting. Possibly a chafing dish. Late 15th and 16th century examples were recovered in the Castle Ditch (no. 79–82). Phase 5A: lower infill of the Swirle.

A small internally and externally glazed fragment with pierced holes may represent another chafing dish or a strainer. Phase 5B: upper infill of the Swirle.

OXIDIZED GREENWARES AND LATE OXIDIZED WARES

CODES: OG LOX

GROUP NO. 8.2

These are essentially the same type of fabric as the reduced wares. Many are probably fired in the same kilns. They are often small vessels which would have been stacked at the top of the kiln or unglazed wares, less subject to reduction. Some forms are identical to the reduced wares (see above).

DISTRIBUTION

PHASE 4

A maximum of 22 vessels.

PHASE 5A

A maximum of 39 vessels.

PHASE 5B

A maximum of 13 vessels.

PHASES 6–9

A maximum of 5 vessels.

THE VESSELS

19 Part of a large hollow vessel. Hard orange/buff fabric with reduced core. External green glaze, shallow "pie-crust" cordon and scratched decoration on the shoulder. External sooting and heat blistering. Internal scale deposit. Possibly part of a

distilling apparatus (Moorhouse 1972). Phase 5A: kiln backfill.

20* Fragment, base of a narrow thick-walled jar? Hard orange/buff fabric reduced internally. Unglazed. Internal residue, probably associated with its use. Similar vessels were found in the Castle Ditch (no. 99) and thought to be for industrial use. Phase 5A: lower infill of the Swirle.

21 Fragment of the neck of a flask. Hard orange/buff fabric external orange/brown glaze. Very similar to Castle Ditch 96. A complete flask with a globular body, narrow base and this type of narrow neck has been recovered in recent excavations at the Castle. Phase 5A: kiln backfill.

Fragments of two similar but unglazed and thicker walled narrow necks were recovered from the same context.

22 Fragment, base of a small jar or jug. Hard pale orange/buff fabric with mid-grey reduced core. Unglazed. Similar to Castle Ditch 98. Phase 5A: lower infill of the Swirle.

One other similar base fragment, phase 5B: upper infill of the Swirle.

HARD GRITTY REDUCED GREENWARES

CODE: RGHG
GROUP NO. 8.3

DISTRIBUTION

A few late reduced greenwares, occurring from phase 4 onwards, are apparently quartz tempered. The hardness, consistency of the fabric, extensive slip glazing and vessel forms associate them with late medieval production rather than the earlier tempered wares.

23 Fragment, rim and shoulder of a wide necked jar. Hard mid-grey fabric with abundant medium quartz temper. Surfaces oxidized in places to a bright orange. Full internal and external green glaze. Not a local clay type, more similar to Tees Valley wares. Phase 8.

LATE 15TH AND 16TH CENTURY REDUCED GREENWARES

CODES: RG5 RG6 PMRG
GROUP NOS. 9.0, 9.1, 9.2

A few fragments of reduce greenware types 5 and 6 (Ellison 1981, p. 108) and some similar early post-medieval wares were recovered.

They differ from the late medieval wares in the following ways: the fabric is softer and contains some quartz grits; more glaze is used, vessels are usually fully glazed internally and externally; the vessels are less carefully potted and decoration is minimal. Earlier wares equated with RG5 on the basis of fabric type (Bown 1988, p. 58) do not share the other characteristics of the early post-medieval production.

DISTRIBUTION

PHASE 5B

Fragments of 4 vessels.

PHASE 6

Fragment of one vessel.

PHASES 7-9

Fragments of 6 vessels.

IRON GLAZED BUFF WARE

CODE: LBW
GROUP NO. 8.4

Apparently contemporary with the local late medieval reduced greenwares. The glazing is very similar to the coarse iron-glazed ware vessels (see below).

24 Fragment, neck and shoulder, probably a large storage vessel. A very hard light grey reduced fabric oxidized to pale buff in places, with moderate medium quartz and black iron inclusions. External dark red/brown glossy glaze, thinning to iron speckled green glaze in places. Phase 5A: lower infill of the Swirle.

A base fragment, thinly glazed internally and in slightly softer fabric occurred in the same context and an almost identical shoulder fragment (from the same or matching vessel) in the upper infill of the Swirle.

LOW COUNTRIES REDWARES

CODE: LCR
GROUP NO. 20.1

These wares mainly originate in production centres in the coastal areas of the Netherlands though some Flemish wares are probably also present. The ferrous alluvial clays, characteristic of the region differ little from one area to another, so exact provenances are difficult to establish.

For a more detailed discussion of the characteristics and provenance of these wares imported into Newcastle, refer to the pottery report on the excava-

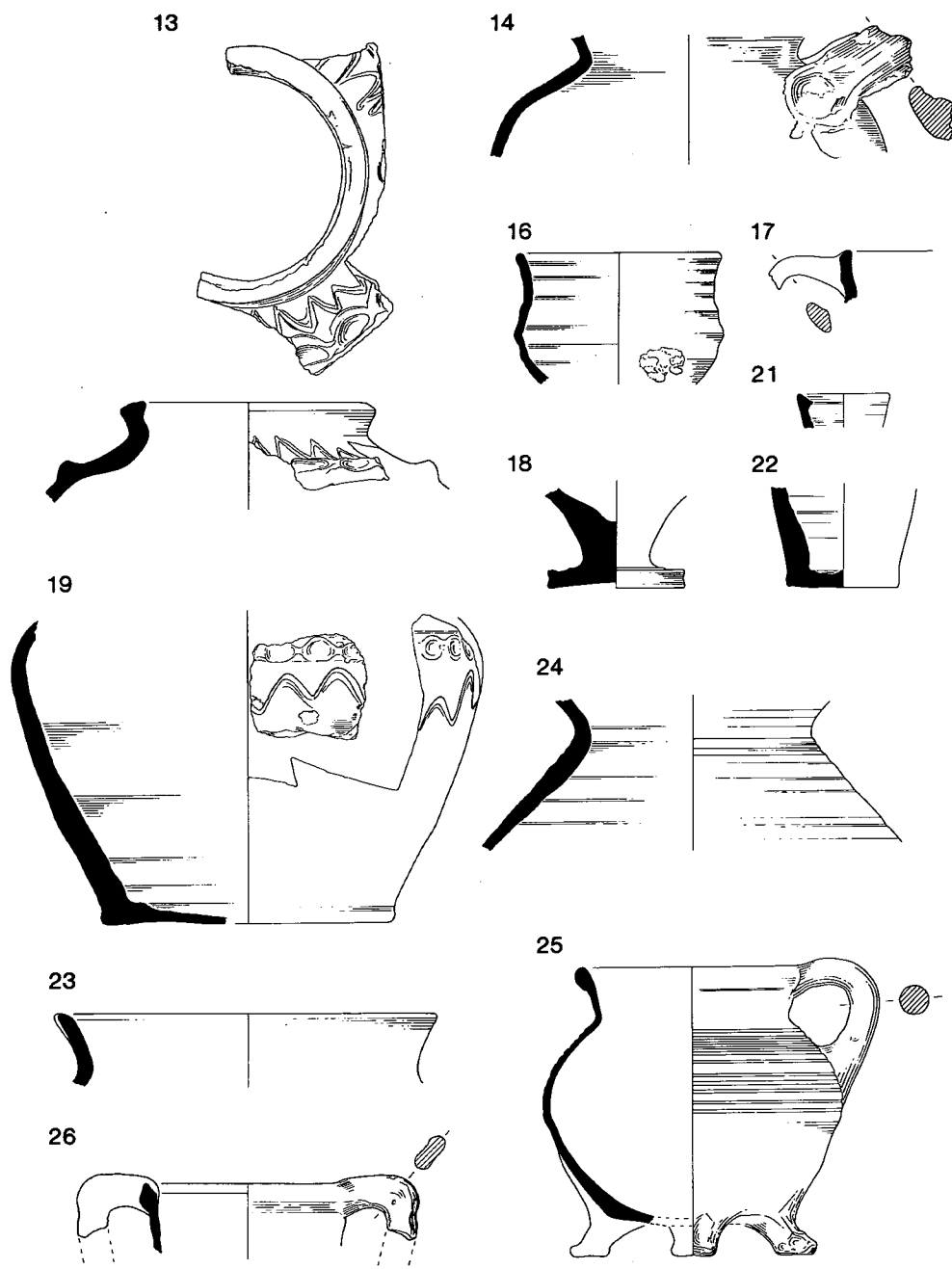


Fig. 18 Pottery scale 1/4.

tions in the Castle Ditch (Ellison 1981). The continental evidence is summarized in two articles by Janssen and Verhaeghe (1983) and by Hurst, Neal and Van Beuningen (1986). Similar assemblages of these wares have been recorded at other east coast ports, especially Hull (Watkins 1983).

DISTRIBUTION

PHASE 2

One small fragment from the shoulder of a hollow vessel, externally glazed with pronounced rilling, occurs in this phase. There is some intrusive material in the same context (0021), so this fragment may also be intrusive. However, it may represent an early import similar to the rilled cooking pots and jugs produced at the Haarlem II kiln (late 13th/early 14th century Janssen 1983) and contemporary with the small sample of local wares recovered from this phase.

PHASE 4

A maximum of 34 vessels.

PHASE 5A

The largest group of redwares, a maximum of 109 vessels, occurs in this phase, mainly associated with the back-filling of the kilns after they went out of use.

Although the wares are clearly from a number of different production centres, the majority share characteristics of form, glazing and fabric that suggest a restricted date range from the late 14th century to the early 15th century (with a few earlier 14th century and later 15th century vessels). The group is therefore broadly similar to the assemblages in phases 5 and 5a of the Castle Ditch and assemblages in a garderobe pit and a brick-lined pit (pottery groups 3 and 4) from excavations in Ousefleet, Hull (Watkins 1987).

The tripod cooking pot (both "grapen" and pipkins) is by far the most common form and the narrow conical necks (often with pinched handles), sparse glazing and darker fabric are diagnostic of this period. The cooking pot forms and those of the second most common vessel, the frying pan, are broadly similar to wasters from the Utrecht II kiln site (Bruijn 1979; Janssen 1983), dated to the first quarter of the 15th century.

PHASE 5B

A smaller group (maximum 26 vessels) containing residual earlier wares (including catalogue no. 49 which is possibly a product of the Utrecht II kiln and certainly contemporary) but also some late 15th and early 16th century forms similar to vessels recovered from phase 7 and later in the Castle Ditch.

PHASE 6

A few later 16th and 17th century vessels occur somewhat residually in this phase. Maximum 13 vessels.

PHASES 7-9

Small numbers of vessels (15th-17th century types) occur residually. Maximum 19 vessels.

THE VESSELS

TRIPOD COOKING POTS

(Grapen—two-handled; Pipkins—single handled and sometimes spouted.)

Probably 118 vessels are represented. The following forms were identified:

25 Probably a pipkin, but little of the rim survives. Medium soft, sandy, orange fabric with darker red/orange surfaces, orange/brown glaze on inner rim, spots on the shoulder. Extensively sooted externally and internally. The form is similar to Castle Ditch no. 162 and a pipkin from the Utrecht II kiln (Hurst *et al.* 1986, no. 190). Narrow rilling on the shoulder and knife-trimmed basal angle. Phase 5A: kiln backfill.

One other example in the same context, fragments of 6 others in phases 4 and 5, in contexts contemporary with the use of the kilns and in the backfill material. Of these one is spouted, so clearly a pipkin.

26 Possibly a "grape". This is suggested by the pinched and angled handle. Medium hard, orange, sandy fabric with darker red/orange surfaces. Thin dusting of glaze on the inner rim and upper handle. External sooting. The rim form is similar to a pipkin from the Utrecht II kiln (Janssen 1983, fig. 9.11, no. 2) and a "grape" from pottery group 3 on the Ousefleet site in Hull (Watkins 1987, fig. 44, no. 1). Phase 4 same context as no. 25.

One other example in phase 5B.

27 & 28 Examples of vessels with lid-seated rims similar to Castle Ditch no. 164, 163, "grapen" from the Utrecht II kiln (Janssen 1983, fig. 9.11, no. 1) and vessels in pottery group 4 (fig. 45, nos. 1, 2) at Ousefleet.

Both are in a medium hard, orange/buff, fine sandy fabric with darker surfaces. Patchy glazing over the rim and shoulder is a reduced olive/brown. No. 27 is externally sooted. Phase 5A: backfilling of the kilns and contemporary levels.

Fragments of 5 other vessels occurred in the kiln backfill and earlier phase 4 contexts.

29 Probably a "grape". Medium hard, light orange, fine sandy fabric with darker red surfaces but mostly chipped away. Orange/brown glaze surviving on the top of the handle. The sharp angle of the handle copies those of metal cauldrons and is similar to a vessel from a context in Zeeland dated before the floods of 1530 (1474–1525) (Hurst *et al.* 1986, no. 182). Phase 5A.

One other example phase 5A: kiln backfill.

30* Incomplete rim profile and handle similar to a pipkin from the Utrecht II kiln (Janssen 1983, fig. 9.11, no. 3). Medium soft, orange, sandy fabric. Internal orange/brown glaze. External sooting. Phase 5A: kiln backfill.

31* Fragments of a decorated vessel, probably a cooking-pot form. Medium hard, pinkish red, sandy fabric, reduced in places with dark buff surfaces. External olive/brown glaze and patches and splashes internally. External rilling between parallel cordons decorated with applied pads and slip-trailed arcs.

This type of slip decoration and rilling occurs on a pipkin from Utrecht dated to the first half of the 15th century (Hurst *et al.* 1986, no. 191). Though slip trailed decoration occurs earlier, and the parallel cordons and rilling are similar to a 15th century "grape" from Rotterdam (Hurst *et al.* 1986, no. 181). Phase 5A: kiln backfill.

Two other slip decorated vessels occur in phase 4, a context contemporary with the kiln use, and in phase 5A, backfill of the kilns.

32 "Grape" or pipkin. Medium soft, orange, fine sandy fabric. Full internal chestnut brown glaze. Externally sooted. The lid-seating formed by the angle of the neck is a common 16th century feature. Similar to Castle Ditch no. 170 which occurs in that sequence from the late 15th century onwards. Phase 6.

One other example, phase 8.

33* Rim fragment in medium hard, orange, fine sandy fabric. Full cover of glossy chestnut brown glaze. The form is similar to Castle Ditch 171 (16th century context). Phase 5B.

34* Rim and shoulder fragment of a lid-seated small pipkin with collared rim. Medium hard, dark orange/red, sandy fabric. Full yellow/brown glaze externally and on the inner rim. Form identical to Castle Ditch 168 (16th century type). Phase 6.

35* Rim fragment of a cooking pot with thumbled external cordon. Medium soft, light orange, fine sandy fabric. Full cover of orange/brown glaze. The

form is the same as Castle Ditch 173 (Mid-16th century type). Phase 8.

36* Rim fragment, cooking pot or similar vessel. Medium hard, abundant sandy pink/buff fabric. Internal yellow glaze with sage green patches. Collared rim, lid-seating formed by the angle of the wide neck. Typical 17th-century form (see Hurst *et al.* 1986, no. 186 and 17th century vessels from the Blackfriars at Newcastle, Vaughan 1987). Phase 8.

FRYING PANS (SKILLETS)

Probably 23 vessels represented. Most are sooted externally.

37 Rim and handle of a frying pan. Hard, light orange, fine sandy fabric with darker surfaces. Patches of thin orange glaze dusted below the inner rim.

The solid handle form is not known in the Netherlands before the late 14th century (Hurst *et al.* 1986, p. 136) and the form of this vessel is similar to skillets from the Utrecht II kiln (Janssen 1983, fig. 9.13, 1,2). However very similar vessels were also produced in Flanders (Lampernes) from the late 13th century to c. 1375 (Verhaeghe 1983, p. 71, fig. 7.2).

Since this vessel occurs in a context in Phase 4 associated with the use of kiln no. 106 and the last firing of that kiln has an archaeomagnetic date of 1280–1320, it is likely that it is from a Flemish source.

38 Frying pan. Medium hard, buff, sandy fabric with orange/buff and reddish surfaces. Internal yellow glaze unevenly splashed. Sooted externally.

The form is similar to a vessel from Ousefleet (Watkins 1987, fig. 45, no. 7). The basic vessel form is still the same as late 14th and early 15th century vessels but the folded handle suggests a mid to late 15th century date (Janssen 1983, p. 161). Phase 5B: upper levels of the infill of the Swirle.

One other fragment of the same rim form (without the handle), phase 5A: kiln infill.

39 Fragment of a frying pan. Medium hard, orange/red, fine sandy fabric with dark red surfaces. Internal orange/brown glaze splashed unevenly. External sooting.

The form is very similar to a vessel from the Utrecht II kiln (Janssen 1983, fig. 9.13, no. 2). Phase 5A: kiln backfill.

40 Fragment of a frying pan. Medium hard, dark orange, sandy fabric. Internal pitted orange/brown glaze, spots and runs externally. External sooting.

