The Excavation of a Late Medieval/Transitional Pottery Kiln at Cheam, Surrey.

by CLIVE ORTON

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2. Structural Evidence

2.2 Phase Descriptions

2.2.1 'natural'

The natural Thanet Sand had been cut by features over almost the entire area, except at the north end, where it appears to be covered with redeposited sand, possibly derived from the cutting of the pit for the kiln and stokeholes (see 2.2.3). A north-south section cut into the sand at the north end (Section 2, see figs. 2 and 3) revealed the top of Thanet Sand at -0.91 to 0.94m (-36 to 37 in). If the natural slope of the hill were maintained evenly across the site, a drop of 0.15m (6 in) from east to west of the site could be expected.

2.2.2 Phase 1: features earlier than the kiln

Although features earlier than the kiln were apparent at the north end during excavation, time was not available to record them in detail. The clearest evidence comes from Section 2 (fig. 3) which shows two cuts into the Thanet Sand, the northern about 0.30m (12 in) wide and 0.43m (17 in) deep, and the southern cut to the same depth (-1.37m, -54 in) but itself cut by the stokepit (see 2.2.3). They are separated by a roughly horizontal area 0.53m (21 in) wide and 1.03 - 1.07m (40½ - 42 in) below TBM. The northern feature is also shown on a contour plan (not illustrated), where it appears as a roughly oval pit, aligned east-west,

at least 0.61m (24 in) long (but the west end was not excavated) and 0.41m (16 in) wide where it cuts 'natural'. This plan was, however, made at an early stage of excavation and appears to be unreliable, showing the feature about 0.15m (6 in) further south than it is shown in Section 2. The fill of the northern feature is described as grey sand covered by a layer of 'red crushed "brick" ', which in turn is covered by grey clay and charcoal which also extend over the horizontal area to the south. Both are then covered by a layer described as 'crushed red brick (burnt clay)' and the entire north end of the section by redeposited sand. The fill of the southern feature was not recorded.

These features could be interpreted as the cut for, and central pedestal of, a kiln, part of which was damaged when the stokepit was dug and the rest covered by upcast. No pottery was recorded as coming from this area, although some is shown on Section 2. Two large deposits of pottery, including many intact or almost intact vessels, were found in the surviving pre-kiln deposits (T1L4 and T2L2, see fig. 4).

Deposit T1L4 is described as being cut by both the stokepit and the modern drain trench. The top 0.23m (9 in) is composed of redeposited sand, beneath which there is 0.10 - 0.13m (4 - 5 in) of red burnt sand, then more yellow sand with much pottery. The red layer could be the same as the upper layer of red crushed brick seen in Section 2, but its height below TBM was not recorded.

Deposit T2L2 is described as being below the bottom of the modern drain trench and to the north of the Victorian cess pit, and as containing a number of largely intact vessels, lying in rows on their sides (M Morris) or in an upright position (I Mortimer). Although the height below TBM was not recorded, this deposit would seem to be located at or just below the top of 'natural', i.e. in a

similar situation to the northern feature in Section 2. It is possible (if the southern feature of Section 2 is discounted) that this deposit, T1L4 and the northern feature belong to the same structure, which would then have a maximum recorded dimension of 2.90m (9 ft 6 in)(see fig. 4). Alternatively, they could relate to two or even three distinct features.

Other deposits thought to belong to this phase are:

T1L11: finds labelled 'holes bottom of kiln pit', context number assigned during post-excavation work. Location not recorded.

T2L12: described as 'mixed hard well packed sandy ashy grey/white, black, brown deposit. Behind and under north-east wing wall /see 2.2.3/ and bottom of stokehole mortar "floor"'. Only one sherd was recorded as being from this deposit, but according to the notes it contained 'much pottery... all of white and off white fabric'.

T6L3: fill of a small pit in south-west corner of Trench 6, possibly truncated by cut for kiln. Pale brown sand.

2.2.3 Phase 2: the kiln and stokepits

The kiln is of twin flue split pedestal type, Musty (1974, 46) type 2d, and is aligned north-south, i.e. along the line of the building plot. (see fig. 5). It appears to have been built directly onto a roughly levelled surface in the Thanet Sand, at 1.19 - 1.27m (47 - 50 in) below TBM. This is about 0.25 - 0.33m (10 - 13 in) below the level of the Thanet Sand at the north end of the site (see 2.2.1), suggesting that the kiln was set in a shallow pit. If, however. the local slope were slightly steeper than that of the High Street as a whole, the kiln could be standing on a platform cut into the hillside. The body of the kiln could

not be excavated completely: the western part was destroyed when a Victorian cess pit was built, and the eastern edge was too close to the modern building to be excavated. Nevertheless, enough remains to be able to say that it is oval in shape, about 3m (10 ft) long and probably 2.6m (8 ft 6 in) wide internally and 3.66m (12 ft) by 3.51m (11 ft 6 in) externally, giving a total internal area of 6.2 sq.m (67 sq.ft). The walls are built mainly of Greensand (Reigate Stone) blocks, up to 0.38 - 0.46m (15 - 18 in) long, 0.18 - 0.27m (7 - 10½ in) wide and 0.14m (5½ in) high, standing up to three courses high (0.50m, 19½ in). There are instances of the space of one block being patched with brick and tile. The eastern wall consists of one thickness of stone blocks, 0.27m (10½ in) wide at the northern end and 0.18m (7 in) wide at the southern end, and backed by bricky rubble, presumably packing between the blocks and the side of the pit. The western wall also consists of one thickness of stone blocks, apparently backed by one thickness of header bricks (although very few survive). At the southern end, the blocks are reportedly laid on a course of tiles.

A few samples of the Reigate Stone were retained: they show evidence of tooling and are flash-glazed on one surface.

The northern flue entrance is formed of a large stone sill 0.53m (21 in) by 0.28m (11 in) with its top some 0.10 - 0.18m (4 - 7 in) above the Thanet Sand at 1.09m (43 in) below TBM, surmounted by two jamb stones, each about 0.30m (12 in) square and standing 0.28m (11 in) high (see fig. 6). The flue itself is thus 0.43m (17 in) wide and 0.28m (11in) high, but it could have been constructed to a greater height than now survives. The southern flue is similar, with a stone sill 0.76m (30 in) by 0.38m (15 in), worn in the centre. The western jamb again consists of a single block, about 0.28m (11 in) square, but the eastern

jamb is missing. Traces of its presence can be seen where it would have abutted the east wall. Assuming this stone to have been the same size as the others, this flue would have been about 0.38m (15 in) wide.