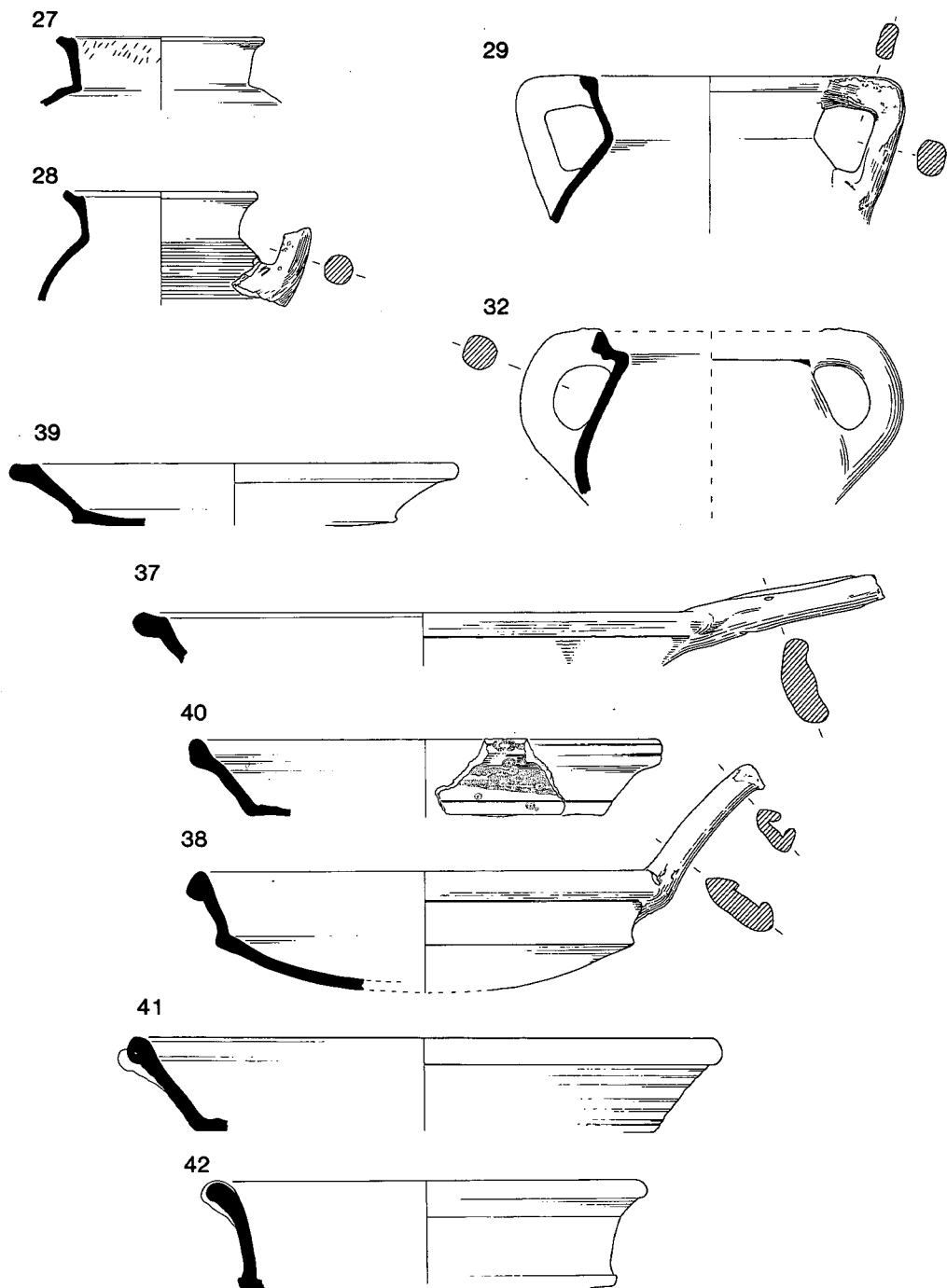


Fig. 19 Pottery scale 1/4.

The form is similar to no. 370 in the Hull type series (Watkins 1987). Phase 5A, same context as no. 39.

41 Fragment of a frying pan. Medium soft, light orange, sandy fabric with dark red surfaces. Full internal chestnut brown glaze. This simple folded rim form (Castle Ditch 196, Hull type series 369) is common in the late 14th and 15th centuries. Phase 5A: infill kiln 97.

One other fragment of smaller vessel of the same form, in the lower infill of the Swirle; 2 other vessels in the kiln backfill. Phase 5A.

42 Fragment of a frying pan. Medium hard, orange, fine sandy fabric with lighter surfaces. Internal full orange/brown glaze. Similar to a vessel from Ousefleet (Watkins 1987, fig. 45, no. 8). Phase 5A: kiln backfill.

Fragment of a second vessel phase 7.

43* Fragment of a rim, possibly a frying pan. Medium hard, orange, sandy fabric. Internal orange/brown glaze. External sooting. Form similar to Castle Ditch 202, a late 15th and 16th century type. Phase 5A: lower infill of the Swirle.

BOWL SHAPED COOKING VESSELS

44 Fragment of a lid-seated rim with the base of a large solid handle, apparently of the common skillet type, and bowl-shaped body. Hard, orange, fine sandy fabric with darker reddish surfaces and reduced core at the base of the handle. Patchy internal orange/brown glaze. No external sooting.

Although what survives of the rim and handle is similar to tripod skillets from the Utrecht II kiln (Janssen 1983, fig. 9.13, no. 4) the context date is too early for this type of vessel in the Netherlands. Solid skillet handles are known in Flanders at this date (see above no. 37) and the rim form is similar to greyware bowls from Lampernesse (Verhaeghe 1983, fig. 7.13) so it may be another Flemish vessel. The fabric is very similar to no. 37. Phase 4: kiln 97 usage (archaeomagnetic date of last firing 1300–1330).

45 Fragment, probably a tripod skillet. Medium soft, sandy orange fabric with darker reddish surfaces. Internal patchy and chipped orange/brown glaze. The rim form is very similar to late 14th and early 15th century frying pans such as Castle Ditch 194. Phase 5A: kiln backfill.

DRIPPING PANS

A less common vessel form occurring from the 13th century onwards.

46* Small fragment of the rim and pouring channel of a dripping pan. Hard, dark orange sandy fabric, mostly burnt to a dull red and dark buff, with reduced core. Internal orange brown glaze. The form of the rim, grooved on the upper edge, is the same as Castle Ditch nos. 190 and 191. Phase 5A: kiln backfill.

One other fragment probably from the basal angle of a dripping pan was recovered from the kiln backfill.

BOWLS

47* Fragment of a collared rim and spout. Very worn. Medium hard, orange fabric with darker red surfaces (chipped). Remains of chestnut brown glaze externally. Probably a similar vessel to one from the Ousefleet excavation (Watkins 1987, pottery group 4, fig. 45, no. 5) and the same type from the Utrecht II kiln (Janssen 1883, fig. 9.14, no. 1). Phase 5A: kiln backfill.

48* Fragment of the base of a large vessel with a pinched foot. Medium soft, sandy orange fabric. Full internal yellow/orange glaze, reduced in patches to yellow/green. The slightly angled form of the base is very similar to large bowl forms from Utrecht II kiln (Janssen 1983, fig. 9.14, 2&3). Phase 5A: kiln backfill.

Another smaller but similar base with either pinched feet or a frilled foot ring and a third fragment with a pinched foot occurred in the same phase.

DISHES

These became common from the end of the 14th century (Janssen 1983, p. 165) and occurred in the Castle Ditch from that period.

49 Fragment of a dish with pinched foot. Medium soft, red/orange, sandy fabric with darker surfaces. Internal slip painting with full glaze cover (yellow/brown and yellow). The vessel form is similar to Castle Ditch no. 206 and the slip design is probably a bird or animal motif with broad dashes round the rim, such as those from the Utrecht II kiln (Hurst *et al.* 1986, no. 226, Janssen 1983, fig. 9.17, no. 1). Phase 5A.

50* Fragment of the body of a dish. Hard red/orange, dark grey/buff (reduced) fabric with buff external surface and internal olive green glaze.

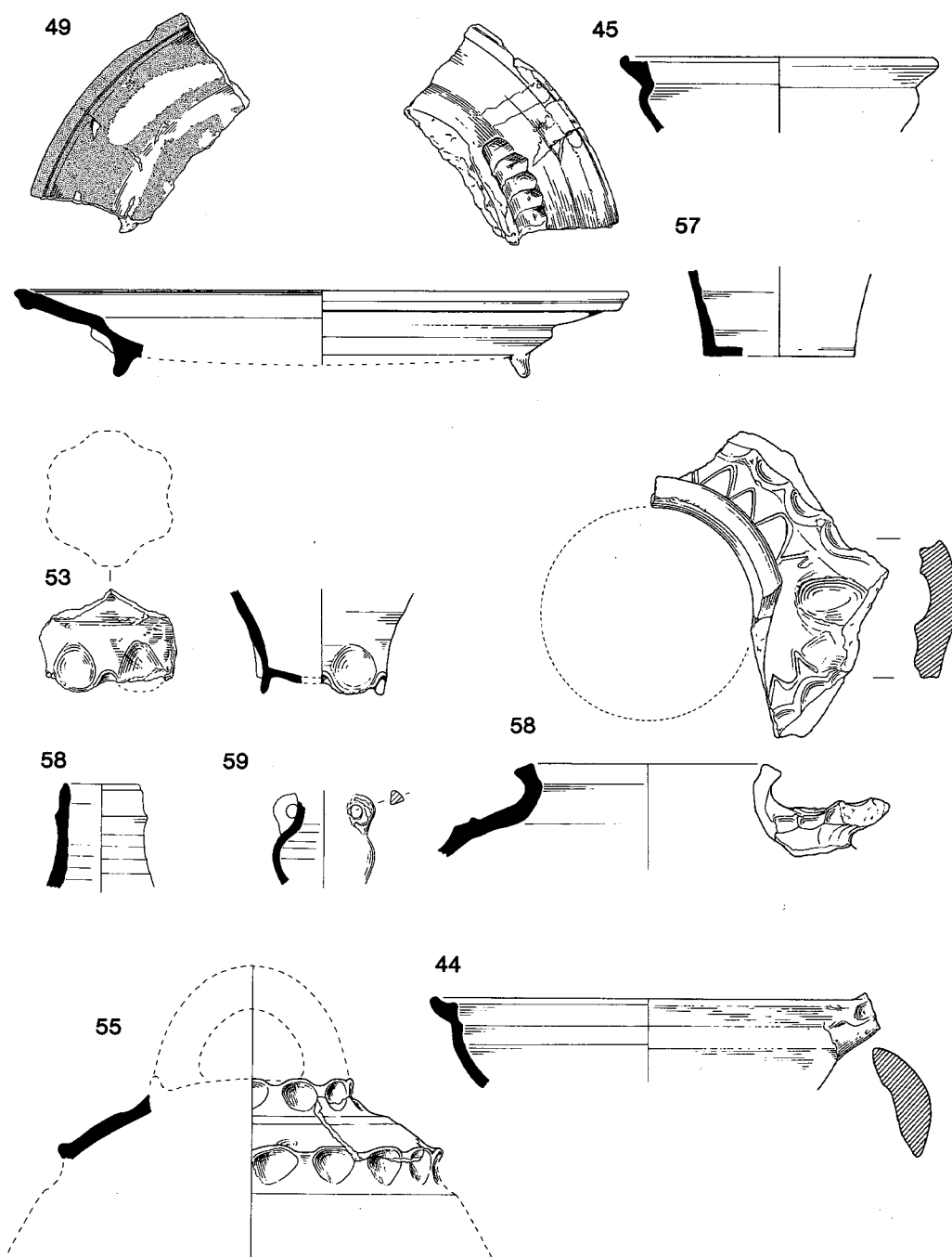


Fig. 20 Pottery scale 1/4.

Some external sooting. The form is very similar to the rather crude heavy dishes found in 16th century contexts in the Castle Ditch (nos. 207–209). Phase 6.

HIGHLY DECORATED WARE?

51* A fragment recovered from a disturbance in the upper levels of the sandpile. The fabric has a medium to fine moderate quartz temper, mid-grey inner margin, oxidized buff/orange external margin and buff surfaces. Glaze splashes and a painted stripe in cream slip externally.

Possibly from the unglazed lower body of a vessel in the highly decorated tradition which developed in Flanders in the later 13th century (Verhaeghe 1983, p. 70), though the fabric is atypical. Phase 5A.

LOW COUNTRIES GREYWARES

CODE: LCG

GROUP NO. 21.0

Unglazed reduced wares produced in the same region, from the same clays and often in the same kilns as the redwares. Common in the 13th and 14th centuries but by the 15th century beginning to be dropped from the production of most potteries. Both red and greywares were still produced by the Utrecht II kiln. Only a few fragments were recovered from the Castle Ditch and at Blackfriars, so this group is unusually large for a Newcastle assemblage.

Usually a mid or light grey sandy fabric with darker surfaces. A few sherds have an orange/brown core.

DISTRIBUTION

PHASE 2

Fragments of 2 vessels in the sand pile.

PHASE 5A

Fragments of 6 vessels in the backfill of kiln 97; 1 in the infill of the Swirle.

PHASE 7

1 fragment.

THE VESSELS

52* Fragment of a large rod handle, probably from a pitcher, similar to Castle Ditch no. 260. Probably 14th century. Phase 2: upper levels of the sand pile.

53 Fragment of the base of a small jug with continuous large thumbing as on a greyware jug from the Utrecht II kiln (Janssen 1983, fig. 9.16, no. 2). Phase 5A: backfill of kiln 97.

A fragment of the base of a second vessel in the same context, is closer to the frilled base form that developed at this time (Redware examples occur in the Utrecht II kiln group).

54* Fragment of the base, probably of a hollow vessel, with pinched foot. Phase 5A: same context as 37.

55 Fragment of the shoulder of a large closed vessel. Part of the base of a handle survives on the upper edge and a thumbled cordon on the lower edge. Possibly from a fire cover similar to those produced by the Utrecht II kiln (Janssen 1983, fig. 9.16, no. 3). Phase 5A: backfill of kiln 97.

LOW COUNTRIES WHITEWARES

CODE: LCW

GROUP NO. 22.0

DISTRIBUTION 1 in Phase 4; 1 in Phase 5B

Small quantities of whitewares were produced in the Low Countries kilns (including Utrecht II) from the 14th century and a few examples were recovered from the Castle Ditch in 16th century contexts (Ellison 1981, p. 147).

56* Two fragments were recovered from phase 4 and phase 5B. Both are glazed with a copper green stained lead glaze. The fabric is hard, white to pale buff and moderately gritty, in one case, rather coarse. The fragments are probably from small dishes or bowls. One is sooted externally.

MERIDA TYPE WARE

CODE: MER

GROUP NO. 13.1

DISTRIBUTION 1 in Phase 5B

An unglazed ware in a sandy micaceous fabric, produced in the Alentejo area of Portugal and neighbouring area of Spain. The ware was first described by Hurst (1977a). He has since updated the evidence in Hurst *et al.* 1986, p. 69.

57 Fragment of a base, possibly a standing costrel. Orange/buff fabric of mixed iron rich and less iron rich clays, with medium to coarse rounded quartz and iron oxide inclusions and fine mica visible on the surfaces. The underside is rough as if stood on sand while wet, with angular quartz and occasional large mica flakes adhering to it. It is also slightly sooted.

The standing costrel form first appears in the 13th

century and is still being made to the present day. The type is illustrated by Hurst (1977a, fig. 32, nos. 46, 48). Medieval wares are distinguishable by their coarser and browner fabric, so this example is consistent with the late medieval date attributed to the context it was recovered from. Phase 5B: upper infill of the Swirle.

SIEGBURG STONEWARES

CODE: SST

GROUP NO. 14.0

A fine light grey stoneware usually unglazed except for patches of ash glaze appearing as an orange bloom.

DISTRIBUTION

PHASE 4

Fragments of 2 vessels.

PHASE 5A

Fragments of 6 vessels.

PHASE 5B

Fragment of one vessel.

PHASE 6

1 fragment.

THE VESSELS

The few diagnostic sherds suggest that the vessels are small drinking mugs and jugs such as the assemblage from Gottingen, dated c. 1400 and illustrated by Stephan (1983, fig. 8.12).

58* Rim fragment of a long-necked mug such as a Jacobakanne (Hurst *et al.* no. 263). The fabric is the hard, fine, light coloured stoneware associated with the Siegburg potteries but the vessel is iron-washed externally and over the lip, a characteristic commonly used to distinguish Langerwehe wares. Phase 5A.

LANGERWEHE STONEWARES

CODE: LST

GROUP NO. 15.0

Usually a dark grey stoneware with external purplish red iron-wash or, by the 15th century, a patchy grey and brown salt glaze. The firing often failed to reach the temperature necessary to produce full stoneware, so underfired vessels occur, ranging from pinkish or buff earthenwares to somewhat darker near stonewares. About 23% of the vessels in this assemblage are earthenware or near stoneware.

The ware was first described by Hurst (1977b) and

a further updating can be found in Hurst *et al.* 1986. A large group was recovered from 14th and 15th century contexts in the Castle Ditch (Ellison 1981).

DISTRIBUTION

PHASE 4

A maximum of 12 vessels.

PHASE 5A

A maximum of 40 vessels.

PHASE 5B

A maximum of 10 vessels.

PHASES 7-9

Fragments of about 10 vessels (occurring residually)

THE VESSELS

A few diagnostic sherds suggest that large jugs are present probably Hurst type III, which are datable to the late 14th and first half of the 15th century, and the smaller 15th century type IV, which are mostly drinking jugs. A few of these which are salt glazed, could be early Raeren or Aachen wares.

59 Fragment of shoulder and looped handle. Possibly a small costrel. Dark grey stoneware. Internal and external iron-wash and external salt glaze. Phase 5A: lower infill of the Swirle.

60 Jug rim with slight cordon. Mid-grey near stoneware to pinkish earthenware. External thin iron-wash and salt glaze. Possibly a type II jug (14th century) but occurring in Phase 5B.

61a & b* Fragments of two bevelled rims of jugs (Hurst type III). One is rouletted. Externally iron-washed, dark grey stoneware. Phase 5B, upper infill of the Swirle and phase 5A, kiln backfill.

62* Rim and part of a handle of a small mug, probably the same form as Castle Ditch 268. Buff near stoneware, light grey and brown salt glazed. Phase 9.

RAEREN/AACHEN STONEWARES

CODE: RAST

GROUP NO. 16.0

Dark grey stonewares with grey and brown glossy salt glaze, produced in the late 15th and 16th centuries at two centres, Raeren and Aachen, whose products are not easily distinguished unless complete vessel forms survive. Some of the earlier wares from these centres are also very similar to the later salt glazed Langerwehe wares.

Fragments in phase 5A and some residual vessels in later phases are all of this earlier type but fragments in phase 5B are typical 16th century Raeren/Aachen wares.

DISTRIBUTION

PHASE 5A

Fragments of 6 vessels.

PHASE 5B

Fragments of 4 vessels.

PHASE 6

Fragments of 3 vessels.

PHASES 7-9

Fragments of about 9 vessels (occurring residually).

THE VESSELS

63* Fragment of the body and handle of a cup. Mid-grey stoneware, internal glossy grey and external grey and brown salt glaze. The form is like Langerwehe cups (Hurst 1977, fig. 6, no. 3), so the vessel could be from that source. However, the fabric and glazing look more like Raeren wares. Phase 5A: kiln backfill.

A fragment of a very similar, but smaller vessel, was recovered from the lower infill of the Swirle (phase 5A).

64* Rim and fragments of the common Raeren mug form (e.g. Castle Ditch no. 277). Dark grey stoneware. External brown salt glaze. Phase 5B.

Fragments of frilled bases of similar vessels occurred residually in phase 9.