The split central pedestal is about 2.5m (8 ft 3 in) long and 1.75m (5 ft 9 in) wide overall, with a central gap about 0.20m (8 in) wide, leaving a space 0.40m (16 in) wide between the pedestal and the kiln wall. Both ends of the two pedestal halves are formed of single large blocks of Reigate Stone, up to 0.34 by 0.25m ($13\frac{1}{2}$ by 10 in) and up to 0.36m (14 in) high (see figs. 5, 7). The rest of the western half consists for the most part of an irregular mass of stone, brick, tile and mortar rubble, its upper surface varying from 0.86 - 0.91m (34 - 36 in) below TBM at the north and south ends to 1.14m (45 in) below in the centre (see fig. 8). At the southern end $4\frac{1}{2}$ courses of bricks, on a tile base, were observed (see fig. 5). The eastern half appears to have been robbed, and shows only as a 'ghost' of unburnt sand contrasting with the burnt sand of the area between it and the kiln wall.

A number of deposits were recorded which appear to be contemporary with the operation of the kiln: between the terminal blocks at the north end of the pedestal is a small pile of tiles (see fig. 8), sloping down to the north and enveloped in soot. There are also deposits of soot between the pedestal and the kiln wall (T4L3 and T6L3, not illustrated), and between the two halves of the pedestal (T4L4, not illustrated).

The area immediately outside of each flue was bounded by diverging 'wing' walls, mainly of chalk block construction (see fig. 5). Those at the north end are 1.0m (3 ft 3 in) long, 0.19m ($7\frac{1}{2}$ in) thick and angled at 45° to the axis of the kiln. They appear to butt onto the kiln wall. The south-eastern one is longer

(at least 1.52m or 5 ft) but less splayed (only 25° to the axis of the kiln), and consists of five courses of chalk blocks, standing 0.61m (24 in) high. The bottom two courses are in good condition, but above them some of the stones have flaked, and there are some repairs in brick and tile. There is one block of Reigate Stone. The south-west wall, by contrast, is insubstantial and appears to consist of only a single row of bricks (see fig. 5). It was, however, incompletely excavated.

The northern stokepit extends a distance of 2.84m (9 ft 4 in) from the flue entrance. Its width cannot be ascertained because much of its eastern side was not excavated and the western side was partly destroyed by modern features. It was cut generally to a depth of 1.37 - 1.42m (54 - 56 in) below TBM, but to 1.52m (60 in) below at the eastern side (see figs 3, 9). The bottom of the cut is thus 0.28 - 0.33m (11 - 13 in) below the level of the sill in the centre and 0.43m (17 in) below it at the eastern edge of the trench.

Deposits which may have been formed during the life-time of the kiln are:

(a) a bank of very well packed chalk rubble, up to 0.18m (7 in) thick, against the west side of the pit, north of the north-west wing wall (T1L10, see figs. 5, 9).

(b) compacted burnt brown sandy deposit, with ash and charcoal (T1L9, T2L11). It is up to 0.15m (6 in) thick, covers the bottom of the pit, except for the western part (see figs. 3, 9) and just overlies the eastern edge of the chalk bank (a) above. Its upper surface is at about 1.35m (53 in) below TBM.

(c) thin mortar spread, presumed to be a floor, at 1.32m (52 in) below TBM. It lies over (b) in the eastern part of pit, and curves up at east

side against the foot of north-east wing wall. (T2L10, not illustrated).

(d) greyish white sandy deposit, slightly sticky, with fragments of charcoal, tile and brick, and much pottery, covering whole of bottom of pit in Trench 1, apparently not recorded in Trench 2 (T1L7, see figs. 3, 9). Surface at about 0.91m (36 in) below TBM at east and west sides of pit, dropping to 1.27m (50 in) below in centre, north of the flue entrance.

(e) deposit of very dark brown sticky earth, with charcoal, chalk and flint fragments. In east side of Trench 2, in angle between north baulk and the north-eastern wing wall, sloping up from west to east (T2L8, not illustrated).

These deposits (b), (d), (e) are seen as possibly the effect of trampling and the raking out of ashes on the original sandy floor of the stokepit. The chalk (a) may have been deposited to stabilise the western side of the pit, and the mortar (c) seems to represent a re-flooring of the part nearest the kiln.

The southern stoking area was less completely excavated, and there is no direct evidence for calling it a 'pit'. Traces of a worn clay floor survive against the south-east wing wall, just south of the flue entrance (see fig. 5). It had been burnt red. A black deposit, with much charcoal (T8L2, not illustrated) may represent raking-out in this area.

2.2.4 Phase 3: dumping in the kiln and stokepits

The kiln and stokepits had been backfilled with a mixture of rubble, ash, clay and pottery fragments. This seems to have happened soon after it went out of use, as there are no signs of weathering inside the kiln and only a slight fall

of sand (T1L8, see figs. 3, 9) in the northern stokepit. It is difficult to distinguish between pottery which may represent the last firing of the kiln and that which may have been dumped later, but the generally fragmentary state of the pottery (see 3.5.1) suggests that it is not in situ. Only six nearly complete vessels were found stratigraphically above the kiln, and of these all were outside the kiln.

The fill of the kiln consists of a mortary rubble with much tile but comparatively little pottery (T4L2, part of T6L1, not illustrated), with a more sandy deposit between the pedestal and the western wall (T5L2). It is possible that the eastern half of the pedestal was removed and recorded as part of this 'demolition fill'. The kiln is covered by 'modern deposits' (T4L1, T5L1, part of T6L1, part of T2L1) which however contain only pottery contemporary with the kiln.

The southern flue entrance is blocked by a barrel (see fig. 8), about 0.61m (2 ft) in diameter and apparently 1.22m (4 ft) high, standing on top of the sill. It contains a small deposit of clay at the bottom, but is filled with bricky rubble, including several hundred sherds, mostly of White Ware, but some of Red Ware (coded T0L1).

There was no pottery other than Cheam Ware, and the barrel is therefore seen as contemporary with the demolition and backfilling of the kiln and stokepits. Presumably it was pushed in during the process of backfilling, and its location in the flue is not thought to have any special significance.

In contrast to the kiln, the northern stokepit had been filled with dumping containing large amounts of pottery. The sequence appears to be:

(a) layers of sand, ash, burnt earth and clay, and pottery. Up to 0.53m (21 in) thick. Tip lines suggest tipping from the west (T1L6 (see figs. 3, 9), T2L6, T2L7, T2L9 not illustrated).

(b) dump of pinkish chalky/mortary material, containing much pottery and roof tiles, and some large blocks of Reigate Stone. Reaches a maximum thickness of 0.84m (33 in) in centre of pit, but thins out to east and west (T1L5, see fig. 9; and T2L5, not illustrated). It contains the only nearly complete vessels found above the kiln.

(c) further deposits, similar in character to (a) above. (T1L3 (see fig. 9), T2L4, T9L2). Part was removed and recorded as T1L1.