COLOGNE/FRECHEN STONEWARE (16th century)

CODE: COL/FRECH

GROUP NO. 17.0

For a general description and examples imported into Newcastle, see Ellison 1981, p. 150.

DISTRIBUTION

One fragment recovered in phase 6.

MARTINCAMP FLASKS

CODE: MC

GROUP NO. 31.0

Two fragments may be from flasks of this type: A stoneware (type 2) fragment in phase 5A; an orange/buff earthenware fragment from the base of

the neck, in phase 6. The fabric of this one is more like the 16th century type 1 vessels than the hard red 17th century type 3 (Hurst, 1966, 1977c).

17TH CENTURY FRECHEN STONEWARES

CODE: FST

GROUP NO. 17.1

Dark grey stoneware with brown or grey salt glaze with "orange peel" surface texture.

DISTRIBUTION

PHASE 6

Fragments of 7 vessels.

PHASE 7

Fragments of 8 vessels.

THE VESSELS

The few fragments recovered are probably from Bartman type jugs of mid-17th century type, except for one fragment with applied acanthus leaf pattern, that may be from an earlier 17th or late 16th century vessel. For a general description of these wares see Hurst *et al.* 1986.

WESTERWALD STONEWARE

CODE: WST

GROUP NO. 30.0

A 17th century ware characterized by cobalt blue and manganese colouring of the applied decoration under a grey salt glaze. For a general description see Hurst *et al.* 1986.

Three small fragments were recovered in phase 6. One has part of an applied lion medallion such as on vessel 339 (Hurst *et al.* 1986) which is dated to 1632.

CISTERCIAN WARE

CODE: CI

GROUP NO. 24.0

Large numbers of this ware were recovered in contexts from the late 15th century to the end of the 16th century in the Castle Ditch. It is likely that they were being produced locally (Ellison 1981, p. 154) and evidence of one kiln has come to light: some fragments of kiln waste, collapsed cups (undecorated type 14 cf. Brears 1971) and kiln furniture, picked up during building work at St. Mary's College, Durham in 1965. This material is now deposited at Durham University Department of Archaeology.

DISTRIBUTION**PHASE 5A**

Fragments of 1 cup.

PHASE 5B

Fragments of 4 cups.

PHASE 6

Fragments of 6 cups.

PHASES 7-9

Fragments of 5 cups.

THE VESSELS

Most of the fragments were too small to indicate specific cup forms. In phase 5, one cup base is probably a type 1 form (Brears 1971) and in phase 6, a rim fragment is probably type 14. A cup base in phase 8 was similar to late 16th and 17th century mug forms derived from Cologne/Frechen stone-ware.

Most of the fragments are undecorated. One example of applied strip decoration occurred in phase 6.

BLACKWARE

CODE: BLW

GROUP NO. 25.0

Red earthenwares with glossy black (iron-stained) glaze. A common 17th century type.

DISTRIBUTION

One fragment in phase 6, 4 in phase 8, 1 in phase 9.

THE VESSELS

Probably mostly cups. One fragment of a large flatware.

COARSE IRON-GLAZED WARE

CODE: MID PUR?

GROUP NO. 25.1

This ware was first identified in the Castle Ditch (nos. 386-388) where it occurred in early to mid-16th century contexts.

It has some similarities to Midlands underfired purple wares (Coppack 1972) but the potting is very crude.

The fabric is red and reddish buff (sometimes reduced) with abundant rounded medium quartz temper. Firing temperature seems to have been variable: the fabric is usually hard but medium soft

underfired fragments occur. Glazing is patchy and ranges from a metallic purple to a brownish yellow, depending on the firing temperature. Some fragments are decorated with scratched wavy lines.

DISTRIBUTION**PHASE 5B**

Fragments of 2 vessels.

PHASE 8

Fragments of 7 vessels.

THE VESSELS

The fragments are of large heavy vessels, such as storage jars. There are fragments of two internally glazed bases (one is thumbled underneath, possibly accidentally) and one simple rounded rim, also glazed internally.

UNPROVENANCED

CODE: HGRM

GROUP NO. 34.0

A very hard (fired to the point of blistering) mid-grey fabric with brick red margin, red/buff or grey/buff external surfaces. Moderate fine and occasional medium quartz, occasional soft white (chalk?) inclusions. Mostly unglazed; two fragments have runs of yellow/brown glaze externally.

DISTRIBUTION**PHASE 5B**

Fragments of 2 vessels.

PHASES 6 AND 8

Fragments of 1 other vessel.

65 Fragment, rim and handle, of a pitcher. Unglazed except for accidental spots. Phase 5B.

ENGLISH WHITEWARES

CODE: WW, SH

GROUP NO. 26.0

Mostly small sherds of yellow or copper green glazed white and pale buff fabrics. The majority seem to be Surrey/Hampshire types (Holling 1971, Haslam 1975). A few may be from a Midlands source (see Castle Ditch 363, which is similar).

DISTRIBUTION**PHASE 5B**

Fragments of 2 vessels.

PHASE 6

Fragments of 4 vessels.

PHASE 7

Fragments of 3 vessels.

66 Rim of a jar. Hard buff fabric partly reduced with apple green glaze on the inner rim only. Probably a Surrey ware. Fabric and glazing are very similar to Castle Ditch 359. Phase 7.

67* Fragment of a cup. The body is in a white fabric with very fine sparse quartz and iron oxide inclusions and yellow glazed internally. This is similar to 17th century Hampshire whitewares (Haslam 1975). However, the base of a handle applied to the external surface is in a red fabric of the metropolitan type and glazed with a copper stained glaze. Phase 7.

WESER SLIPWARE

CODE: WESER

GROUP NO. 19.0

A late 16th and early 17th century German white-ware. For a general description and references, see Hurst *et al.* 1986. A large group of these vessels was excavated at the Blackfriars in Newcastle (Fraser 1987).

68* Rim and body fragment of a plate. The form is the same as no. 375 (Hurst *et al.* 1986) and the slip pattern matches one of the vessels from Blackfriars (no. 90). Phase 9.

METROPOLITAN TYPE REDWARES

CODE: MET

GROUP NO. 27.0

Mid-17th century redwares of the type produced by the Essex potteries. Large groups of these wares were recovered from the backfill of the civil war defences at the Castle (Ellison 1979, 17th Century Pit and 1983, Bastion) and from the Blackfriars (Vaughan 1987). They are thought to be from the London area, rather than a more local source.

DISTRIBUTION

PHASE 6

A maximum of 109 vessels.

PHASE 7

A maximum of 44 vessels.

THE VESSELS

Few large fragments survived but the majority of

forms that could be identified are already known from previous excavations in Newcastle (see above), though not always in typically metropolitan fabric. The vessels from this site are listed below using the site reference and catalogue number of the published form.

PLATES

17th Century Pit: no. 1—5 vessels. Bastion: no. 46—1 vessel. Blackfriars: no. 48—1 vessel; no. 51—1 vessel; no. 54—3 vessels; no. 56—1 vessel.

BOWLS

17th Century Pit: no. 13—2 vessels. Blackfriars: no. 36—1 vessel; no. 39—1 vessel.

JARS

17th Century Pit: no. 7—1 vessel; no. 14 (similar Bastion no. 13)—6 vessels. Bastion: no. 14—2 vessels. Blackfriars: no. 13/15—1 vessel.

SKILLETS

17th Century Pit: no. 9—2 vessels. Bastion: no. 26—1 vessel. Blackfriars: no. 26—1 vessel.

JUGS

Blackfriars: no. 64—3 vessels.

COOKING POT WITH EXTERNAL LID-SEATING

Bastion: no. 2—2 vessels.

MUGS

17th Century Pit: no. 3/3a—3 vessels.

TANKARD

Blackfriars: no. 72/73—1 vessel.

69 Fragment, rim, of a plate. Fairly hard light red fabric. Internal slip trail and full glaze. The form is slightly different from vessels previously recorded in Newcastle. Phase 7.

70 Base, lower body and other fragments of a globular vessel with projecting base. Fairly hard pinkish red fabric. External orange glaze except under base. Unglazed internally. Possibly a money box as most other hollow wares are glazed internally. Phase 7.

OTHER ENGLISH REDWARES

CODE: ENG RED
GROUP NO. 27.1

Some are probably contemporary with metropolitan production but others are later (late 17th/early 18th century).

DISTRIBUTION**PHASE 5**

Fragments of 5 vessels (intrusive).

PHASE 6

Maximum of 21 vessels.

PHASE 7

Maximum of 5 vessels.

PHASES 8, 9

Fragments of 3 vessels.

THE VESSELS

Some metropolitan forms were identified: 17th Century Pit: no. 9 (skillet); no. 10 (bowl); no. 14 (jar), and some similar to redwares found at Blackfriars: no. 21 (jar); no. 32 (bowl); no. 53 (dish). Two plates were similar in form, fabric, glazing and slip decoration to Blackfriars nos. 54 and 56. There was one fragment in phase 9, of a press-moulded dish with toothed edge (late 17th/18th century).

TIN-GLAZED EARTHENWARES

CODE: TGE
GROUP NO. 28.0

English and possibly Netherlands wares, probably dating from the second half of the 17th century and first half of the 18th century. The fragments are mostly small and damaged, but the following features could be noted.

There were about 10 flatware vessels in phase 6 and one in phase 7 with lead glazed backs, a characteristic of early to mid-17th century wares. The majority of the flatwares were fully tin-glazed and painted in styles more typical of the later 17th and early 18th century. There were also a few fragments of plain glazed wares of the type produced in London from the end of the 17th century.

DISTRIBUTION**PHASE 4**

One intrusive fragment.

PHASE 6

A maximum of 31 vessels.

PHASE 7

A maximum of 7 vessels.

PHASE 9

One residual fragment.

71 Half of a dish. Soft pale buff fabric, originally glazed internally and externally with a blue-tinted tinglaze and painted in polychrome internally. Most of this has flaked off. Probably a mid-18th century ware contemporary with the plain creamwares associated with it in the same context (see below nos. 73–75) but not later than c. 1760 when tinglazed wares were probably no longer in production. Phase 7: occupation of the Dutch-gabled building.

A rim fragment of a similar, slightly larger vessel occurred in the same context.

STAFFORDSHIRE WARES

CODES: STS STST ST
GROUP NO. 29.0

Late 17th and 18th century stoneware and buff earthenwares from the Staffordshire potteries or Staffordshire type.

One example of brown-glazed stoneware. The rest are mostly brown slip-trailed, yellow-glazed earthenware. There was one example of feathered slipware.

DISTRIBUTION**PHASE 6**

Fragments of 4 vessels.

PHASE 9

Fragments of 3 vessels.

THE VESSELS

Probably all mugs or cups.

72 Base and lower body of a cup. Pinkish buff, slightly gritty fabric. External brown slip-trailing. Internal and external yellow glaze. Phase 9.

CREAMWARE

CODE: CRW
GROUP NO. 38.0

The 18th century fine white earthenware with pale yellow lead glaze. The production of this ware began c. 1730 and was gradually superseded by clearer glazed white earthenwares (paler creamwares then pearlwares) by the early 19th century.

The earliest creamware forms were simple moulded vessels like the white salt-glazed stone-ware produced at the same kilns (Jennings 1987)

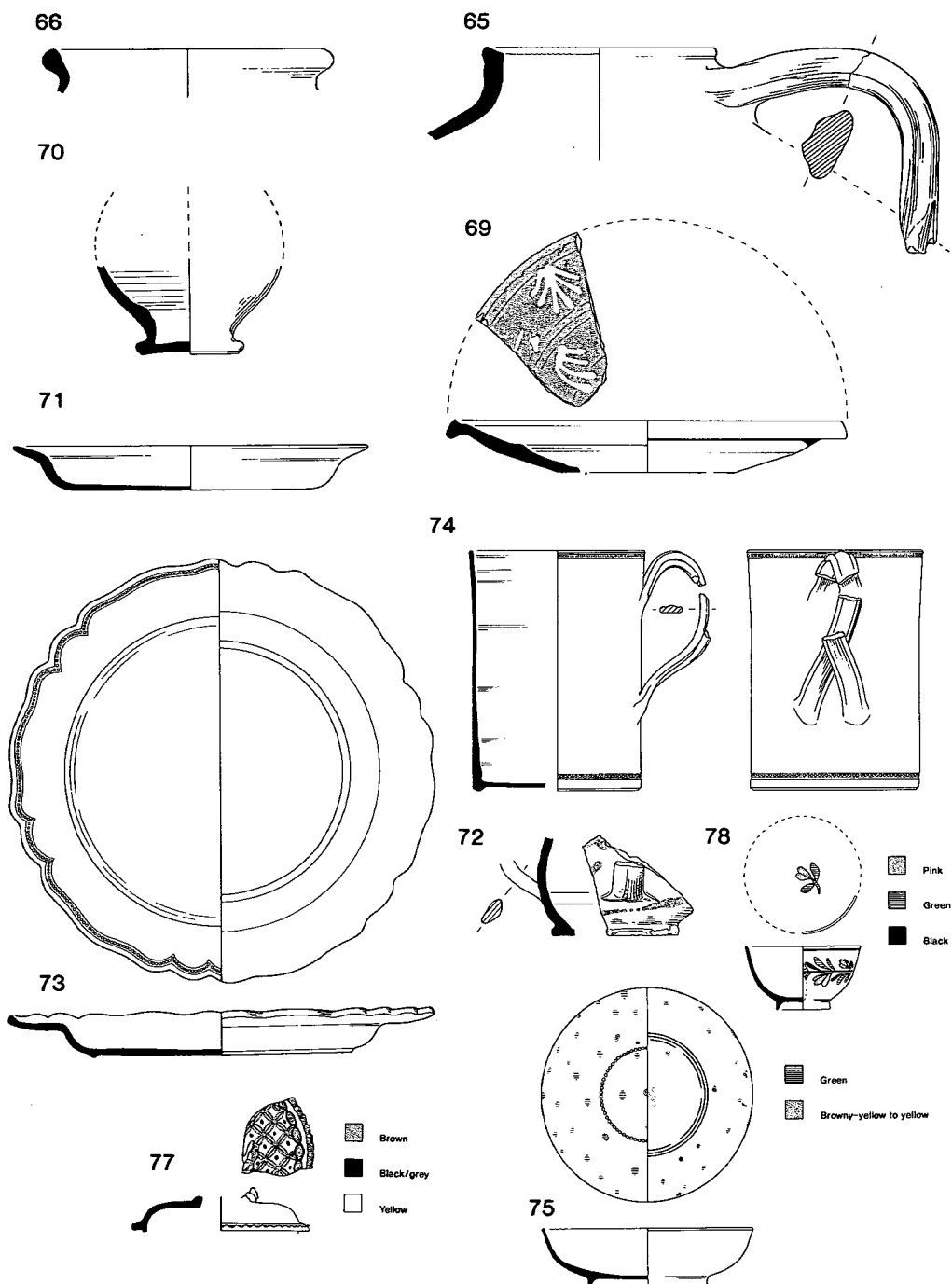


Fig. 21 Pottery scale 1/4.

more highly decorated and painted wares came in the later 18th century.

DISTRIBUTION

PHASE 7

4 almost complete vessels.

PHASE 9

Fragments of 5 vessels.

THE VESSELS

73 Moulded plate with scalloped and beaded edge. Plain lead glaze.

74 Tankard with crossed over handle. Plain lead glaze.

75 Moulded saucer. Green and brown spots under a paler lead glaze than 73 and 74.

73–75 were recovered from the same context in phase 7 and seem to represent a primary deposit associated with the occupation of the Dutch-gabled building in the 18th century. Probably a mid-18th century group.

76* Fragments of a plain cup. Phase 7: use and alterations of the Dutch-gabled building (19th century context).

77 Part of a lid of a milk jug or teapot, with moulded flower knob, beaded edge and red and black geometric painting. This is the more highly decorated ware produced at the end of the 18th century. Possibly a Leeds ware. Phase 9.

WHITE EARTHENWARES

From the end of the 18th century fine earthenwares began to be glazed with clear (or sometimes slightly blue tinted) lead glaze that produced a white rather than cream finish, the final product being pearlware. A number of these wares dating from the late 18th and 19th century are grouped together under this heading. They include plain wares and a number of different types of decorated wares, some by techniques already in use on earlier wares some introduced for the first time in this period.

DISTRIBUTION

PHASE 5A

11 fragments in the same context (intrusive).

PHASE 6

5 fragments (intrusive).

PHASE 7

Fragments of 11 vessels (later use and alteration of the Dutch-gabled building).

PHASE 8

Fragments of 26 vessels.

PHASE 9

Fragments of 73 vessels.

THE VESSELS

PAINTED WHITE EARTHENWARES

CODE: PWE

GROUP NO. 33.3

78 Small bowl. External overglaze painting in black, green and red. Probably late 18th century. Phase 7: use and alterations of the Dutch-gabled building in the 19th century.

79* Base, probably a tea bowl, with underglaze blue Chinese style painting. Phase 9.

A fragment of a saucer with underglaze polychrome painting occurred in the same context.

Probably late 18th century wares.

TRANSFER PRINTED WARES

CODE: TPWE

GROUP NO. 33.1

The majority of the fragments recovered are early to mid-19th century wares. Some are certainly local products including some from the nearby Ouseburn potteries. Some early black transfer prints have been over-painted in colours.

80 Fragments of a saucer. Blue transfer print with printed and impressed marks under base for Isaac Bell and Co, a local company that worked the Ouseburn Bridge pottery sometime between 1860 and 1865 (Bell and Gill 1973). Phase 9: kiln furniture was recovered from the same context (see below).

81 Fragments of a marmalade pot with black transfer printed label: JAMES KEILER DUNDEE. The firm was established in 1797. Phase 8.

BANDED AND MARBLED SLIPWARE

CODE: SLWE

GROUP NO. 33.1

This technique was first used on creamwares, so these examples are probably an early 19th century development of that tradition. They occur in phases 8 and 9.

82 Fragments of a bowl with external red/brown slip band and dark brown and white marbling. The

rim is marked by an impressed zig-zag under a blue slip band. Phase 8.

83 Fragment, possibly a jug rim, with external green and blue slip bands and dark brown, white and green marbling. Phase 9.

OTHER TYPES OF DECORATED WARES

CODE: WGWE
GROUP NO. 33.1

Blue sponge-decorated wares occur in most of the groups. These were produced locally from the early 19th century (see below no. 84).