2.2.5 Phase 4: modern features

The western side of the kiln is cut by a Victorian cess pit of flint and chalk construction (see fig. 5). Above this runs a modern drain trench (see figs. 5, 9). A modern wall runs north-south across Trench 1 (T1L2, not illustrated) and another runs east-west across the southern edge of Trench 2 (T2L3, not illustrated). Other modern deposits overlie the dumping (T1L1, see fig. 9; part of T2L1, T9L1) but, since part of the dumping was recorded as belonging to these contexts, the pottery from them has been assigned to Phase 3.

2.2.6 Phase 5

A large amount of unstratified pottery has been coded as Phase 5 for ease of processing.

2.3 Discussion

2.3.1 The Kiln as a structure

Before comparing the kiln with others in the area or of the same period, we shall attempt to reconstruct its original form and dimensions. Kilns of this type and date are generally thought to have been surmounted by a clay dome, which would have been demolished after each firing (Musty, 1974, 54). This does not seem to be the case here, because (i) the problems of building a dome over an oval area with a minimum diameter of 2.6m ($8\frac{1}{2}$ ft), that would be stable under the thermal expansion of the kiln walls, are too great (cf. Bryant, 1977, 109), and (ii) only a very small amount of fired clay that could possibly be thought

to come from a dome was found. Instead, the kiln is seen as having vertical walls all the way up, and an open top - the open-top updraught type. The pots would have been covered directly with larger sherds, overlapping each other, which may in turn have been covered by some insulating material (e.g. turf). Such kilns are still in use in the Mediterranean region and in Nigeria (Rhodes, 1968, 9-16), and brick kilns of this type were in use in southern England until this century (e.g. at Ashburnham).

The case for reconstructing updraught kilns as open-topped has been reinforced by Bryant (1977, 108-10).

Given this form of kiln, the next question is its height and hence its capacity. Factors which determine a suitable height appear to be:-

(a) favouring a tall kiln:
- (i) need to produce a strong updraught to draw in heat through flues,
- (ii) efficient heat transfer from a long-flamed fuel (e.g. wood),
- (iii) need to minimise heat losses through top of kiln;

(b) favouring a short kiln:
- (i) need to minimise heat retention in, and loss through, kiln walls,
- (ii) ease of stacking pots.

Leach recommends in general terms (1940, 192) that a kiln should be about as high as it is wide, and in Mediterranean open-top kilns the heigh of the firing chamber seems to be from 60% to 100% of its width (see illustrations in Hampe and Winter 1962; 1965), the largest kilns being relatively the shortest. On this basis, one might expect an internal height (i.e. from top of pedestal to top of wall) of 2.5m (the same as the internal diameter). This would be a very large kiln and extremely difficult to stack, even if a rebate were cut in the kiln wall to facilitate loading, as is done in the Mediterranean examples.

Since it would not be possible to reach the centre of the kiln from outside, it must have been stacked mainly from the inside, and the walls need only be low enough to allow pots to be passed over from the outside to the inside. This suggests a 'most likely' internal height of 1.5m (4 ft 10 in) with limits of perhaps

1m and 2m (3 ft 3 in - 6 ft 7 in) on the internal height. With this relatively low height/width ratio of 60% the central passage through the flue may have been necessary to bring more heat into the centre of the kiln and even out heat transfer. A hypothetical cross-section of the complete kiln is shown as fig. 10 and an isometric view as fig. 11. Relating these heights to the internal surface area of 6.2 sq.m. (67 sq. ft) we have a 'most likely' capacity of 9.3 cu.m (330 cu. ft) with lower and upper limits of 6.2 cu.m (220 cu.ft) and 12.4 cu.m (440 cu.ft).

The capacity of the kiln, in terms of numbers of pots, obviously depends on the size of the pots and the efficiency of the stacking. In calculating the potential capacity, it is assumed that the pots were stacked in orderly tiers, although for unglazed pottery this is not strictly necessary. The number of pots per tier of each of the main types is given in Table 1. A 'typical' kiln load appears to be about 600 pots. The space between the pedestal and the kiln's walls poses some problems: the pots must have been stacked right up to the kiln walls since hot gases could otherwise move too rapidly up the voids or 'chimneys' (Cardew, 1969, 179) left between the pots and the walls, but the gap is so wide that unsupported pots nearest the wall would have fallen into the space between pedestal and wall. Fire-bars are the obvious answer, but none was found and there is no trace of them on the kiln walls. This suggests that the floor of the firing chamber may have been at, or even above, the highest recorded level of the kiln wall, 0.69m (27 in) below TBM, and supported by the dressed stone wall and the pedestal. Bridging the space between wall and pedestal with tiles or ceramic firebars would be difficult. This problem cannot be resolved on the evidence available from this kiln.

In the reconstruction (figs. 10, 11, 12) the kiln floor is put at the highest recorded level of the kiln walls. Any reconstruction above this level must be purely hypothetical. Here the upper parts are reconstructed as a firestone inner wall surrounded by a brick outer wall, which together would possess the necessary thermal and structural properties. Many other forms of construction are of course possible.

The top of the blocks on each side of the flues, at 0.81m (32 in) below TBM are only 0.12m (5 in) below the most likely level of the kiln floor. Since the top

of the flues needs to be below the floor level, and since the floors must be supported near the flues, the most likely reconstruction is with a large lintel of firestone supported by the blocks on either side of the flue. This would both form the top of the flue and support firebars (see figs. 11, 12). It would not be possible to enter or leave the kiln through these flues. Access for stacking pots must therefore be over the kiln wall, suggesting the presence of a small rebate cut in one side, which could easily be blocked with (for example) waster vessels and clay for each firing.

Firing would have been through both flues simultaneously, since a single flue of this size could not heat such a large volume. The old idea of a 'through-draught' kiln, e.g. as put forward by Marshall (1924, 82), in which one flue is an 'entrance' and the other an 'exit', has already been discounted (Musty, 1974, 44). It is emphatically denied here too - such an arrangement is impractical because (i) without a chimney (for which there has never been any evidence) there would be insufficient draught to draw the flames through the kiln, and (ii) heat transfer to the pots would be very uneven, with the upper part of the kiln much cooler than the lower. A through-draught, or rather 'cross-draught' arrangement is in fact possible, but requires the presence of a large 'bag wall' just inside the entrance flue (see longitudinal sections, fig. 13).

As an exercise, it is possible to reconstruct the kiln as a cross-draught example but only by postulating the presence of (i) a bag wall running round the entire periphery of the central pedestal, (ii) blocking of the two side passages at one end and the central passage at the other (a blocking of tiles is recorded at the north end of the central passage, see M4, fig. 8), (iii) a permanent or semi-permanent cover to the kiln, (iv) a chimney at one end, perhaps about 5 - 6m (15 - 20 ft) in height (see fig. 13). Evidence for almost all of these features is lacking but their possibility should be kept in mind, especially in any future excavation of a similar kiln.