Occasional examples of lustre ware and applied moulded decoration occur.

WHITE EARTHENWARE KILN WASTE

CODE: BISWE
GROUP NO. 33.2

Fragments of biscuit fired white earthenwares were recovered from several contexts: intrusively in phase 5A and in land fill contexts in phase 9 (a total of 5 vessels).

Fragments of white, pale yellow lead glazed kiln furniture were also found in phase 9 in land fill.

84 Fragment of a biscuit fired plate with impressed mark under base. The same mark occurs on a christening bowl in the Laing Art Gallery, dated 1829 (Bell and Gill 1973). Thomas Fell and Co. founded the St. Peter's Pottery (a short distance down river from the excavation) in 1817. It produced white, printed and sponged wares. Phase 9.

85 Fragment of a biscuit fired plate with a "willow" pattern transfer already applied, ready for the second firing.

LATE 18TH AND 19TH CENTURY REDWARES

CODES: RED LGRE
GROUP NOS. 32.0, 32.1, 32.5

These represent the continuation of the 17th century tradition. Techniques of slip coating and trailing, iron-stained glaze etc. continue. The difference is in the hardness and consistency of the fabric and the more uniform application of slip and glaze. The status of the ware has also shifted from a decorative table ware to a kitchen and utility ware.

By the 19th century, the common local redware has a very hard dark red fabric and a pale lead glaze that leaves slip looking pale cream rather than

yellow. It is used almost exclusively for heavy kitchen and utility wares.

DISTRIBUTION

PHASES 2 and 5A

6 fragments (intrusive).

PHASE 6 (latest context)

Fragment of one vessel.

PHASE 7

Fragments of 14 vessels.

PHASE 8

Fragments of 2 vessels.

PHASE 9

Fragments of 29 vessels.

THE VESSELS

86 Lower part of a mug or jug. Hard red fabric. Full cover of dark brown glaze, except on the foot. Phase 7: occupation of the Dutch-gabled building. Same context as nos. 71 and 73-75.

87 Kitchen bowl. Light red, fairly hard fabric. Internal slip coat and glaze streaked with iron stain. Late 18th or early 19th century. Phase 7: later use and alteration of the Dutch-gabled building.

88 Fragments of a rectangular pie dish. Very hard dark red fabric. Internal dark brown glaze and slip-trailed decoration. 19th century. Phase 9.

89 Straight-sided, thick-walled jar. Hard dark red fabric. Internal dark brown glaze. Phase 9.

90 Similar to 89. Phase 9.

Fragments of 6 other vessels similar to 89 and 90 occurred in phase 9 in the land fill. They obviously have a utility and possibly an industrial, function.

MODERN STONEWARES

CODE: MOD ST.
GROUP NO. 35.1

These are essentially utility wares, mainly for the sale of foods and liquids. They include large containers, pickle jars, small food jars, ink bottles and bottles for beverages.

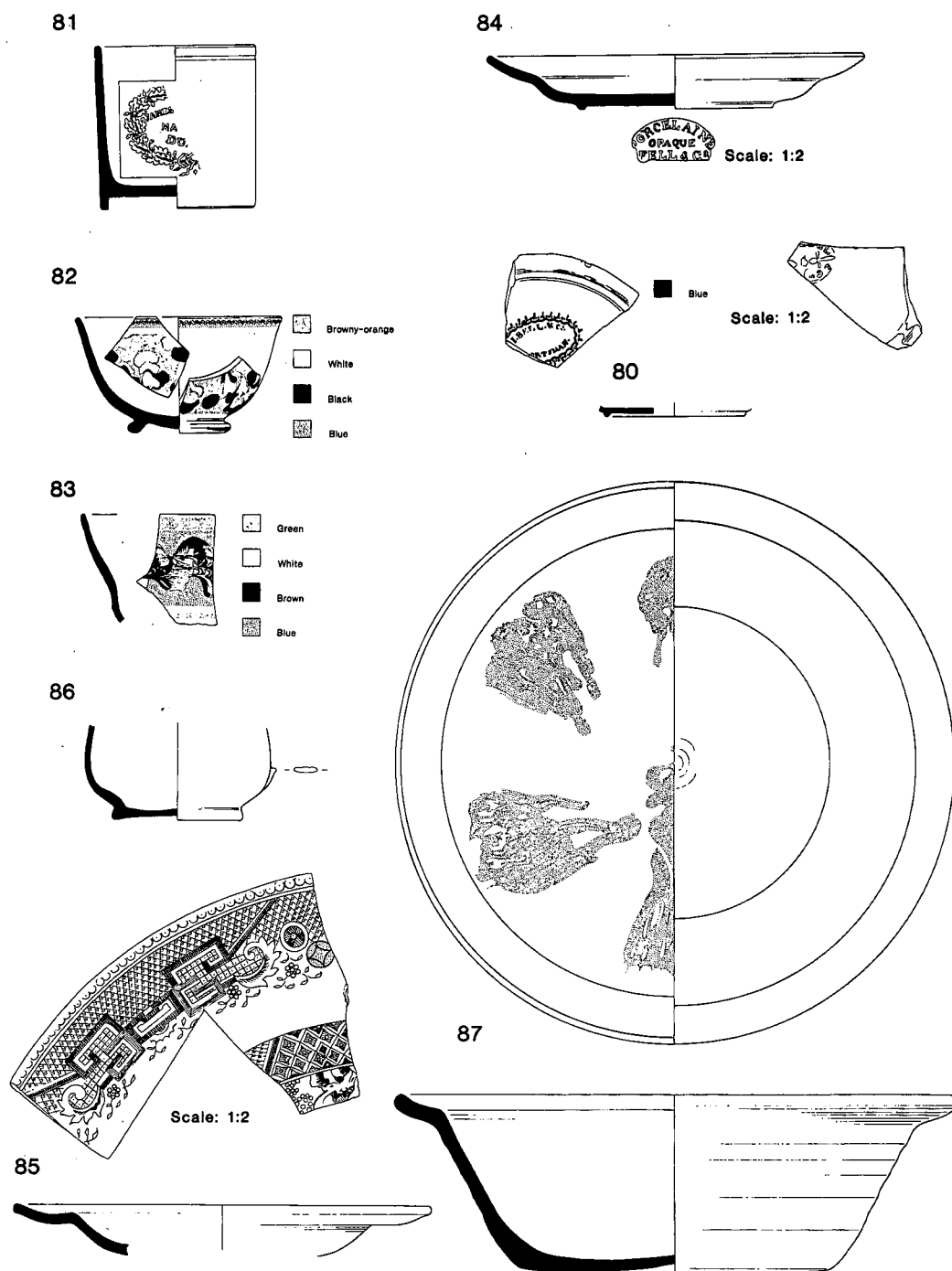
DISTRIBUTION

PHASES 5A and 6

7 intrusive fragments.

PHASE 7

Fragments of 3 vessels (2 probably late 18th century).



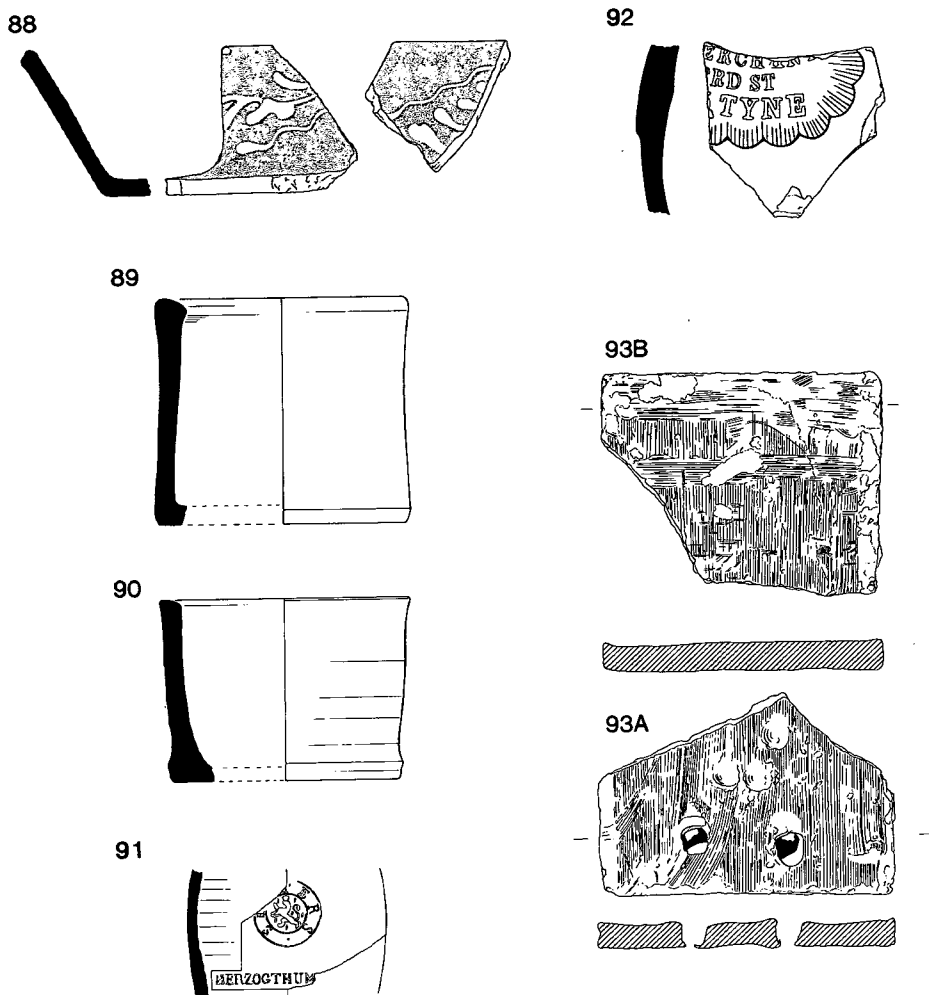


Fig. 23 Pottery and tile scale 1/4.

PHASE 8

Fragments of 8 vessels.

PHASE 9

Fragments of 32 vessels.

THE VESSELS

91 Fragments of 14 brown salt-glazed bottles, commonly known as Dutch gin bottles, were recovered in phases 8 and 9. Several have this stamp, which indicates that they were manufactured for marketing Selters mineral water from Niederselters in the duchy of Nassau. The lion in the centre of the stamp is the lion of Nassau and the complete label read

HERZOGTHUM NASSAU. The bottles are also marked with letter and number codes: 2 with "H"; 2 with "NUM 96"; one marked "R NUMr 88".

The duchy of Nassau was overrun by the Kingdom of Prussia in 1866, so the bottles predate that event, probably from the late 18th century up to 1866. (Information John Philipson.)

92 Fragment of a raised label from a large container made for a local retailer, possibly a wine and spirit merchant. Phase 9.

OTHER 19TH CENTURY WARES

These included brown-glazed buff earthenware

teapots (a number are early 19th century wares) and a few fragments of porcelain, probably from cups and saucers.

ROOFING MATERIALS

Margaret Ellison

The Types

Clay plain tiles

93(A) rectangular tiles with double peg holes in an orange/red fabric, in some cases slightly sandy in others rather hard-fired with a mid-grey reduced core. The top surface is wiped smooth along the length and then across the width at the end (see illustration). The underside is rough. Occasional splashes of amber glaze appear on some.

Dimensions: 13 mm thick; 145–155 mm wide; no complete length recovered.

Fragments of very similar tiles, though with nibs rather than peg holes were recorded at the Castle Ditch (Harbottle and Ellison 1981). They were not thought to be local and a Low Countries origin was suggested. Evidence from this site tends to reinforce that. The largest group, 51 fragments, occurs on top of the sand pile (phase 2) immediately below the earliest kiln construction. The fragments are cleanly broken and the surfaces are not much worn, though some have apparently been mortared. It is possible that they were broken tiles used as ship's ballast. Their general distribution from phases 2–6 matches the distribution of Low Countries pottery and probable brick imports and includes the period of floor tile imports from the same source. This evidence combined with the similarities of fabric and firing makes it likely that they were shipped from the Low Countries.

B—One example in phase 4. Pink fabric with very coarse temper, which is the same as floor tile type I. 13 mm thick. Not necessarily local but clearly not the same origin as type A.

C—Similar to the local buff/white ware pottery fabric and probably from the same clay source. 14–15 mm thick.

G—Flat red earthenware tile fragments probably post-medieval.

Clay ridge tiles

D—Two rather small fragments and one curved fragment. Iron rich partly reduced fabric with abundant quartz temper. Lead glazed on the upper surface, rough under surface. 17 mm thick thinning to 10 mm at the top of the curve.

Probably the same local type as ii) from the Castle Ditch (Harbottle and Ellison 1981).

L—One curved fragment 11 mm thick in a redware fabric. Probably Low Countries and could have been used with type A.

Unidentifiable

M—Fragments which are burnt, near vitrified etc. including one that may have been glazed. Either clay plain tiles or ridge tiles and probably local fabrics.

Pantiles

E—Light red earthenware. 13 mm thick. One fairly complete example in phase 8 matches the measurements 9½" by 14" standardized in the reign of George I (Harbottle 1979). 17th century and later.

K—Glass type CL1 (see Glass distribution above). The dimensions are the same as the earthenware tiles. Post 1855.

Stone Flag

F—One example of a sandstone roofing flag of the common local type with a single peg hole. Approximately 210 mm wide.

Many fragments were recorded from the Castle Ditch (Harbottle and Ellison 1981), though none was as complete as this.

Floor tiles

H—Red earthenware tiles. The top surface is glazed either with a copper green stained lead glaze or a clear yellow lead glaze over a white slip. Thickness varies from 22 to 35 mm. Most were probably square. A complete example is 112 mm square on the top surface 110 mm at the base. Another has one side 140 mm long and a third was cut to a triangle before laying.

These are very common in late medieval contexts in Newcastle and almost certainly of Low Countries origin. In the Castle Ditch (Harbottle and Ellison 1981) they did not occur before about 1400.

I—One example in the same fabric as the roof tile B. Copper green stained lead glaze on the upper surface. 18 mm thick.

J—Post medieval floor tiles: chips of a lead glazed red earthenware tile in phase 7; a large red earthen ware flag 60 mm thick, 228 mm square, apparently red polished, in phase 9.

Illustration 93:

- a) Top half type A clay plain tile with double peg hole.
- b) Lower part of the same type of tile.

CLAY TOBACCO PIPES

Margaret Ellison

In relation to the stratigraphy

Clay tobacco pipes are one of the most useful indicators for dating on post-medieval sites because they have a very short period of use: even highly decorative and commemorative pipes would rarely be kept in the same way as, for example, fine pottery which can be passed from one generation to another or household

wares that could be used for a lifetime; most pipes were in fact discarded after a very short period of use. This means that the problem of residuality is limited to redeposited contexts and even there the problem is minimal since marked pipes can be independently dated by reference to their makers and by comparison with them, unmarked pipes of the same form can also be dated. Consequently residual material is easily identified.

On this site, it has therefore been possible to use the clay pipes to refine the dating of the post-medieval stratification by differentiating blocks and contexts within phases. Taken with the broad dating evidence provided by the pottery assemblages, this probably gives quite an accurate account of the sequence of events on the site.

Pipe Forms

The overwhelming majority of the pipes is clearly of local manufacture. While the group does not substantially alter our knowledge of the local pipe-making industry, it provides some additional information and further confirmation of the basic typological sequence already established, first by Eric Parsons (1964), extended by Adrian Oswald (1979) and revised by Lloyd Edwards (1987).

In the following presentation of the data I have adopted a coding based on Edwards' revised series and (for the later pipes) Parsons' series: form numbers prefixed by "T" are Tyneside forms from Edwards' series; those prefixed by "P" refer to Parsons' series.

There is a small number of pipes that are not local: those related to Atkinson and Oswald's London series (1969) are prefixed by "L"; "H" refers to Hull types (first identified by Parsons as "Yorkshire bulbous"); "NP" refers to unprovenanced pipes.

I have found that the decrease in the average stem bore from the earliest to the latest contexts was consistent and comparable to groups from London recorded by Atkinson and Oswald (1969), so I have included this data in the report.

Pipe marks and makers

Local makers marks are letter coded: Edwards' series TA, TC, TD, TE; Parsons' series Pd. BG 69 refers to a quartered lozenge mark with fleur-de-lis first noted by Oswald (1979) and thought to be of Yorkshire or North East origin.

All unidentified marks, and those not previously recorded, are illustrated in the catalogue.

In the list of makers, pipes by the same maker already illustrated in the Blackfriars report (Edwards 1987) are indicated by their catalogue number prefixed by BF. The numbers of pipes illustrated in this report are prefixed by No.

*Groups and Dating**Phase 6*

Block 1265 maximum 19 pipes.

FORMS: none

MARKS: TC 1670–80; TD 1675–1710.

MAKERS: Arthur Haistings late 17th/early 18th century Michael Park c. 1692–1737.

STEM BORES: 8/64: 42, 7/64: 26, 6/64: 26, 5/64: 5%.

ASSOCIATED: late 17th/early 18th century pottery.

DEPOSITION: by c. 1710.

Block 1266 maximum 192 pipes

FORMS: T1 1635–50; T3 1650–75; T5 1630–45; T9 1680–1710; T12 1680–1720; L15 1660–80; L24 1680–1720.

MARKS: TA 1635–75; TC 1670–80; TD 1675–1710; TE 1680–1750; BG 69 1650–80.

MAKERS: John Bowman 1645–89; Michael Park c. 1692–1737; John Rodchester 1688–1718; Leonard Holmes 1671–1707; Henry Walker 1674–99.

STEM BORES: 8/64: 28, 7/64: 38, 6/64: 28, 4/64: 0.5%.

ASSOCIATED: late 17th/early 18th century and residual pottery.

DEPOSITION: by c. 1750.

Block 1276 maximum 129 pipes

FORMS: T8 1670–90; T9 1680–1710; T11 1680–1720; T13 1710–50; T14 1700–80; T15 1700–80.

[P18, L30 19th century intrusive].

MARKS: TC 1670–80; TD 1675–1710; TE 1680–1750.

MAKERS: John Colling 1706–29; William Harle c. 1679; Roger Rain c. 1698; Henry Walker 1674–99.

STEM BORES: 8/64: 7, 7/64: 31, 6/64: 57, 5/64: 2, 4/64: 2%.

ASSOCIATED: late 17th/early 18th century pottery.

DEPOSITION: mid 18th century.