The function of the 'wing' walls is uncertain. They may well serve to revet the natural sand into which the stokepits were cut (see M5), to prevent the sides collapsing through trampling while the kiln was being fired. They could also be seen as buttresses to support the cylindrical structure of the kiln walls (some present day kilns of this type are heavily buttressed, e.g. Bab Tisra, Morocco,

see Rhodes, 1968, 13), and if there were one or even two more on each side, they would either have been destroyed (west) or not found in the excavation (east). It is unlikely that they were constructed as wind deflectors or 'baffles': the kiln's height would have been responsible for the necessary draught and any external factors, such as the wind, which could not be controlled, are more likely to have been a nuisance than an aid. In one instance where baffles are reported (Pryor, 1978, 36 and fig. 3) they appear to prevent wind blowing into the flues. Wing walls are common on glass furnaces of the 16th century (Vose, 1980, 139-42), but are thought to be secondary furnaces. The possibility of a more sophisticated arrangement for burning fuel should be kept in mind. For example, the use of a down-draft hob (Cardew, 1969, 177) would prevent the flues from becoming blocked with ash.

The question of the amount of fuel required to fire the kiln is also of interest. It has been assumed in the above reconstruction that the fuel was wood. Based on practical experience, Rhodes (1968, 6) suggests that a kiln of 30 - 50 cu. ft would consume one cord of wood (i.e. 128 cu. ft or 1 - 1½ tons). Simple extrapolation to the 330 cu. ft of the Cheam kiln indicates a consumption of 6½ - 11 cords, or about 10 tons, but arguments based on the greater thermal efficiency of a larger kiln (see Appendix) would reduce this to about 70%, i.e. around 7 tons. Elsewhere, he gives the calorific value of wood as 8-9 000 B T U per lb (ibid, 13), and the requirements of a kiln as 30,000 B T U heating capacity per cu. ft (ibid, 117), which would imply about 10 million B T U for the Cheam kiln. Allowing for losses of 14% in vapourising moisture and incomplete combustion (ibid, 54), we have a requirement of about 1,400 lb of wood per hour. For a six hour firing (see below) this implies a total figure of about 4 tons of wood. Hampe and Winter (1965, 227) give firing times and wood consumption for a number of modern up-draught kilns in southern Italy and Crete. 'Small' kilns (about 8 cu. m) require from 600 to 1 900 kg of dried wood, while 'medium' kilns (about 12 cu. m) range from 2 400 to 3 750 kg: firing times are usually between 5 and 8 hours, although one middle-sized kiln fired in 3-4 hours. However, practical advice on wood-burning kilns (e.g. Cardew, 1969, 176) suggests a much longer firing time of 12 hours or even more.

Evidence can also be adduced from experimental firings of medieval type

kilns of Musty type 2a (Bryant, 1977). Two kilns of this type were fired: Kiln 1 had a capacity of 0.4 cu. m. (calculated from figs. 39 and 40), held 64 pots (ibid. 112), was fired for $3\frac{3}{4}$ hours, reached a temperature of about 860°C and used $5\frac{1}{2}$ cwt of wood (ibid. 116). Kiln 2 had a capacity of 0.6 cu. m (calculated from figs 39 and 40), held 96 pots (ibid. 112), was fired for 10 hours, reached a temperature of about 785°C and used 7 cwt of wood (ibid. 116).

Simple extrapolation of these figures indicates a consumption of 5-6 tons for the Cheam kiln, which might reduce to $3\frac{1}{2}$-$4\frac{1}{2}$ tons if one argues for the greater efficiency of the larger kiln (see above). However, the temperatures reached in the experiment, especially in Kiln 2, seem a little lower than at Cheam (see below), so a slight increase might be indicated.

Taken together, these sometimes divergent sources of evidence suggest that the Cheam kiln may have taken between 6 and 12 hours to fire, and consumed (very roughly) 4-5 tons of wood per firing.

No experimental work has been done to discover the temperature at which the Red Ware was fired. However, examination of the fabric and comparison of it with other fabrics, suggests a temperature of around 950°C. This would be well within the capabilities of the kiln.

2.3.2 Pre- kiln features

These features (see 2.2.2) are interpreted as the remains of one or more earlier kilns, damaged by the digging of the stokepit and incompletely excavated. They could well resemble the Parkside kiln (Marshall, 1924), since the pottery assemblages are very similar (see 3.5.4). If so, they would have a firing chamber floor area of 3.3 sq. m (30 sq. ft) (measured from published plan) and a capacity of 2.1 cu. m (60 cu. ft) (my estimate). This size would be sufficient to hold 1 000 biconical jugs or 400 standard jugs (the main products, see table 3) or an average load of 700 pots. Thus, although much smaller than the later kiln, this kiln would have held roughly the same number of pots, because it was used for firing smaller pots.

2.3.3. Comparison with other kilns in the region and/or of similar date

The Cheam kiln follows the general tradition of late medieval kilns in south-east England in being of twin-flue updraught type (Musty, 1974, type 2),

but differs considerably in size (see table 2). It is 50% larger (in terms of area) than the largest comparable medieval kiln (Brill D), implying about 80% greater capacity if the height/width ratios are the same. It has nearly three times the area, and by implication five times the capacity, of the largest known contemporary kiln (Knighton). It may be significant that Cheam is much closer to a main centre of population (in its case, London), than Knighton, Hareplain or Lower Parrock (see map, fig. 14). The remoteness of the last was especially noted (Freke, 1979, 79).

The construction of the kiln, although apparently unusual in being of dressed stone blocks, does have antecedents and parallels in the area. The Knighton kiln, although severely damaged, appears to have been built of stone, and the lower walls of the Chichester kiln were made of stone rubble. In the Parkside kiln, stone was used to face the central pedestal, but was not used in the kiln walls. It may be that suitable stone was more readily available at Cheam than at many sites. The use of stone is more common in the Midlands and the North, e.g. Potovens, Yorkshire (Brears, 1967), Brackenfield, Derbyshire (Webster and Cherry, 1973, 184).

The closest local parallel to the Cheam kiln in plan is the Woolwich Ferry stoneware kiln (Pryor, 1978), dated by the excavator to the 1660s but more likely part of Rous' and Cullen's short-lived experiments in the late 1620s (ibid, 61). Although built of brick, it has the same oval shape, twin flues and split central pedestal, and is only a little smaller (see table 2). In addition, much of its floor survives. The plan (ibid, fig 4) suggests a through-draught arrangement, already discussed here (M12) and elsewhere as impractical, but the slope (12° to the horizontal) to this kiln's size may hint at some cross-draught arrangement. Until a Tudor kiln in the London area is excavated, it is impossible to say whether this kiln represents an attempt at adapting the local earthenware tradition to (unsuccessful) stoneware production, or a radical departure from the type of kiln then producing earthenware in this area. Possible locations for such kilns are at Aldgate (unpublished late 16th century earthenware wasters from excavations in Mitre Square, 1979, see Richardson, 1980, 385; Edwards, 1974, 8), Greenwich (ibid, 6), South Lambeth (ibid, 4), Woolwich Ferry Phase 1 (Pryor, 1978, 39-41).