Phase 7

Block 1270 small sample 13 fragments

No forms or marks identifiable.

Stem bores, majority 8/64 and 7/64.

Associated with a large group of residual late medieval pottery and a few late 17th/early 18th century wares.

DEPOSITION: secondary c. 1700.

Block 1269 maximum 181 pipes

Main Context Groups

1026 maximum 137 pipes

FORMS: T1 1635–50; T3 1650–75; T5 1630–43; T8 1670–90; L15 1660–80; L19 1690–1710; L25 early 18th century; H2 late 17th century.

MARKS: TC 1670–80; TD 1675–1710; London moulded type early 18th century.

MAKERS: John Bowman 1645–89; George Canton? 1667; Edward Craggs 1678–1717; Arthur Haistings late 17th/early 18th century; Michael Swaddel 1670–99.

STEM BORES: 8/64: 28, 7/64: 41, 6/64: 26, 5/64: 1%.

ASSOCIATED: early 18th century pottery.

DEPOSITION: early 18th century.

1021 small group of 10 fragments

FORMS: P13? post 1780.

STEM BORES: majority 5/64 and 6/64.

ASSOCIATED: mid-18th century pottery.

DEPOSITION: possibly late 18th century.

1089 small group of 13 fragments

FORMS: T9 1680–1710; P13 1780–1840.

STEM BORES: majority 5/64 and 4/64.

ASSOCIATED: late 18th/first half 19th century pottery.

DEPOSITION: probably first half of 19th century.

Other contexts in 1269 contained only a few stem fragments, apart from 1016, which contained a bowl fragment with Thomas Park's mark (1667–87).

Phase 8 maximum of 20 pipes

FORMS: P16 1820–60; P18 post 1840; moulded decorated pipes post 1840.

MARKS: TC 1670–80 (residual).

STEM BORES: 9/64: 5, 8/64: 5, 7/64: 10, 6/64: 20, 5/64: 15, 4/64: 30, 2/64: 5%.

ASSOCIATED: large quantity residual medieval and 17th century pottery and a few second half of 19th century wares.

DEPOSITION: second half 19th century.

Phase 9

Block 232 maximum 92 pipes

FORMS: T9/11 early 18th century; T13 1710–50; P13 1780–1840; P15 1800–50; P16 1820–60.

MARKS: TC 1670–80; TD 1675–1710; TE 1680–1750; Pd post 1840.

MAKERS: George Hamilton 1855–73; Michael Park 1692–1737.

STEM BORES: 8/64: 1, 7/64: 1, 6/64: 8, 5/64: 12, 4/64: 74%.

ASSOCIATED: late 18th to late 19th century pottery.

DEPOSITION: late 19th century or later.

Block 1268 maximum 24 pipes

MARKS: Pd post 1840.

MAKERS: Alexander Hamilton 1883–1902.

STEM BORES: 8/64: 4, 7/64: 4, 6/64: 29, 5/64: 8, 4/64: 54%.

ASSOCIATED: late 19th/20th century pottery.

DEPOSITION: 20th century.

CATALOGUE OF ILLUSTRATED PIPES

Pipe numbers are those recorded in the archive and on the pipes.

Local pipes not previously recorded

94 (pipe 52). (Further examples nos. 53, 54). The form is very similar to T8 (1670–90) but rather smaller than previously recorded examples.

95 (pipe 11). A spurred pipe similar to local T9. A moulded mark on the spur (TE) has not previously been recorded with this bowl type. Probably 1680–1710.

96 (pipe 41). The long bowl form (T11?) is common from 1680–1710. The combination of a moulded mark on the foot (TE) and an oval stamp on the stem (TD) has not previously been recorded. The maker is John Colling of Gateshead 1706–29 (Parsons 1964).

97 (pipe 31). Local bowl from T13 with a moulded mark on the foot (TE) 1710–50.

98 (pipe 88). A pipe by Michael Park of Gateshead

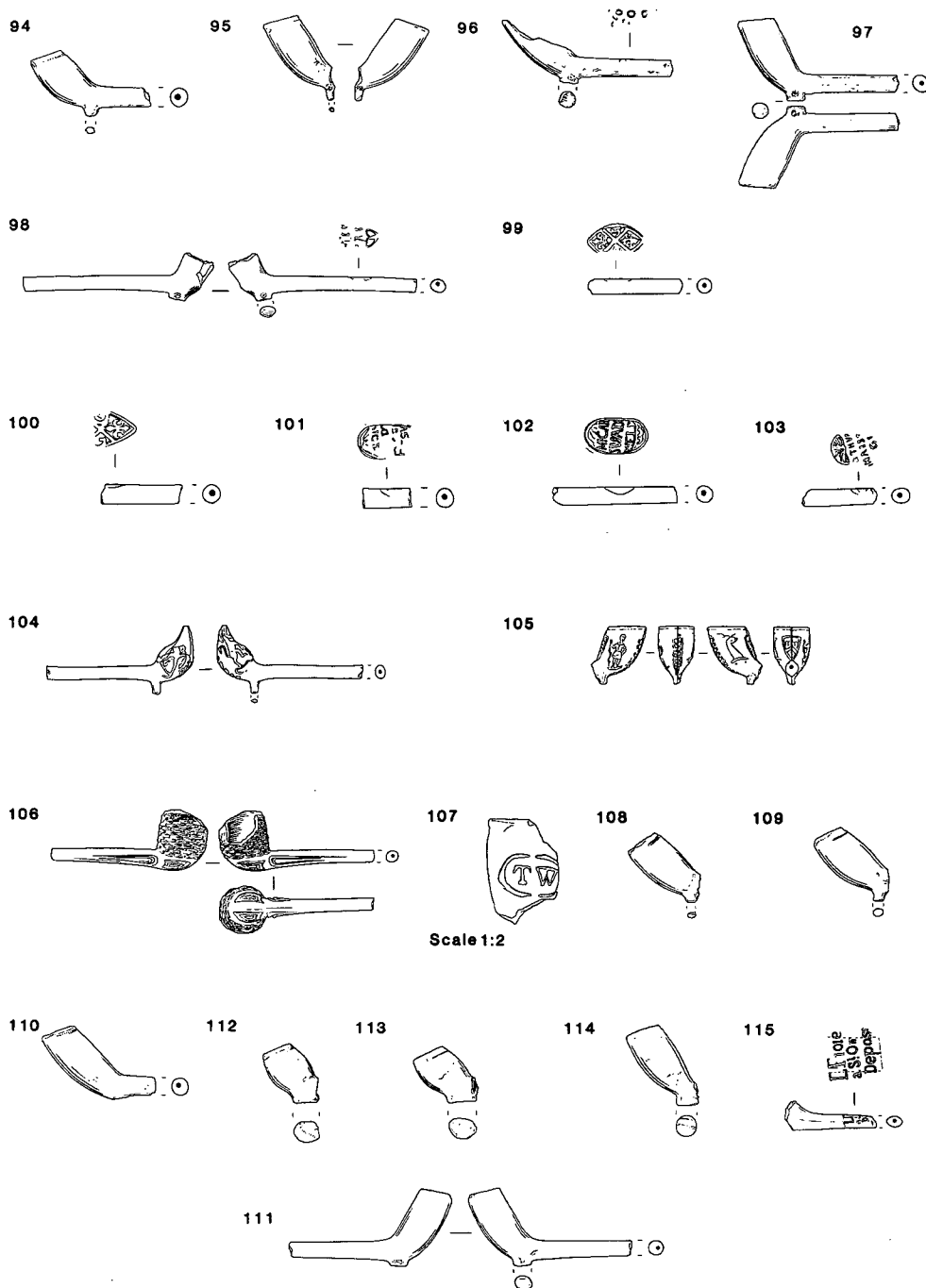


Fig. 24 Clay pipes scale 1/2.

Local pipe makers (identified with Parsons' and Edwards' lists)

MAKER	TOWN	DATES	FORMS	MARKS	ILLUSTRATED
John Bowman	Gateshead	1645–89	T3?	T8 TC	BF176
George Canton?	Gateshead	1667		TC	no. 100
John Colling	Gateshead	1706–29	T11?	TD TE	no. 96
Edward Craggs	Newcastle	1678–1717		TD	no. 101
Andrew Conquhoun	Gateshead	1863–76		Pd	
John Grayson?	Newcastle	1653–4		TA	BF 180, 148
Arthur Haistings	Gateshead	l. 17th/e. 18th c.		TD	no. 103
Alexander Hamilton	Gateshead	1883–1902		Pd	
George Hamilton?	Hexham	1855–73		Pd	
William Harle	Gateshead	c. 1699		TD	BF 199
Leonard Holmes	Gateshead	1671–1707		TD	BF 35
Michael Park	Gateshead	1692–1737		TD TE	BF 43, 86, 87 no. 98
Thomas Park	Gateshead	1667–87		TD	BF 33
Roger Rain	Newcastle	1698		TD	BF 12, 74
John Rodchester?	Gateshead	1688–1718		TD	BF 52
Michael Swaddel	Gateshead	1670–99		TD	no. 102
Henry Walker	Gateshead	1674–99		TC	BF 79

(1692–1737). The form is probably T13 and the mark on the stem (TD) is similar to others recorded for this maker (Edwards 1987). Like 41 above, the oval stamp mark is combined with a moulded mark on the foot (TE). Probably c. 1710.

99 (pipe 79). A mark similar to TC (1670–80) but smaller than previously recorded examples.

100 (pipe 48). A TC mark similar to those of other makers recorded at Blackfriars (Edwards 1987). Possibly GC for George Canton of Gateshead, a maker recorded in 1667 (Parsons 1964).

101 (pipe 44). Another version of Edward Craggs' mark (TD) similar to those recorded at Blackfriars (Edwards 1987). 1678–1717.

102 (pipe 45). A mark (TD) of Michael Swaddel of Gateshead (1670–99) known from documentary sources (Parsons 1964).

103 (pipe 92). A mark (TD) of Arthur Haistings a Gateshead maker in the late 17th and early 18th century (Parsons 1964). (Second example no. 47.)

Late 18th and 19th century pipes (some are probably local)

104 (pipe 78). Highly decorated bowl with a Lion and Unicorn motif. Late 18th century.

105 (pipe 85). Decorated pipe with armorial motif. 1800–1850.

Other fragments of moulded decorated pipes included one with a thistle motif and a fragment of decorated stem, which are probably late 19th century, and fluted bowls either P13 (late 18th century) or possibly P17 (19th century).

106 (pipe 33). Moulded pipe of mid-19th century type.

107 (pipe 72). Stamp from the back of the bowl. These occurred in London from c. 1780 but were only common in the early 19th century (Atkinson and Oswald 1969). Locally, a mark of this type (BF 156) is dated 1855–77 (Edwards 1987).

Pipes probably of London origin

108 (pipe 66). (Other examples nos. 12, 13, 67.) The form is similar to L15 (1660–80), though slightly larger.

109 (pipe 68). Form similar to L19 1690–1710.

110 (pipe 6). Form similar to L24 1680–1720.

111 (pipe 65). Form similar to L25, the long bowl type common in the early 18th century, with moulded marks on the sides of the foot.

Hull types

112 (pipe 59). (Second example no. 60.) Late 17th century H2 or "Yorkshire bulbous" type.

113 (pipe 61). (Second example no. 62.) A larger version of the same form as no. 59.

Unprovenanced pipes

114 (pipe 37). Similar to local T9 (1680–1710) but with a round splayed foot. Stem bore 6/64" (phase 6).

115 (pipe 80). Probably a 19th century pipe (from phase 9), French or Belgian. The stem has an oval section and the bore is 5/64".

GLASS

Margaret Ellison

The Types

Green metals

G1 green glass, 16th–18th century, using a potash flux. The local manufacturers used kelp ash. No known local manufacture before 1681 (Ellison 1979).

Products: broad window glass, probably of local manufacture; a few fragments of crown glass, not made locally before the early 18th century; pharmaceutical equipment; flasks; case bottles; sack bottles.

G2 an improved metal of the late 18th and early 19th century. In this period local manufacturers were trying to produce a clearer metal by part substituting the kelp ash flux (Ross 1982). The general quality of the metal is also improved. The result is a blue/green high quality metal.

Products: window glass.

G3 19th century and modern green bottle glass.

Products: bottles and jars.

G4 "black" bottle glass (in fact a very dark brownish green). A common product of the local bottle houses in the late 18th and early 19th century (Ross 1982).

Products: beer and wine bottles.

Clear metals

CR early crystal glass usually of soda-lime formula, predating lead crystal in the 16th and 17th centuries with some overlap into the 18th century.

Products: table wares.

L lead crystal developed at the end of the 17th century but a luxury ware until the mid-19th century.

Products: table wares; plate glass for special purposes e.g. pharmaceutical mixing plates, mirrors.

CL1 a clear metal with a slight, usually blue tint. By the 1830s local manufacturers had substituted the kelp ash with a soda silicate flux (Ross 1982). A number of different formulas were used with the aim of removing the coloured tint. However since colour was not totally eliminated window glass remained thin, usually produced as sheet or plate glass and then polished.

Products: window glass; bottles (beer, gin, medicines); roof tiles (see roofing materials).

CL2 colourless metal of modern type. This was in common use for windows and utility wares by the late 19th century. Although the window glass is colourless it was still manufactured thinner than modern window glass.

Products: window glass; bottles; food jars etc.

Coloured metals

CO coloured glass. Developed (in this country) from the 18th century but only common in the 19th century.

Products: window glass, plate sheet glass and moulded decorative plate glass; pharmaceutical bottles.

Distribution on the site

PHASE 4

Intrusive fragments 19th century bottle glass.

Phase 5A, B

A few fragments of green (G1) broad glass and

a fragment of a "wrythen" ribbed beaker (cf. Castle Ditch no. 407) in a soda glass metal (CR).

At this date neither is likely to be of local manufacture but both types were recovered from contexts of this period in the Castle Ditch (Ellison 1981).

Phase 6

Green glass (G1) was the only type present in this phase apart from intrusive 19th century fragments.

Most of the window glass is probably broad glass and local but two crown glass fragments occurred which are probably not local at this date.

Fragments of tubing, a twisted stirring rod and fragments of small flasks are probably pharmaceutical equipment.

A few fragments of sack bottles occurred in one context.

Phase 7

The earlier contexts (18th century) still contained green broad glass, sack bottles and an apothecary's flask (G1).

Later contexts contained late 18th/early 19th century window glass (G2) and mid to late 19th century clear tinted window glass and bottles (CL1) including marbles from Codd patented bottles (post 1875, Pool 1976).

"Black" beer (and probably gin) bottles manufactured by simple blowing and in split moulds with hand finished lips also occur. The split cast iron mould was patented in 1821 (Meigh 1972) and bottle lips were hand finished at least until 1887.

Up to the late 1870s beer bottles had a collar for fixing tied corks and had a capacity larger than the standard pint measure they contained to allow for expansion of the unpasteurized beverage.

Phase 8

The same types are present as in phase 7 but in addition there is the first occurrence of a glass pantile of the standard 9½" width and moulded from a plain sheet of tinted clear glass (CL1). A local manufacturer, J. Bowron took out a

patent for manufacturing these in 1855 (Ross 1982). (See roofing materials.)

Fragments of three heavy lead (L) glass goblets (2 blown and one moulded) and a small case bottle indicate that this metal was now being used for cheaper table wares. A worn lead glass plate, 7 mm thick, is probably a pharmacist's mixing plate.

The first colourless (CL2) utility wares also appear: two small moulded bottles.

Residual 17th century fragments included a second ribbed crystal glass (CR) beaker, green glass (G1) tubing and a stirring rod.

Phase 9

The common 19th century window glass and bottle glass types persist as well as residual 17th and 18th century fragments.

Pantile fragments also occur in the same metal but ribbed on one side, which is probably a development of the original type.

There are also fragments of coloured and clear moulded decorative plate glass.

Clear (CL1) and dark green (G4) aerated water bottles of the "torpedo" shape occur as well as the similar type with a flattened base. All are moulded, with hand finished lips. The torpedo shape occurs from 1814 (Pool 1976) but moulded bottles would not occur that early. The example with a flattened end is late 19th century.

Two complete pharmaceutical bottles occurred in coloured blue glass.

A clear (CL2) Newcastle Breweries internal screw stoppered bottle is post 1872 (Meigh 1972) but probably quite modern.

Fragments of clear (CL2) window glass are 19th century (thin) and modern.

One context in block 1268 contained fragments of glass manufacturer's waste (cullet) consisting of different clear and coloured glass fragments melted together and threads of glass dripped in manufacture. This is another indication of land fill being brought from local industrial sites that went out of use at the end of the 19th century. The Ouseburn area just down the river was an important centre for glass making as well as pottery (see above).

THE LEATHER

Mick MacElvaney

All the leather found on this site comes from a closely related group of contexts (1206, 1244 and 1258) located at or below low tide mark at the bottom of embankment 1240 in phase 4. The anaerobic, waterlogged conditions found here have conserved most of the leather in remarkably good condition, though some pieces do show signs of delamination. The assemblage is relatively small and fragmentary. A total of 92 pieces have been included in the archive catalogue most of which is made up of shoe leather and associated off-cuts. As this inter-tidal zone was probably open for a long period and material randomly deposited in it, both as secondary dumping from the bank and as river-borne detritus, no evaluation can be made concerning the specific provenance of these leather fragments.

All the shoe-leather is from shoes or ankle-boots of turnshoe construction. (See Thornton 1973a for definition and description.) This can be seen from the nature of the stitch-holes in soles, uppers and sections of rand (e.g. catalogue nos. 62, 32a, 32b). The shoe-leather appears to be cowhide sewn together using flax thread. None of the fragments are from expensively made or highly fashionable shoes and many exhibit distinct signs of wear and repair (e.g. no. 19, illustration 117).

Despite the apparently limited size and nature of this assemblage, the style and construction of the shoe parts is consistent with a deposition date at about the end of the 14th century. This is consistent with the pottery dating. There is no evidence in this assemblage for the use of toggles and/or long laces for fastening which were common until the mid-C14, nor is there any evidence of the use of the turn-welt in sole attachment which was developed around the mid-C15 (Grew and de Neergaard 1988, 25ff, 47). Rather, the typical shoe type would seem to be an ankle boot which fastened at the front using a metal buckle and strap (no. 1, illustration 116) the quarters of which were constructed of two

separate pieces joined together at the back of the heel by a vertical butted seam (no. 44, illustration 119) (Grew and de Neergaard 1988, 51). Similar boots have been found at Trig Lane, London (Milne & Milne 1982) (e.g. Grew & de Neergaard fig. 107, p. 73 = TL 74 {275} <3278>). The assemblage as a whole has parallels with that found at Oxford Castle (Hassall 1976).

Description

With the exception of thickness and stitch lengths, which are averages, all measurements given are maximum measurements of fragments in their waterlogged state. Terminology is in accordance with that used by J. Thornton 1973b and Grew and de Neergaard 1988.

Illustrated pieces

116 (No. 1). Upper front section of a turnshoe quarter. 73 mm × 45 mm. Probably from a left, front-fastening ankle-shoe. One edge has edge/flesh binding-stitch hole at 4 mm intervals, probably where a topband was attached. This edge shows the scalloping effect characteristically caused by this stitch. The front and top edges are knife-cut. Other edges are torn.

A piece of strap, c. 53 mm × 8 mm, is threaded through a 9 mm hole near the junction of the two knife-cut edges. This strap would have secured the shoe across the instep with a small metal buckle. A spade-shaped thickening on the inside end prevents the strap from slipping out of place.

117 (No. 19). A badly worn waist section of a turnshoe sole, 110 mm × 40 mm × 3 mm. Outer long edges have remnant edge/flesh stitch holes at 7 mm intervals. Irregular grain/flesh and tunnel-stitch holes occur in two bands across the piece indicating that the piece had at least one repair patch attached to it.

118 (No. 33). Forward section of vamp and lasting margin of turnshoe upper with slightly pointed toe. Vamp is c. 38 mm long. Grain/flesh stitch holes occur at 7–10 mm intervals. A small hole has been worn through at the extreme front of the toe.

119 (No. 44). Large sectional piece of turnshoe upper quarter, 130 mm × 120 mm × 1–2 mm. The rear vertical edge has butted seam stitch holes at 2–3 mm intervals. The bottom edge is torn. The top, knife-cut, edge has edge/flesh (binding) stitch holes

at 3–4 mm intervals. This edge is scalloped. Tunnel (whipping) stitch holes, which probably attached the heel stiffener, can be seen at about 4–5 mm intervals at the rear bottom end. The curved knife-cut edge which joined the vamp wing has butted seam stitch holes at 2–3 mm intervals. The front edge, though torn, has remnants of tunnel stitch holes associated with a lace hole stiffener, buckle or strap-end.

120 (No. 62). Portion of forepart of right turnshoe sole with pointed toe, 85 mm × 75 mm × 1–3 mm. The outer edges have edge/flesh stitch holes at 5–6 mm intervals. The sole is worn away right across the tread and at the toe. Remnants of some tunnel stitch holes, possibly associated with repair are present on the flesh side. This sole is typical of those found in the assemblage.

121 (No. 89). Forepart of sole, 95 mm × 95 mm × 2–3 mm. This sole is odd in that one of its outer edges has edge/flesh stitches at 3 mm intervals while the other has grain/flesh stitch holes at 6 mm intervals. The toe and waist edges are torn. There is very little evidence of wear on the grain side. Possibly the sole of a slipper rather than an outdoor shoe (Andrew Grew, *pers. comm.*).

122 (No. 90). Heel stiffener of turnshoe (possibly associated with no. 44), 120 mm × 55 mm × 2 mm. The bottom edge has grain/flesh binding stitch holes at 6–8 mm intervals. The upper edges have grain/flesh stitch holes at 10–12 mm intervals. The bottom edge is badly worn. Several large grain/flesh stitch holes between 15 mm and 20 mm apart occur about 15 mm above the bottom edge. These are probably associated with the attachment of a heel repair patch.

METALWORK

Alan Williams

Copper Alloy

The assemblage of copper alloy objects from the East Quayside excavation was small; 38 objects in all. These are described below, divided according to phase.

Six objects were recovered from phase 4, in contexts associated with the limekilns built on the Tyne embankment. These included two lace ends, a round headed pin, a fragment of carved strip, possibly a belt end 123, a split ring, and a stud or boss 124.

From phases 5a and 5b came 11 objects, all from dump and refuse deposits. This included four pins, two with round heads, a piece of blade, two pieces of sheet and a buckle 125.

Phase 6, perhaps, represents a more coherent assemblage of material, most of the 14 pieces recovered deriving from layers associated with building [1265]. These included two buttons, three rings, one large (36 mm in diameter) and of uncertain use 126, four pins, three round and one flat headed, a piece of buckle arm and one lace end. Other material of indeterminate use included a tack or stud 128 and a trefoil shaped object 127, possibly the end of a handle.

Only two objects were recovered from phase 7, the construction and usage of the shaped gable buildings along the Swirle frontage, these were a finger ring and a piece of tube or cylinder. Finds from phases 8 and 9 included a possible mariner's compass and a pin.

Iron

All the ironwork from the excavation was badly corroded as is common with Newcastle material. Of the 280 pieces retrieved, over 260 were identified by eye or X-ray as nails. Relatively few were clenched, although with the number of breakages being high, some would not have been readily identifiable as such. Nails were present in all the phases of the site from phase 4 onwards, the vast majority, however, coming from post medieval phases 6 to 9. Other than the nails, identifiable objects included two pieces of iron band, a needle or awl from phase 4, a portion of very corroded knife blade from phase 5 and a shafted wedge 129 from phase 6.

Bone

Of the 3 objects of worked bone recovered from the site, a cut length came from a layer associated with the phase 4 limekilns. A perforated disc was found within a dump filling the abandoned kiln [1060] in phase 5a, and a comb 130, lay within a floor surface of compacted ash [1127] associated with building [1265] in phase 6.

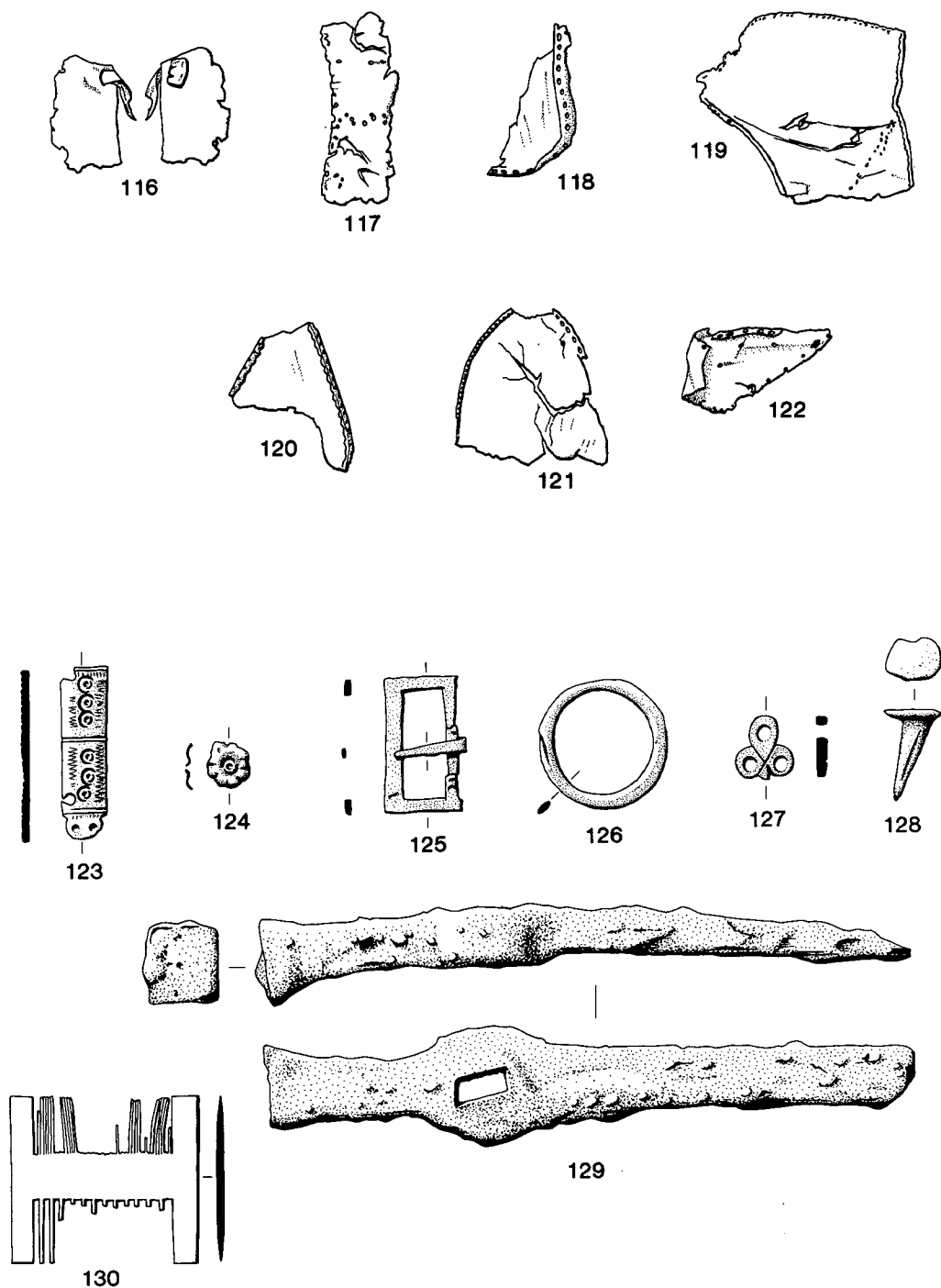


Fig. 25 Leather and metal (scale 1/4), and bone (scale 1/2) objects.

Table 2 List of coins by phase.

<i>Phase 6</i>				
sf34	AR	Penny? Long cross	?	26 mm
sf36	AE	Scottish, turner,	Charles II?	19 mm
sf37	AE	Scottish, turner,	Charles II?	20 mm
sf40	AE	Scottish, turner,	Charles II?	19 mm
sf45	AE	Scottish, turner,	?	19 mm
<i>Phase 7</i>				
sf13	AE	Halfpenny	George IV 1821	22 mm
sf14	AE	?	George III?	28 mm
sf15	AE	?	George III?	28 mm
<i>Phase 9</i>				
sf3	AE	Halfpenny	George III?	28 mm
sf4	AE	Penny	Victoria 1882	30 mm
sf5	AE	Penny?	?	27 mm
sf10	AE	Halfpenny	George III 1806	28 mm
<i>Unstratified</i>				
sf11	AE	Penny	George III 1799	30 mm

Jet

A single jet bead was found within phase 4 layer [1244].

The Coins

Eighteen coins were located in the excavation, one silver, the rest copper alloy. Of the total number five were badly worn and only 13 distinguishable. The following lists and describes these by phase.

DISCUSSION

Colm O'Brien and Alan Williams

The development of the river frontage

The area of foreshore studied in this excavation was brought into use with the construction of an embankment some way forward from the natural river bank, on land which, it may be supposed, lay between the upper and lower tidal limits. The natural shape of the land at the

point where the Swirle discharged into the tidal race of the Tyne is unknown; the effect of the man-made construction was to make this regular in the form of a right-angled corner with two distinct frontages facing the main river and the tributary. This shape, established before the year 1300, has determined the form of development ever since, with the two frontages consolidated into street lines, and property plots developed within. Fig. 26 shows a schematic view of the successive stages of evolution from the consolidation of the foreshore, to the kilns, and then the establishment of the property lines which survived until the wholesale clearance of the site in the mid-20th century.

On the east side, the profile of the embankment can be seen (fig. 2) with a steeply-pitched outer face, suitable perhaps for gaining access to ships beached against it at the low tide. If it did originally serve in this way as a quay, this function was soon lost as material was tipped over the edge, encroaching on to the fore-

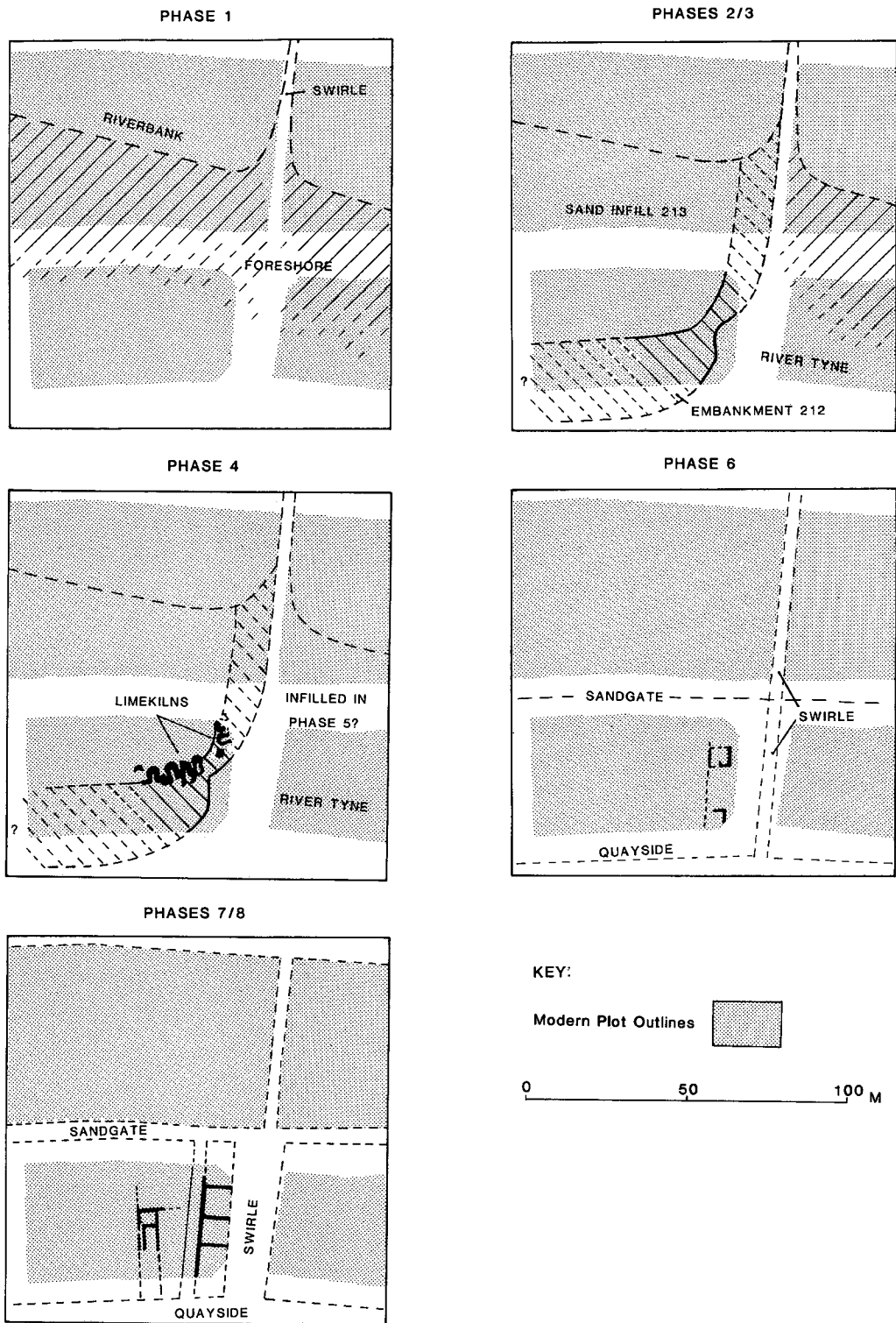


Fig. 26 Schematic view of the stages of waterfront development.

shore, and confining the water of the Swirle to the narrower space which is now occupied by the street of that name after the stream had been culverted. Southwards, facing the Tyne, the embankment extended beyond the area of excavation and underneath the present Quayside road, and so its profile cannot be established. It is unlikely, however, that it went any further forward than the line of the building frontage shown by Thomas Oliver in 1831.

To the north, it may be assumed that the embankment extended under the present line of Sandgate to meet solid ground at the foot of the cliff, while the basements of large 19th century warehouses prevent the feature from being traced any further westwards. Likewise on the east side of the Swirle, the land is no longer accessible for archaeological study.

Behind the embankment, the level of the ground was built up with a dump of sand. It is now evident from additional work in progress (during 1992) that this sand dump covers a much more extensive area than that observed in 1990, and that it was deposited as ships' ballast. We hope to be able to take a wider view of the development of the Sandgate area in a future paper; for present purposes, we concentrate on the excavated area.

The chronology of the waterfront development is established by the pottery study (Ellison, above) and by the archaeomagnetic dating of the kilns. The construction stages of the embankment (phase 2) are assigned to a period after A.D. 1250, with the Phase 3 activities, immediately preceding the use of the kilns, extending towards the mid-14th century (though it is noted that the amount of pottery recovered here was not statistically significant). If, following Ellison, we take the period of use of the kilns (phase 4) as lying between the early 14th century and a date of about 1375, and if we take account of the evidence for limeburning at the site before the surviving kilns had been constructed, it appears that the establishment of the limeburning industry follows on quickly after completion of the riverfront structures. If, on the basis of the archaeomagnetic dating, we allow a slightly earlier beginning for

the kilns, this reduces even more the period of development leading to the first industrial use. On either timescale, we can see the consolidation of the riverfront and its exploitation as an industrial area as part of a single, evolving process.

This chronology can be compared with the two other areas of the waterfront below the bridge which have previously been studied, Queen Street in the core area of the waterfront between the Lort Burn and Pandon Burn, and the area on the east bank of the Pandon Burn, within the town walls (O'Brien *et al.* 1988; 1989). (Table 3 shows the correlations.) At Queen Street the first stages of waterfront development were initiated before the mid-13th century, earlier than the first structures by the Pandon or at the Swirle, where the Phase 2 embankment is broadly contemporary with the Phase 1 quay wall at Pandon Burn. Yet it may be noted that at both Pandon Burn and the Swirle, waterfront developments began while the land was still part of the vill of Pandon, before its transfer to Newcastle in 1298. The evidence of the Lay Subsidy Roll of 1296 suggests a trading community of some vigour already established in Pandon, with Gilbert of Cowgate, wool exporter, Elias of Dunwich, a merchant juror, and Roger of Ripon, a ship's captain all assessed for tax. In the Newcastle riverside parish of All Saints, only five merchants were assessed higher than Gilbert of Cowgate at £7 11s 8d, and the total Pandon assessment of £29 9s 8d was greater than either the liberty of Tynemouth or North Shields (Fraser 1968).