3 The Finds

3.2 White Ware Pottery

3.2.2 Barrel-shaped jugs (nos. 1-23)

Although this is by far the most abundant category, there are no complete examples, because almost all are from Phases 2, 3 and 5, where the pottery is in a very fragmentary state. Two classes of body profile can be distinguished - a genuine 'barrel' shape following a smooth convex curve (e.g. nos. 4, 5R, 11M, 12) and a more 'rounded biconical' shape with a tightening of the curvature at the girth (e.g. nos. 14, 15R, 16M, 19). Within each class there are forms with a neck (i.e. a concavity of profile below the rim) and without. Rims can be assigned to two groups: (a) with an external flange (60% of the total) and (b) with a simple external thickening (30% of the total. (10% were not classified). The flanges seem to be associated with the necked body profiles but some rims are broken off too short to be associated with any particular body shape. Table 5 shows the range of possibilities.

Within rims group (b), about 40% have the distinctive 'quiff' that may be evidence of turning (nos. 10, 17, 18; see description of biconical jugs) and a further 40% have a slight internal chamfer, as if this 'quiff' had been removed (nos. 6, 21, 23). No rim has a pouring lip. Rim diameters range from 40mm to 140mm ($1\frac{1}{2}$ - $5\frac{1}{2}$ ins) but the majority (75%) are in the range 60 - 80mm ($2\frac{1}{2}$ - $3\frac{1}{2}$ ins) and less than 1% are greater than 100mm (4 ins). There are no very pronounced differences in diameter between the various categories. (Note: a classification of sherds to type numbers may not always be reliable because the complexities of Table 5 were not appreciated at the time of sorting and too much reliance may have been placed on the detail of rim form).

Handle attachments are uncommon: only ten were recorded as against about sixty rim-equivalents and over one hundred vessel-equivalents. Nevertheless, a statistical argument (see Appendix 1) suggests that all (or almost all) must originally have had handles.

Possible reasons for this discrepancy are (i) the thin body of the vessel tends to break between the rim and the relatively heavy handle, so that the handle attachment would not have been recorded as part of a rim, and (ii) the handle may have become completely detached from the vessel (see below) and the scar may not have been recorded. Where they can be identified, handles are of a distinctive sub-triangular section (e.g. nos. 3, 9, 17) with occasionally a groove on the upper surface (no. 7). They appear to have been simply luted on at the upper end: no lower attachments can be positively identified but they do not seem to be of the 'skewered' type (see biconical jugs) and may have been luted too. This may account for the large numbers of detached handles found, a point also made by Marshall (1941, 100). Alternatively, it could be argued that since all the examples with handles surviving are of the un-necked type, or of 'rounded biconical' form, the necked version of the barrel-shaped form did not have a handle. The surplus of detached handles could be postulated to come from jugs which, apart from the loss of a handle, were perfectly serviceable and were in fact sold.

No decorated examples are recorded and glazing is very uncommon, although some examples with a bib of green glaze are known in the Museum of London's collection.

Biconical jugs (nos. 24-30)

By contrast, almost all of these are from Phase 1, and several are complete or nearly so. The profile is generally angular and falls into three distinct sections - a conical base, a conical shoulder and a vertical (occasionally slightly everted) neck - in very consistent proportions of 43% : 24% : 33% of the total height. The general shape and range of sizes is shown in nos. 25 and 26, which account for about 80% of the total. Slight variations are shown in nos. 24 (everted neck), 29 (thinner, with slightly 'bulgy' shoulder), 28 (squatter) and 30 (more rounded profile, similar to the biconical jugs found by Marshall (1924, fig. 6) and which may in fact be from the Parkside kiln). These are however isolated examples and should not bias one's idea of the 'typical'

shape. Heights range from 185mm ($7\frac{1}{4}$ in) to 255mm (10 in) and capacities from about $\frac{3}{4}$ pint (no. 26) to 1 1/3 pints (no. 25).

Rims are thickened and have been turned with a tool which has a flat upper edge and a shallow U-shaped side. Three widths of tool can be determined - narrow (see nos. 25, 26, 29), medium (see nos. 24, 27), and broad (see no. 30, but more common on standard jugs, see below). The tool has usually been held at a slight angle to the horizontal, so that the top of the rim slopes down towards the interior of the vessel. In some cases it has penetrated, but not removed, a line of surplus clay, leaving the characteristic 'Cheam quiff' (this is best seen on no. 27). None has a pouring lip. Rim diameters range from 40mm to 140mm ($1\frac{1}{2}$ - $5\frac{1}{2}$ in), with the majority (90%) in the range 50 - 80mm (2 - $3\frac{1}{2}$ in). Only 5% are larger than 80mm ($3\frac{1}{2}$ in) and these may be mis-classified standard jugs. There are roughly equal numbers at 50mm, 60mm, 70mm, and 80mm diameters, suggesting that a range of sizes was being produced.

Both statistically and from the complete examples it is clear that all vessels have a handle, of rounded section and often rather heavy in appearance. The upper end is attached well down the neck (on no. 27 it is unusually near the rim) and is luted on, while the lower end is 'skewered' on (see Marshall, 1924, 88 for details).

Biconical jugs generally have a 'bib' of glaze on the shoulder, opposite the handle. Both an even, rather yellowish, green glaze and a clear or light green glaze with darker mottling are used. The only decoration consists of one or two faint horizontal grooves just above the girth.

Standard Jugs (nos. 31-42)

Although most common in Phase 1, these are also found in all the other phases. There is only one complete profile (no. 32), showing the characteristic form: the profile runs in a smooth curve from base to angle of neck, above which there is a straight neck (usually vertical but sometimes everted). The body profile resembles that of the barrel-shaped jug, but the neck and neck angle are more like the biconical, except that the neck takes up a smaller proportion of the total body height (about 25%). Heights appear to be in the 200 - 250mm (8 - 10 in) range, and capacities about 3 pints.

Two main categories can be defined: (a) with pouring lip, no. 32, corresponding to Marshall's 'ewers' (Marshall, 1924, 86, fig. 7) - five lips (30% total of eves) but only 15% of rim equivalents - all found in Phase 1 and (b) with no lip, all other examples, corresponding to Marshall's 'pitchers' (ibid) and divided equally between Phase 1 and Phase 3.