After Pandon's incorporation into Newcastle, the riverside was further developed. Land was consolidated immediately beside the Burn (Area H, phase 3), and streets such as Burn Bank and Byker Chare (Area F, phase 1) were laid out with buildings alongside, extending the network of streets which had been established in the core area.

Comparison of the three areas offers some insight into what Newcastle gained by taking in the land between the Pandon Burn and Swirle. Firstly, the town gained the waterfront infrastructure and buildings which Pandon had

Table 3

SWIRLE		Queen Street (O'Brien et al, 1988)	Pandon (O'Brien et al, 1989)	
Pottery Phasing	Archaeomagnetic dating		Burn Bank Area H)	Byker Chare (Area F)
<p>Phase 5B</p> <p>Phase 5A</p> <p>Phase 4 Use of Kilns</p> <p>Phase 3</p> <p>?</p> <p>Phase 2 Embankment</p>		<p>Third stage of use</p> <p>Second stage of use (phase 5i)</p> <p>Reorganisation of 1st building</p> <p>First Building (phase 5)</p> <p>Origin of Streets</p> <p>Landfill and Consolidation (phase 4)</p> <p>Second Pier (phase 3)</p> <p>First Waterfront Structures (phase 2)</p>	<p>First Building on Burn Bank</p> <p>Build-up by the Burn (phase 3)</p> <p>Forward dumping (phase 2)</p> <p>Quay wall (phase 1)</p>	<p>Second Building (phase 3)</p> <p>Occupation of First Building (phase 2)</p> <p>Establishment of Byker Chare (phase 1)</p> <p>Pre-street Deposits</p>
1450				1450
1400	Kiln 1060 1380			1400
1350	Kiln 145 1330			1350
1300	Kiln 97 1300			1300
1250	Kiln 106 1280			1250

already established. In the land which was to become part of the intra-mural area, the existing structures were redeveloped to create a unified waterfront as far downstream as the town wall; that is to say an extension of about 100 m, or an increase of 25%, on the principal River Tyne frontage available to the town. Secondly, the town gained a length of foreshore beyond the wall which was available for dumping ballast sand without choking up the core area. And thirdly, it gained a riverside area available for large scale, open-air industrial processes, directly accessible to sea-going ships and from which, under prevailing winds, smoke would blow away from the town. The extension of the town in 1547 into the Byker lands between the Swirle and the Ouse Burn can be seen as a second stage of expansion out from the core area offering the same sorts of benefits as those gained in 1298.

Lime and Limeburning

Uses of Lime

The ability of lime to form a hard setting and tenacious coating was certainly recognized and valued in prehistoric times. Human skulls from Jericho, dating to as early as the 7th millennium B.C. and associated with an ancestor cult, were coated in lime plaster to mimic the facial features of the dead. In a European context, many of the Middle Minoan palaces on Crete had both walls and floors covered in lime plaster. Lime, though, only became the natural adjunct to construction in the Roman period. Builders and engineers exploited its uses to the full, not only in decorative and protective coatings but also as a strong and durable mortar to tie masonry structures together and in the many monolithic concrete works of that period.

It was the Romans who introduced the skills of stone and mortar construction to the British Isles following their invasion in A.D. 43. It seems unlikely that these skills, apart perhaps for a short period after the Roman withdrawal in the 5th century, were ever subsequently lost.

Certainly, there is considerable evidence for the production and use of lime in the Middle and Late Anglo-Saxon periods; the Middle Saxon mortar mixers in the town of Northampton for instance (Williams 1979), along with the evidence of its use within our remaining Saxon churches. The great acceleration in both ecclesiastic and secular stone construction in Norman and Medieval times must have necessitated an equivalent expansion in the production of lime.

Although the Roman writer Cato in his work, *De Agricultura*, mentioned and advocated the use of lime in agricultural practice to neutralise acidic soils, it was only in the 16th century that its production for this purpose in Britain began to increase, eventually outstripping that for the construction industry. The many limekilns dotting Northumberland today were in the main dedicated to this agricultural use and date at earliest to the 18th century.

Lime Production

Lime is not a natural raw material. It is derived from one of the forms of calcium carbonate such as limestone, chalk, marble or seashell. To become lime, calcium carbonate must go through a number of processes, the first of which is heating, usually carried out in a kiln. When calcium carbonate (CaCO_3) is heated with sufficient intensity (around 900°C) and for a long enough time, a figure dependent upon the stone used, it will calcine, that is, its constituents will dissociate to form carbon dioxide gas (CO_2) and calcium oxide (CaO). At this stage the carbon dioxide must be removed from the calcium oxide or they will re-combine, this is effected by a greater quantity of air being introduced to the burning process than would be necessary for combustion alone which draws off the carbon dioxide. The resultant calcium oxide or quicklime is a reactive, volatile material. If water is added it will fall to a dry powder, hissing and steaming in the process. The resultant hydrated or slaked lime ($\text{Ca}[\text{OH}]_2$) is suitable for agricultural use as it will readily pass into the structure of the

soil. For construction purposes, however, more water is generally added and the mixture, when stirred, will become creamy and quite glutinous, forming a lime putty. Mixed with sand, this will make a hard setting mortar or with other minor additions, plaster and stucco. additions, plaster and stucco.

As described above, limeburning appears simple; in reality great skill was required, with many variables involved throughout the process, including the type of calcium carbonate used, the fuel available to heat this material, and the design and efficiency of the kiln used to contain both during the process of burning.

Types of Limekiln

In Romano-British times, limeburners seem to have utilised intermittent kilns only, in which the raw material was loaded and then burnt through, the quicklime being removed after the kiln had cooled. Two broad sub-divisions of this type of kiln can be made.

a. Flare Kilns

The charge of calcium carbonate, usually chalk or limestone in smallish lumps to allow the free flow of gases, was carefully packed into the kiln, forming a shallow arch which sprang from a ledge within the oven. Fuel, charcoal or wood, was then burnt beneath this charge which was calcined by radiant heat. If the calcium oxide was removed from the top of the kiln it would not come into contact with the fuel and the resultant lime would be evenly burnt and white, ideal for use as a fine plaster or stucco.

b. Intermittent Mixed Feed Kilns

Fuel and calcium carbonate were placed in alternate layers within the kiln. This would be lit from the bottom and could burn through to the top. Because fuel and raw material were mixed, the lime produced would not be of as high a quality as that from a flare kiln but the firing process would not necessitate the same attention or skill to achieve an adequately burnt product.

c. Running Kilns

That the whole load had to be removed once calcined was a very inefficient feature of both flare and mixed feed kilns. The heat built up over the firing would dissipate and be wasted. As a result, other more efficient kilns began to be developed during the Medieval period. These running or continuous kilns extended the firing time by allowing raw material and fuel to be fed in, calcined and removed without necessitating the drawing of the fire, thereby utilising heat stored both within the kiln structure and that percentage of the load already heated. As with the mixed feed kiln, the load would be placed in successive layers of fuel (from the early Middle Ages coal began to be used) and calcium carbonate, which would burn up through the kiln. In theory the "burning zone" within a kiln should be limited to the middle of the pot; in practice it often extended to the top. As the lime was produced it would be removed by the limeburner through a flue or "eye" at the bottom of the kiln. The load would slump and the void at the top be recharged with more fuel and calcium carbonate. This process could continue for as long as desired provided the structure of the kiln remained sturdy and supplies of fuel and raw material held out. The comparative efficiency of fuel use as between intermittent and running kilns can be illustrated by figures derived by Wingate (1985) in which coal was used in simple modern kilns. The intermittent kilns consumed half a tonne of coal per tonne of lime, while the running kilns produced 1½ tonnes of lime for the same amount of coal.

Medieval Lime Kilns

A comprehensive survey of Medieval lime kilns is not presently available, though Williams (1989) gives a general review. Although over 50 have been archaeologically investigated in England alone, the available information is patchy and relevant material sometimes omitted in published works. The following summary is given with this proviso.

Morphology of Medieval Lime Kilns

The variety in size and shape of Medieval lime kilns is great. All, however, required a pot or oven in which to burn the lime. Generally, these were dug as pits, either rectangular or circular in plan. Both forms are exhibited in the Chew Valley, Somerset, where a circular example, kiln 3, was constructed directly over one rectangular in shape (Rahtz and Greenfield 1977). Usually, these ovens ranged between 1 and 5 m across. Exceptionally, one kiln at Bedford Castle had an oven nearly 6 m across (Hassal 1979). In profile they could be straight sided, as with the 13th century kiln 1 at Portchester Castle (Cunliffe 1977) or taper markedly towards the bottom as with the 15th century kiln at Old Erringham, West Sussex (Wilson and Hurst 1965) and they varied greatly in depth; generally, however, between 1 and 3 m. The pot might be lined with stones, clay or even tiles, as with a series of kilns at Lion Walk, Colchester (Crummy 1984). It was certainly not abnormal to leave the kiln unlined, even in the 19th century, provided the bedrock or subsoil was sufficiently resistant to heat.

If a bank or slope were accessible to the limeburners in which to recess the kiln, this would obviously have been exploited, cutting down considerably on construction time and facilitating access to the top of the kiln for loading. This leads directly on to the most problematic aspect of kiln structure, the above ground proportion. In some cases it is probable that what survives is relatively complete, as at Bedford (Hassal 1979), where a path would appear to have provided access to the top of a kiln for loading. Other kilns are clearly truncated; modern evidence suggests that in running kilns at least, a minimum oven height of 6 m is needed for efficient running (Wingate 1985). All kilns had basal flues; some had four, as at North Elmham, Norfolk (Wade Martins 1980), others had three, as with a kiln at Southampton Castle, and Portchester Castle, kiln 2, for instance, and many had two, as with a series of probably 13th century examples in south west Wales, associated with castle construction (Craster 1950). Single-flued exam-

ples, however, predominated. A relatively local example, with steps leading down to the oven and dating to the 14th century, was excavated at Church Close, Hartlepool (Daniels 1990). Flues could be extremely basic structures, as at Bedford where a kiln with two flues had simple arched openings (Hassal 1979), or very complex as with a number of kilns at Southampton in which the multiple flues were ducted to the centre of the oven and then vented through one opening. As a constant draught was needed in limeburning to ensure the removal of carbon dioxide from the oven, the presence of one flue within a kiln was an absolute necessity. To prevent interruption of this flow, whilst stoking and raking the fire, two flues would be useful, as described by Cato in *De Agricultura* in the 2nd century B.C.: "If you burn with two furnace entrances. . . throw (the ashes) out at one entrance and there will be fire at the other."

The presence of three or four flues within one kiln, alongside, in some cases, the ducting of air flow into the centre of the oven, must be seen as attempts to regulate the flow of air extremely carefully, possibly because of the idiosyncrasies of some of the raw materials used or in order to maintain a longer and better controlled firing, as with running kilns. Some kilns had the flue area buttressed, as at Niton on the Isle of Wight (Craster 1950) and others had covered flues, as with kiln 3 at Chew Valley (Rahtz and Greenfield 1977) and a kiln excavated in High Street, Exeter (Med Arch vol 25, 1981, Notes p. 207). Beyond the flue a raking pit or stokehole was often provided, sometimes with steps as at Portchester (Cunliffe 1977).

Development of Medieval Limekilns

There is evidence to suggest that an evolutionary development of limekilns took place in the medieval period. The reasons must have been to increase the speed at which quicklime was produced and to decrease the quantities of fuel consumed. Although it has been claimed that limekilns diminished in size throughout the

period, as exemplified in Colchester (Crummy 1984) and Portchester (Cunliffe 1977) in order to raise temperatures during the process of burning, the evidence for this is only partial; whilst temperature was clearly raised within the pot, witnessed by the extensive vitrification within the later Colchester kilns, to deduce volume merely from ground plan is clearly dangerous; the later kilns may have been considerably taller than the earlier ones: as already stated, continuous kilns to be efficient need to be tall (Wingate 1985). Additionally, although the greater complexity of a kiln and the multiplication of its flues may be indicative of its continuous use, they are not necessarily diagnostic features.

Distribution of Medieval Limekilns

The many 18th and 19th century limekilns surviving today in complete or ruinous state, produced vast quantities of lime primarily for agricultural use. They reflect a very different industry from that of limeburning in the medieval period. Although a number of medieval limekilns may be associated with the production of agricultural lime, as with a possibly 14th century example from Bradwell Bury, Buckinghamshire (Med Arch vol 20, 1976, Notes p. 193), and late medieval documents refer to the practice of liming fields, lime was primarily consumed in that period by the building industry for the production of mortar and plaster.

For various reasons, not least the hazards inherent in the transportation of quicklime, medieval limeburning tended to gravitate towards the building sites where the lime was to be used. Quicklime was a material which if dampened would produce enough heat exothermically to burn a boat or cart, exemplified in the former case by a passage from Sykes Local Records for the year 1829, which describes how the schooner *George and Henrys* coming into the harbour at Sunderland "*struck upon the bar and sprung a leak; the water then getting to the lime, she took fire, and afterwards drove up into the harbour mouth, where she*

sunk." (Sykes 1866, 251.) Many medieval limekilns are found in urban contexts, grouped in clusters, as in Bedford and Colchester, and here in Newcastle, whilst others can be linked to specific building works, as with the 13th century limekilns in south west Wales, associated with English castle construction (Craster 1950).

The Newcastle Limekilns

As described in the excavation text above, this group of limekilns consisted of a total of nine units. Initially at least four, and possibly up to seven, kilns were in use. It is thought that they began production some time around or before the mid-14th century, with the remainder probably coming into use over the next few decades. As individual structures they are unremarkable and their general form and individual features can be paralleled by other medieval kilns described above: in internal diameter and depth they fall well within the average for kilns of the period. All the kilns were single flued, which again places them with the majority of medieval examples. The internal vitrification of the kilns can be paralleled by limekilns excavated at Colchester (Crummy 1984). In the East Quayside kilns, this vitrification is probably a reflection of the use of coal as a fuel, which would tend to raise the temperature above the ideal, whether intentionally or otherwise. Two aspects of the East Quayside kilns stand out as somewhat unusual. Firstly, in the number of kilns working at any one time; up to seven kilns in production simultaneously is unparalleled for the medieval period. Neither at Colchester nor Bedford were so many in use at the same time. Secondly, in the idea that the whole series was, to a greater or lesser extent, planned. The continuous frontage wall of the southern row is very suggestive of this, as is the lack of differentiation in the individual structure of the kilns.

Kiln Technology

To test the proposition that these kilns were of the continuous type, Dr. Mark Noel examined the profile of remagnetisation in the burnt sand around the outside of one of the kiln pots. For the calculation of the heat transfer equation, a value of 1000°C was used to represent the firing temperature inside the kiln (this arbitrary figure falls within the range which might be expected). On this basis it was calculated that at its last firing the kiln was running at this temperature for a period of not less than 51 days.

Although this figure must be treated with caution, it gives support to the idea that they were operating as running kilns, and it suggests that usage may have been seasonal. The vitrified linings of all the ovens would presuppose that they had been running at a very high temperature presumably to speed up the process but with the risk of overburning the lime.

Fuel and raw materials

Lithological samples taken from contexts associated with the kilns were examined by Andrew Newman of the Hancock Museum with a view to establishing the sources of origin of the raw material used in the kilns and the stone from which they were constructed (see Appendix 1). Samples examined included lumps of stone which had not been fully burnt in the kilns and had been discarded, and other material, mostly sand, mixed in the rake-out deposits from the kilns.

The sandstone used in the kiln construction is identified as Carboniferous yellow sandstone which was available locally from outcrops, as was the coal which was used as fuel and abundant in layers associated with the lime-kilns. Raw materials used in lime production included chalk of the Upper and Middle Cretaceous Periods and Carboniferous Limestone. The nearest outcrops of chalk are in Yorkshire, and it is thought that the samples investigated may have come from East Anglia or the South East of England. The Carboniferous Lime-

stone occurred in the form of small boulders, suggesting a coastal origin, possibly the north of Northumberland. The Magnesian Limestone which outcrops along the coast between South Shields and Sunderland was not identified amongst the samples.

There are no records from the 14th century to explain why a heavy and bulky raw material was imported over long distances when an alternative source was available 10 miles from the kiln site. However, the records contained in the earliest surviving accounts of the Newcastle Chamberlain for the period 1508–1511 offer some insight into the matter (Fraser 1987). The Chamberlain noted the dues paid by each ship on commodities landed for sale in Newcastle and the cargo taken on board, both for foreign ships and for English coastal vessels. Newcastle coal was by then being shipped along the east coast of England, and in particular to ports in East Anglia and the Thames estuary, and overseas to Holland and Zeeland, Flanders, and Normandy and the Pas de Calais in France. In many instances the colliers arrived on the Tyne carrying ballast which was discharged on the shore on payment of a fee. As Constance Fraser notes (1987, xv–xvi), the nature of the ballast was never stated, and while stones would no doubt do the job of keeping the ship stable, the fact that they are sometimes recorded separately suggests that they may also be a commodity, though there is no indication of the use to which they were put. It is not impossible that chalk was the stone carried by the ships *Franssos* and *Turttow* of Boulogne or the *Katrine* of Dieppe who paid dues to the Chamberlain on 19 June 1508, or the *Trinity* of Yarmouth and the *John* from Cromer who paid the following day, or the *Mare* of Rochester on 14 August 1509. All these (to take a few examples at random) arrived on the Tyne carrying stone and departed with coal. The massive deposits of ballast on the banks of the Tyne show that for many ships the outward journey to Newcastle was made without a cargo, but a collier with a hold full of stones which both stabilised the ship and which found a market on the quay gained a double benefit over a ship with bal-

last, first in the revenue raised from the sale of the stones, and second from the avoidance of the impost and dues charged at the ballast shore.

1508 was a century or more after the Swirle kilns had gone out of use, and there is no direct link with the ships of that period. Yet such evidence as survives allows the possibility that the pattern of shipping observed in 1508 had by then been developing over some two centuries. Constance Fraser has reviewed the evidence for the exploitation of coal close to Newcastle during the 13th century, leading to a regular trade in shipping (1962, 209–213), while the importance to the town of this trade during the 14th century is suggested by such episodes as the appeal to the king in 1362 to lift the prohibition on coal shipments overseas (Fraser 1966, no. 222), and Bishop Fordham's appeal against the high handed actions of the Newcastle burgesses in blocking his access to the trade (Fraser 1981, no. 127), and by the evidence for installations at the riverside for handling coal; the stathes belonging to the Prior of Tynemouth (Gibson 1846, 138), and the *gardino carbones* referred to in a lease of 1332 (Welford 1909, 57). Trading contacts with East Anglia and Kent are implied by the incident of 1277 when the ship belonging to Tjoderick the Norwegian was hijacked on the Tyne and taken, loaded with coal, to King's Lynn (Fraser 1966, no. 203), by the seizure in Great Yarmouth in 1324 of a ship laden with coal belonging to the Newcastle burgess Hugh Haukyn (Fraser 1962, 213), and by the engagement in 1389 and 1394 of ships belonging to John Herrington and John Mitford to transport coal to Sandwich and Great Yarmouth (Blake 1967, 10). The London market was being supplied by 1257, and during the 14th century London merchants and shipowners came to Newcastle for coal to serve an increasing demand (Blake 1967, 11). Overseas, French ports were becoming increasingly important for Newcastle during the 14th century, with ships sailing to St. Malo, Poitou, Pontoise, Harfleur and Abbeville (Blake 1967, 12–13).

The detail provided by the Chamberlain in the early 16th century, and not available for

the 14th century while the kilns were in use, offers by analogy an explanation as to how and why stone for the limeburning could be brought from long distances, and gives us the suggestion that the limeburners set up their kilns on the riverside deliberately to exploit the particular circumstances of shipping on the Tyne. From as early as the 13th century coal was being shipped to limeburners for building works elsewhere in the country (Blake 1967, 2–9); it is not difficult to imagine how a one-way trade could have developed into a two-way exchange to the mutual benefit of the Newcastle limeburners and the southern colliers.

Output

Estimates of the total possible output of the kiln group are bound to be so hedged with uncertainties as to be meaningless, but some estimate may be made of the capacity and yield of the kilns. If we take the best-preserved of the group, that is kiln 1060 with a surviving height of 1.7 m and a maximum diameter of 4.0 m, and kiln 40 at 3.0 m high and 2.8 m in diameter, and assuming them to be regular cones in shape, and if we assume a fuel to stone mix of 1:3, as given above for running kilns, then the kiln 1060 could hold some 8.0 cubic metres of stone and kiln 40 some 6.9 cubic metres. If two tonnes of stone occupy one cubic metre in the kiln (allowing space between the nodules of stone for air to circulate), we can calculate the weight of stone in the full kiln. Wingate (1985) calculates from controlled experiments that the yield of lime from the raw material may be 56%. This would give us nine tonnes and 7.7 tonnes respectively from our two kilns. The length of time taken to convert the stone into lime depends upon temperature and the size of the stone nodules. Wingate's graph (1985, appendix 3) gives 12 hours for coarse nodules of 125 mm diameter heated to 1000°C (and two hours for 25 mm nodules). To estimate the rate of production of lime, we need to know how long a nodule would take to work its way from the top, down the kiln and into the area of maximum heat, and then to the

bottom. This we do not know; but if we assume coarse material, then 24 hours in the kiln might be a fair guess. This would mean that on a continuous process, the equivalent of one kiln full would pass through each day. A 51 day firing would thus yield something in the range 400–460 tonnes of lime per kiln. The evidence of the excavation is that at least four, and possibly seven, of the kilns were in use at the same time. On these figures, the seasonal yield from the group could be between 1600 tonnes and 3200 tonnes.

These figures, highly approximate though they are, taken along with the common features of design and the regular arrangement of the kilns, suggest the systematic production of lime on a large scale, and we may wonder where it was used. There is no direct evidence on this, but the end date for production indicated by Margaret Ellison's analysis of the pottery so closely coincides with the completion of the town wall that we are strongly tempted to suggest that these kilns were established to provide lime mortar for use in the town wall during the later stages of its construction as the builders progressed towards the riverside and finally along the Quay to the bridge. It would be interesting to see if during any future work on the wall, original mortar were to be identified, and if by using fragments of incompletely burnt stone, the source of origin of the lime could be identified, and if so, whether it came from the same sources as that used in the kilns sited during the 14th century on the edge of the town, at the confluence of the Tyne and Swirle.

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APPENDIX 1: Report on Lithological Samples

Andrew Newman

A series of ten hand specimens and seven soil and sand samples was taken from the site. It was not possible to collect these in a systematic way, as collection was undertaken after the main excavation was completed, but it is believed that the hand specimens and soil samples are representative of the site. The ten hand specimens were sectioned and microscope slides produced. These were then examined using a binocular microscope. In an attempt to provenance the specimens and soil samples, their lithological and palaeontological characteristics were considered. The hand specimens and soil samples have been deposited in The Hancock Museum, Newcastle upon Tyne and may be accessed using their reference numbers.

Background Geology

The Geology of North East England (Robson, D. A. 1980, Anderton, R. 1979, & Frost, D. V. & Holliday, D. W. 1980) consists of a series of volcanic and sedimentary rocks. Volcanic rocks are represented in the Cheviot massif, which was formed before the sedimentary rocks were laid down. These deposits date from the Devonian Period (about 380 million years ago), for the Volcanic rocks, to the Carboniferous Period (280–360 million years ago) for the majority of the sedimentary rocks found in Northumberland and Durham, and finally the Permian and Triassic Periods (200–280 million years ago) for the characteristic deposits, representing reefs and arid environments, found mainly in Durham. Also of interest is the Whin Sill (formed at the end of the Carboniferous Period), which because of its resistance to weathering, makes one of the impressive topographical features in the region. Finally, there are significant Quaternary deposits which date mainly to the end of the last ice age (about 14000 years ago) and consist of a series of sands and poorly sorted gravels.

The rocks of the quayside area of Newcastle upon Tyne consist of a series of sandstones, shales and coals, which may be dated to the Westphalian B division of the Carboniferous period (about 300 million years ago). This country rock is overlain in places with surface drift deposits which date to the end of the last glacial period (Devensian, about 14000 years ago).

The site is situated on the East Quayside, where the River Tyne is deeply incised into the surrounding country rock. The rock exposed on the site itself consists mainly of typical Carboniferous sandstones. These are yellow in colour (from iron oxide), coarse grained and have been cemented with silica. This would have resulted in a rock which was hard, generally very resistant and well suited to building. However, possibly the most important aspect of the immediate geology is the accessibility of coal. Within a close proximity to the site four significant coal seams would have outcropped. These were, the High Main, the Main, the Yard, and the Bensham Seam (Robson, D. A.

1980, fig. 7). At a further distance another eight seams would have been accessible. It is difficult to determine to what extent the surface outcrop would have been removed by the date the kilns were in operation, but it would have been easy to get coal onto the site.

Description and source of Soil Samples and Hand Specimens

Hand Specimens

1 160 77 H

Name. Flint

Description. A compact variety of silica (SiO₂) which comprises of minute quartz crystals with sub-microscopic pores. Its hardness (Mohs scale 6.5) and compact nature, results in a pronounced conchoidal fracture.

Source. Flint is only found in the chalk deposits of the Cretaceous Period (about 100 million years ago). The Chalk outcrops range from Speaton in North Yorkshire to Lyme Regis in Dorset. Flint is distributed throughout the chalk deposits, but is more pronounced in the Upper Chalk. This specimen may have originated from almost anywhere along the chalk outcrop. But in practice it is reasonable to suggest that it will have originated from East Anglia or South East England because of the specimen's form and colour. Flint has also been reported weathering out of coastal glacial deposits but such specimens tend to be small in size and exhibit a considerable degree of weathering (Bullerwell, R. G. A. 1911). It is not thought that this specimen could have originated in this way.

2 160 B

Name. Sandstone

Description. A well sorted sandstone, known as a lithic arenite, it is medium grained and well cemented. A small amount of mica is present together with coal fragments. The iron oxide impurities produce a yellow colouration.

Source. This is a classic example of a Carboniferous sandstone, which is very commonly found in North East England. It may have

originated from the Westphalian, Dinantian or Namurian rocks of the Carboniferous period. Sandstones such as these would have provided the main bed rock under the site itself, so may not have been brought on to the site at all. This particular example shows no evidence of being subject to heat, as would be expected if it was used for the kiln construction.

3 160 D

Name. Limestone

Description. A coarsely crystalline, impure limestone, known as biomicrite. Comprised mainly of calcite with a small percentage of silt. It also contains a considerable amount of fossil material in the form of shell fragments and Crinoid ossicles.

Source. This is a good example of a local limestone derived from the Dinantian series of rocks within the Carboniferous period (about 350 million years ago). They are common and widely distributed in Northumberland. The specimen itself is in the form of a small boulder about 210 mm in diameter and having a weathered rounded appearance. Boulders such as this are commonly found on the coast of North Northumberland, and would have needed to have been brought on to the site. They then may have been used as a raw material. This limestone would have offered a reasonably pure and accessible source of calcium carbonate.

4 160 F

Name. Dolerite

Description. This is medium grained basic igneous rock. It contains quartz, hornblende and mica. It is a very hard rock with a relatively high specific density. This specimen is in the form of a water worn pebble about 100 mm in diameter.

Source. The closest source of such material to the site is the Whin Sill, which crosses Northumberland from east to west. Because of its hard and very resistant nature it stands proud of the surrounding countryside, making it suitable for fortifications. This specimen would have been imported into the site. It would have either been moved by glacial action or im-

ported artificially. If the latter situation was the case the reasons for importation are not clear, equally good building material is available and it is of no use as a raw material.

5 160 E

Name. Sandstone

Description. A fine grained pure sandstone, showing rounded to sub-angular grains, with some interlocking, known as quartzite. The specimen is also reasonably well cemented. It takes the form of a weathered pebble about 100 mm in diameter. The specimen does show a colour change which is indicative of having been heated but no re-crystallization is evident, either in hand specimen or in thin section.

Source. This fine grained type of sandstone is quite common in the local Carboniferous rocks. Its origin may have been from the Westphalian, Namurian or Dinantian rocks. It is possible that this specimen came from the Westphalian rocks exposed on the site. The rounded nature of the specimen indicates that it may have been water worn, and so originating from the river channel of the Tyne.

6 160 A

Name. Limestone

Description. This is a very impure limestone, containing a considerable range of fossils and known as a biomicrite. These include, Corals, Crinoids, Gastropods and Bivalves. They are small and in a fragmented form, indicating a quite high energy environment. The specimen is quite well crystalline but lacking in structure. The specimen is in the form of water-worn rounded small boulder about 200 mm in diameter.

Source. This specimen is another example of a local Carboniferous limestone. It may have its origins in the Dinantian Series of rocks. Boulders such as this, as has been described earlier, are seen in quite large numbers on the Northumberland coast. This would have possibly been the closest source of such material.

7 160 G

Name. Sandstone

Description. A fine grained, very poorly sorted sandstone, showing some lamination and some evidence of re-crystallization. It may be described as a quartz arenite. It is almost pure quartz with very few impurities. It is in the form of small boulder about 110 mm in diameter. The specimen does not have an even structure and shows some quartz veins running through it.

Source. Determining the source of this rock is quite problematic. It clearly shows evidence of mineralisation in the form of the quartz veins. The lamination seems to be the result of partial melting. The amount of metamorphism is considerable and greater than could be produced by the heat generated in a kiln. There are a number of possible sources for the mineralisation represented. Firstly, there are a number of Tertiary dykes seen in Northumberland and Tyne and Wear and secondly the Whin Sill which crosses Northumberland from east to west is also a possible candidate.

8 160 L

Name. Chalk

Description. A very pure limestone containing fragmented micro-fossils, a variety of biomicrite. This specimen is very compact producing a harder than normal rock. No macro-fossils are present. The specimen is in the form of a small boulder about 170 mm in diameter.

Source. Chalk such as this will have come from Cretaceous rocks. The appearance of the specimen indicates that it may have come from the Upper or Middle Chalk, as these deposits tend to produce a clean white chalk. The Upper and Middle Chalk is found along most of its range, so this does not aid determination of provenance. The presence of macro-fossils would have been of use but these are absent. A small number of crushed micro-fossils are visible on the thin section, but they are in poor condition and not determinable.

9 160 J

Name. Chalk

Description. This is again a well compacted hard chalk which is less pure than EQA 160 L, containing more detritus. It also contains some

banding, jointing and pressure solution evidence. It also contains more fossils, mainly micro, but these are again fragmentary. It is again a variety of biomicrite.

Source. This specimen will again have originated from the Cretaceous deposits. Again this specimen may have come from the Upper and Middle Chalk. This specimen contains more silt than EQA 160 L, but chalk can be locally variable, so it is dangerous to draw conclusions on the basis of lithology alone. The absence of satisfactory fossil evidence prevents a precise provenance being determinable.

10 160 I

Name. Chalk

Description. This is a hard silty chalk, very similar to EQA 160 J. It contains joints and pressure solution boundaries.

Source. As EQA 160 J

Sand and Soil Samples

11 182 sample 54

Description. A clean yellow sand containing water worn pebbles of sandstone and flint. It also contains some large coal fragments. Also present are the shell remains of brachiopods and gastropods.

Source. This may be a local river sand, dumped ballast or a combination of both. Its content reflects the range of the materials found on the site. Coal and flint were brought to the site and the sandstones may have been already present, as they show the greatest amount of water related abrasion.

12 185 sample 57

Description. A clean sand with a high proportion of flint pebbles, of about 20.00 mm in diameter. A small amount of coal and some mortar present.

Source. This may be again a local river sand that contains a whole range of materials which are found on the site. The coal and flint are introduced mixing with the locally derived materials. It is also possible that the sand and flint may originate as dumped ballast. The mortar is only present in very small quantities.

13 181 sample 53

Description. A dirty sand containing small fragments of coal and many water worn sandstone pebbles. Some of these show heat effects.

Source. The sample may have been derived locally or dumped as ballast. The sample contains coal and flint together with the yellow sand. The silt constituent of this sample is much greater than in previous samples.

14 183 sample 55

Description. A clean pure sand, with coal fragments and water worn flint pebbles.

Source. The sample has again two possible origins. It may have been the result of ballast dumping or possibly be largely existing river sands mixed with imported materials.

15 180 sample 52

Description. An impure sand with a large soil content. It again contains water worn flint and sandstone pebbles. Some small coal fragments are present.

Source. Similar to the above, local soil/sand imported flint/coal.

16 186 sample 58

Description. Sandy soil, some visible mica. Water worn flint pebbles and coal fragments.

Source. Similar to the above, local soil/sand imported flint/coal. A contribution from dumped ballast is possible.

17 184 sample 56

Description. Sandy soil some mica visible. High clay content.

Source. Local clay soil contaminated with sands.

Conclusion. The lithological samples from the site can be divided up into a number of significant groups.

Chalk/Flint. These have been imported onto the site. The chalk was used as a raw material and because of its close association, flint would have also been present. Because of lack of evidence the precise stratigraphical and so

geographical origins of this material are difficult to determine. However, it is possible to say that it came from an area of chalk outcrop. It is also possible, but only in a very tentative way, to say that the flint came from East Anglia or South East England, because of its general form and colour. If this is the case the chalk may also originate in this general area. Flint has been reported weathering out of coastal quaternary deposits in small quantities, but it is felt that such a source is not likely for that found on the site.

Limestone. This rock would have again been imported onto the site. Its colour and compact nature indicates that it is a local Carboniferous Limestone. Such rocks are slightly older than those exposed on the site and outcrop to the north and west of Northumberland and on its coast. The form of the material, in boulders up to 250 mm in diameter, seems to indicate a coastal origin. Examples of such deposits are found, for example, on the coast just south of Dunstanburgh Castle.

Coal. This material is found widely on the site as would be expected. As has been explained, coal would have been available very close to the site. A number of important seams outcropped in close proximity.

Sandstones. This rock outcropped on the site. The Carboniferous yellow sandstones are locally variable but reasonably consistent throughout Northumberland. The kilns seem to have been constructed out of this material. There is some variation but this is probably due to the intense heat generated during the firing process.

Dolerite. This material is of no use as a raw material for the kilns and equally good building materials are to be found on site. One possible explanation is that it was mistaken for a limestone pebble when they were being collected. They occur in similar localities on the coast and can look similar, when dirty or wet. It is also possible that it was brought to the site by glacial action but no scratches or striations are present which would indicate such an origin.

Conclusions

The sand and soil have a number of possible modes of origin. Firstly, they may have originated as dumped ballast which became contaminated with coal, or secondly they may mainly represent a river sand which has become mixed with imported material. A partial glacial origin also cannot be ruled out.

The stone samples reflect the possible import to Newcastle quayside of raw materials from South East England and the Northumberland

coast. Coal was available locally. For some reason no use was made of the Magnesian Limestone which is exposed south of the mouth of the River Tyne on the coast north of Sunderland, as no samples of this material have been found. There may be a chemical reason why this limestone was not used, or it may just be that it is easier to collect the Carboniferous limestone, which may be found in useful sized boulders on the Northumberland coast, and does not need to be mined.

APPENDIX 2: Cartographic and Documentary Sources for Building History

1. Maps.

Place	Surveyor	Date published
Newcastle	Cotton	c. 1590
Castle Ward	[NCH vol. IX pl II]	c. 1600
Newcastle	William Matthew	1610
River Tyne	[Gardner]	1654
Newcastle	James Corbridge	1723
Newcastle	[Bourne 1736]	1736
Newcastle	Isaac Thompson	1746

(Reproduced in *Archaeologia Aeliana* series 4 vol. XIV 1937, Plate XI)

Newcastle	Charles Hutton	1772
Newcastle	Thomas Oliver	1831
Newcastle	Goad Insurance Plans	1899-1942
Ordnance Survey 1:500		
Northumberl'd XCVII.8.6		1861
Northumberl'd XCVII.8.11		1861
Northumberl'd 68		1896

2. Documentary sources

Newcastle Central Library:

Seymour Bell portfolio 20

Census Enumerators' Books on microfilm.

Tyne and Wear Archives Service: (Accession numbers all TWAS/)

Long Boxes 29/1/50 Deed 1638

32/2 Plans of Newcastle Corporation property

544/8 Inrolment book

589/4 Common Council book 1645-1650

589/6 Calendar of Common Council book 1656-1722

589/7 Common Council book 1733-1782

589/12 Common Council book 1699-1718

589/13 Common Council book 1718-1743

589/20 Common Council book 1824-1831

589/21 Common Council book 1831-1835

1151/1 Sale of land from Sandgate to the shore, 1620.

T186/11668 Mr. Arnott's property

T186/13030 Half Moon Inn

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