Rims of the standard jugs are very similar to those of the biconicals and most have been turned with the medium tool (40%) (nos. 32, 34, 37, 38) or the broad tool (32%) (nos. 33, 36, 39). The main exception is no. 35 (12%) which has a unique rim shape, decoration and handle section (see below). The rest (e.g. no. 40) do not belong to either of the major categories. None has the 'quiff' noted on some biconical jugs. Diameters are generally rather larger than those of the biconicals - ranging from 60mm to 130mm ($2\frac{1}{2}$ - 5 in), the majority (80%) are between 80 and 100mm (3 - 4 in) and only 5% are smaller than 80mm (3 in).

It appears that all vessels have a handle, of oval section but varying from rather pointed (no. 33) to sub-rectangular (no. 35). A minority with strap handles (no. 36) should probably be assigned to the pitcher category (see below).

The method of attaching handles is the same as for the biconical jugs (q v). The slashed and stabbed handles, which form a prominent part of the 1923 assemblage (Marshall, 1924, fig. 9), are not present here.

Standard jugs seem to have a 'bib' of glaze on the shoulder opposite the handle. The mottled glaze is perhaps more common. Decoration consists of shallow grooving at or just above the girth: two (no. 31), three (no. 32) or five grooves (no. 42) are known, but their relative frequencies cannot be calculated. A slight cordon (no. 31) or further grooving (no. 32) can occur at the neck angle. A distinctive feature is a very slight groove which occurs about 18 - 25mm ($\frac{3}{4}$ - 1 in) below the rim on about 50% of examples (nos. 32, 33, 34, 37).

Cooking pots (no. 43; see also no. 74)

These form about 3% of the total White Ware, and are concentrated in Phases 3 and 5 (see table 3), with only odd sherds in other phases. All are extremely fragmentary and nothing approaching a complete profile could be reconstructed. Two sub-categories can be tentatively recognised - (a) similar to the common forms of Red Ware 'cauldron' cooking pots (no. 74) (q v) and (b) with a flat topped flanged rim (no. 43), more like the products of the Kingston Kiln (Hinton, 1980, nos. 13-18). Roughly equal proportions of each sort seem to be present. There is no evidence of any handles, glaze or decoration. Rim diameters are very varied, ranging from 80 - 220mm (3 - 9 in), with most (90%) in the range 120 - 200mm ($4\frac{1}{2}$ - 8 in). Those in 'red' forms seem to be rather larger than the others, about the same size as their Red Ware counterparts.

Pitchers (no. 44R, see also nos. 36 and 57)

This category consists of rims of the type found on Red Ware pitchers

(q v), and sagging bases with either knife trimming (no. 44R) or thumbing (not illustrated), apparently totalling 6 eves, or 3% of the total White Ware, and found in all phases except Phase 4. Since the bases greatly outnumber the rims, and since eight white bung-holes (presumably belonging to this category of vessel) are present, it is very likely that some 'standard jug' rims, particularly the two with strap handles, belong to this category.

Rim diameters range from 80 - 160mm (3 - 6½ in), most (75%) between 100 - 120mm (4 - 5 in), i.e. slightly larger than the standard jugs. The bases tend to be larger than the jugs' - about 75% are 120mm (5 in) or more in diameter.

The category appears to have a strap handle and there is no evidence for pouring lips, glaze or decoration.

Lids (nos. 45 - 6R)

These again total about 3% of all White Ware and are found in Phases 2, 3 and 5. There seem to be two sub-categories (a) 'domed' shape with convex profile and thick handle (no. 45R) and (b) flatter shape with concave-convex profile and thin handle (no. 46R), present in roughly equal proportions. Rim diameters range from 100 - 240mm (4 - 9½ in) with most (70%) between 120 and 160mm (4½ and 6½ in). Glaze is uncommon and none is decorated.

Jars (nos. 47-9)

These form a small, homogeneous group of vessels, mainly from Phase 1, and forming about 2% of total White Ware. They have a distinctive rim with an internal bevel and show signs of more careful finish than the jugs, as on no. 47, which shows the general form. Rim diameters range from 120 - 190mm

(6 - 7½ in). There is an area of even green glaze on the interior of the base, and some examples (e.g. nos. 48, 49) have grooving on the shoulder. There are no handles.

Dishes (nos 50-3, see also nos. 104-6)

This is a heterogeneous grouping of large open forms, totalling some 2% of all White Ware, and occurring in all phases except Phase 4. All are very fragmentary and there are no complete profiles. The most common form (no. 50, 25%) has a wide, flat and usually horizontal rim: there is a variety of other forms (nos. 51-3) but some may be distorted due to firing accidents. Rim diameters are mainly in the range 240 - 380mm (9½ - 15 in), with a few as small as 180mm (7 in) or as large as 440mm (17 in). Glaze is not common and decoration is unknown.

Conical jugs (no. 54)

This form is known from one almost complete example and a few sherds, all in Phase 1. The rim is turned with the broad tool (see M18) and diameters are between 80 - 100mm (3 - 4 in). The form has a pouring lip, a low-set sub-rectangular handle and appears to have no glaze or decoration.

Other categories

There are occasional sherds in the following categories:

wall-sided dish (see Red Ware, no. 117)

cup (with green glaze overall, no. 55)

saucepan (no. 56)

skillet (see Red Ware, no. 118)

and chafing dish (see Red Ware, no. 120)

3 The Finds

3.3 Red Ware Pottery

3.3.2 Pitchers (nos 57-73)

Although this is the most abundant Red Ware category, there is only one complete example, from Phase 3 (no. 57). The general profile is broad and high-shouldered, but a minority have a less pronounced shoulder and presumably a slimmer profile (e.g. no. 72). In many of the examples the rim is broken off so short that it is not possible to ascertain the overall profile. The rims have a distinctive triangular thickening on the exterior, ranging from vestigial (no. 59) to pronounced (no. 67) and even undercut (no. 65). It is likely that all examples have a simple pinched pouring lip (see nos. 57, 58), usually opposite the handle but in one case (no. 66) next to it. No. 61 differs in having a flat-topped rim, but seems to belong to the same general category.

Rim diameters range from 60 to 180mm (2 - 7½ in) but almost all (94%) are in the range 80 - 120mm (3 - 5 in). Base diameters range from 70 to 280mm (2½ - 11 in), almost all (95%) lying between 100 and 200mm (4 and 8 in). Since these bases are 'shared' with large and small jar categories, it is difficult to draw conclusions from these figures.

All examples have a single handle, generally a strap handle with a groove on the upper surface (nos. 57-9, 66: 84% of all pitcher handles) of which most (70%) are attached at the neck (nos. 58, 59, 66), but 30% to the rim (no. 57). There are also oval or sub-rectangular strap handles (nos. 61, 64: 7% of all pitcher handles) and genuine rod handles (nos. 63, 68, 69: 8% of all pitcher handles). Attachment seems to be by a 'tenon' method at the upper end (a projection on the end of the handle fits into a slot cut into the side of the vessel, cf Marshall's

'dowel' method, 1924, 88) and by simple luting and thumb pressure at the lower end.

Bases are slightly sagging and most seem to have either three or four small pulled feet, usually consisting of one thumb impression each, but rarely two or more. These feet are not functional, since they do not reach a horizontal surface on which a base is placed, and sometimes do not even extend below the profile of the base itself.

Enough bungholes are present to supply about 2/3 of the pitchers, sometimes in association with a basal angle but usually by themselves. They are of the collared type (see no. 57): there is one example of a simple hole (not illustrated). It is possible that a few belong to the large jars (see below), in which case about 60% of the pitchers would have bungholes. The examples without bungholes may be of a rather slimmer profile (e.g. no. 72) and might better be called jugs. No complete profile is present, but a reconstruction is shown (no. 73R).

A characteristic feature of the category is the extensive knife-trimming used to pare down the exterior of the base, on one or both sides of the basal angle (for an account of this technique, see van der Leeuw, 1975, 73 and 79-80). It is also used to thin down the interior of some vessels.

Very little glaze is used on this form, only spots and small patches (possibly accidental) being observed. The main type of decoration consists of curvilinear patterns painted in white slip, mainly on the shoulder and neck, (see nos. 57-8) but also elsewhere on the body and even on the underside of the base. Horizontal grooving is found on the shoulder of some examples (e.g. nos. 57-8).

Cooking-pots (nos. 74-85)

Following Dawson (1979, 34-6), we divide this category into (a) cauldron types, with two rod-section loop handles and three applied feet, and (b) pipkin types, with single stub or flat handle and pulled or applied feet, or none at all. Together they make up about 31% of the Red Ware, cauldron types being more common than pipkins.

(a) cauldron types (nos 74-76)

One complete example of this type is present (no. 74): about 85% of the

rims are of this form, i.e. strongly everted with a triangular thickening on the exterior (compare with the pitchers). The profile is globular with a slightly sagging base. Three peg-shaped feet are applied at the basal angle, which is heavily knife-trimmed, but the shortage of base-equivalents suggests that some bases may have been rounded. Pinched pouring lips occur on a few examples.

A less common form has a shorter neck and apparently more elongated body (no. 75, 15% of cauldron types): statistically these are likely to have two handles, although none is complete enough to have two. There is also one example with a squared rim (no. 76).

Rim diameters range from 80 - 340mm (3 - 13½ in), but most (89%) are between 140 and 240mm (5½ and 9½ in). A similar proportion of the bases lie in the range 100 - 160mm (3½ - 6½ in), with a few outliers at 80 and 180mm (about 3 and 7 in).

Clear glaze usually occurs on the interior of the base, and either clear or mottled green glaze on the interior of the rim and sometimes on the shoulder of the vessel. The only form of decoration consists of horizontal grooving above the girth.

(b) pipkin types (nos. 77-85)

One complete profile is present (no. 82), but its handle is missing, and a reconstruction has been added to the drawing. The profile is squatter than the cauldron type, and this example has pulled feet. The overall numbers of pulled and applied feet present suggest that either (or neither) can occur on this form. The most common variations on the rim form have a squared external thickening (no. 77), are upturned (no. 78) or are as nos. 79, 80. Less common are nos. 81, 83, 84, 85. Rim and base diameters are broadly similar to those of the cauldrons. The only handles that can be physically associated with this form are stub handles (see no. 82), but there are enough for only just over half of the total.

A number of detached flat handles (not illustrated, but see no. 118), originally thought to belong to skillets (see below) may make up some of the rest.

Glazing and decoration are as on the cauldrons.

Small jars (nos. 86-91)

Although this group form 10% of the total Red Ware, there are no complete profiles. To judge from the most complete example, the profile is globular with a short neck and a wider rim diameter than the pitchers, with which they were initially confused. The rims have a squared thickening on the exterior: the general shape is shown as no. 91R, the most common rim as no. 86, and variations as nos. 88, 89. There is one oddity - no. 90: the rim appears to have split during drying and has been repaired with a large unsightly 'patch' of clay, fired on. There are only two examples with a pinched pouring lip. Rim diameters range from 80 to 220mm (3 - 9 in) but most (80%) are in the range 120 - 180mm ($4\frac{1}{2}$ - $7\frac{1}{2}$ in).

This form does not seem to have handles; only two were found for 25 eves. These have been re-allocated to the 'large jar' category (see below) although the rim shape is of 'small jar' type.

Statistical analysis suggests that bases are slightly sagging and cannot be distinguished from the pitchers'. There is no direct evidence for their diameters but statistical analysis suggests a ratio of rim:base diameter of about 5:4 (see Appendix 2). A reconstruction based on this ratio is shown as no. 91R.

There are apparently no bungholes associated with this category. Glaze only occurs as spots or small patches, white painted decoration is absent and the only type of decoration consists of horizontal grooving on the shoulders of some examples (e.g. no. 86).

Large jars (nos. 92-103, see also no. 87)

This category was only recognised as a result of the statistical analysis, and nothing like a complete profile exists. The profile appears to be broad and high-shouldered, with a short neck and simple or everted rim. There are many minor variations in the rim form - the most common appear to be nos. 92-8 and possibly no. 87 (similar to the small jar rim, but with handles): others are nos. 99-102. There are no pouring lips. Rim diameters range from 100 to 220mm (4 - 9 in), most (86%) lying between 120 and 180mm ($4\frac{1}{2}$ - $7\frac{1}{2}$ in).

The distinctive feature of this category is that they possess two strap

handles (demonstrated statistically, see Appendix 2) but no examples retaining two handles survive. Handle shapes are shown on nos. 92, 95 - a very broad strap with central thumbed groove seems to be the norm. An example of no. 87 was assigned to this category, despite its 'small jar' rim form, because it possessed the only two handles known on rims of this form.

Statistical arguments again suggest that the bases are indistinguishable from the pitchers' and may well have roughly the same range of diameters (Appendix 2). A rather tentative reconstruction is shown as no. 103R.

It is not known whether any example of this category has a bunghole, but it seems likely a priori. Glaze is rare but white painted decoration occurs on some necks and no other decoration is known.

Dishes (nos. 104-106)

This rather loose category comprises 10 eves of large flanged dishes and odd sherds of other 'open' forms. Two complete profiles (nos. 104, 105) illustrate the variation within the flanged dishes - the basic shape is much the same, including the distinctive thickening on the underside of the flange, but there are differences in angle of rim and body and in shape of the base. Most rims of this type are between 300 and 400mm (12 - 16 in) in diameter and most bases between 100 - 180mm (4 - 7½ in).

Bases are often heavily knife-trimmed and there is usually a zone of clear glaze on the interior of the base. No decoration is recorded.

Also classed as dishes are two other, much rarer, forms (no. 106; not illustrated).

Lids (nos. 107-11)

This category shows a large discrepancy between rim- and base-equivalents, making reconstruction difficult. The solid lid handles tend to survive (and/or be identified) much better than the rather fragile rims. The only complete profile, which also represents the majority of this category, is no. 107. Less common examples are nos. 108-11. None is glazed or decorated.

Costrels (nos. 112-114)

Vessels of this category are made up in two stages: first the body is thrown about an axis which then becomes the horizontal axis of the vessel, then a hole is

made in what is initially the side and the rim is added as a separate piece (see no. 112 - a rim variation is shown as no. 113). Rim diameters range from 40 - 60mm ($1\frac{1}{2}$ - $2\frac{1}{2}$ in). Bases are not recognised but a hypothetical reconstruction is shown as no. 114R.

There are two small rod-section handles, but no evidence for glaze or decoration.

Lamps (no. 115)

Vessels in this category, of which there is one complete example, were initially thought to be lids. This now seems unlikely because the base is not well shaped for grasping, and parallels with several burnt examples (in Surrey White Ware) in the Museum of London collection suggest use as lamps. The rim is simple and the base slightly kicked. Rim diameters are around 140mm ($5\frac{1}{2}$ in) and base diameters around 70mm (3 in). There is no glaze or decoration.

Barrel-shaped jugs (no. 116, see also no. 5)

Although predominantly a White Ware form, these are also present, in small quantities, in the Red Ware. There are no complete profiles. Rims have an external flange (no. 116, type (a) in the White Ware, M16), and the only rim with any body has an unusual carinated shoulder: it is not known how typical this is. Rim diameters are mostly 70 - 80mm (about 3 in) and base diameters about the same. The rims have patchy clear glaze on the exterior and the majority of bases (see no. 12 in White Ware for shape) are covered in white slip so that they resemble the far more common White Ware barrel-shaped jugs.

Wall-sided dishes (no. 117)

The distinctive features of this category are the rim, which has been formed by folding a strip of clay over a simple rim and turning it to shape, and its horizontal handles, of which each vessel seems to have two. Rim diameters are mostly in the range 360 - 380mm (14 - 15 in), but no bases are identified - presumably they have been included in the dish category (see above). Some examples have a zone of white slip on the interior, thus resembling Guy's Ware (Dawson, 1979, 44-5), but only some are glazed.

Skillets (nos. 118-9)

This term is applied to complete profiles of 'frying pan' shape, with

sagging base, almost vertical side and a simple rim. They have a wide, flat handle rising from the rim, a heavily knife-trimmed base and glaze on the interior of the base. The rim diameter is about 260mm ($10\frac{1}{2}$ in).

Chafing dishes (nos. 120-2)

There are no complete profiles but one has been reconstructed from non-joining sherds (no. 120R). There is a simple flanged rim, with diameter from 180mm to 260mm (7 - $10\frac{1}{2}$ in), which could easily be mistaken for a dish rim (cf no. 105). Statistically, each rim seems to have three of the characteristic knobs. Bases are flat but appear to be thumbed.

There are two types of decoration on the rim - incised wavy lines (no. 120R), and arcades of white slip (no. 121, which also has white slip on the interior, cf. Guy's Ware, ibid. 44). There is also one glazed but undecorated example (no. 122).

Small dishes (nos. 123-5)

This category consists of small open forms with relatively simple rims, similar to the skillets but smaller. No bases are identified, and there is no evidence for handles, decoration or deliberate glazing. Rim diameters range from 120 - 200mm ($4\frac{1}{2}$ - 8 in) but are mostly at the lower end of the range.

Watering pot (no. 126)

Only the rim of this category is found. For reconstruction and explanation of use, see Blockley, 1978, fig. 10, no. 31 and p. 51.

Mugs (nos. 127, 128)

Two rim sherds, possibly from mugs. No. 128 has white slip, but no glaze, on the exterior, and no. 127 is glazed.

Miscellaneous

A very small proportion of rims and bases could not be identified. One unusual form is no. 129.

3.4 Hybrids

There are two examples of vessels in both white and red fabrics, both from Phase 3.

(i) body sherd of pitcher in red fabric with applied bunghole surround

(see no. 57) in white fabric.

(ii) sagging base sherd, probably of pitcher. The base itself is in white fabric and the body is in red fabric, joining along the basal angle.

There are also examples of White Ware vessels in characteristically Red Ware forms, and vice versa, some of which have already been mentioned above. They are summarised in table 8.

Although insignificant in total, these 'hybrids' make significant contributions to the totals of White Ware pitchers and cooking-pots, and include all of the Red Ware barrel-shaped jugs, i.e. the only Red Ware jugs with handles but no pouring lip.

3.5 Discussion

3.5.1 Fragmentation

An examination of the degree to which the pottery in different contexts is broken can yield useful information about the conditions under which those contexts were deposited. Two statistics are presented here: (i) the average percentage of each rim or base sherd (i.e. expressed as a percentage of a whole rim or base) (table 9), and (ii) the average total percentage of all the rim or base sherds from the same vessel in one context (table 10). This second statistic is accurate for individual contexts, but is an under-estimate for groups of contexts (e.g. phases) because no systematic attempt was made to reconstruct vessels from more than one context at a time.

Some preliminary points about these figures will be made here but the main discussion will be given later. The 'total' figures confirm what one would expect, that rims break into more pieces than bases (because they are more fragile), and the Red Ware breaks into more pieces than the White Ware (because of its generally greater diameters). The figures for the Red Ware by phases are remarkably consistent, showing no significant differences between phases. More detailed examination of Phase 3 (Table C 1, see Appendix) shows that two contexts, T2L5 and T9L2, stand out from the rest (table 11).

The Red Ware from these contexts is slightly less broken than that from

the rest of the Phase, but, more important, far more of it reconstructs. There does seem to be a real difference between these contexts and the rest of the Phase.

The figures for the White Ware are more variable, reflecting the greater variability within the material. However, Phase 1 stands out as apparently less broken than the other Phases, and Phase 2 more broken. In more detail, large differences within Phase 1 are apparent (see table 11). T2L2 is clearly the most 'complete' context.

3.5.2 Capacities and functions

To help interpret the relationships between the assemblages, it is necessary to consider the functions of the forms loosely classed as 'jugs' and 'pitchers'. Three main functions can be suggested: (a) production and/or storage of liquids (e.g. brewing), (b) 'break of bulk' of liquids (e.g. transporting beer from barrel to table) and (c) drinking vessels. Many other functions are possible (see e.g. Moorhouse, 1978; Brooks, 1980), but it seems likely that most of these vessels would be intended primarily for one of the above functions. Can individual jugs be assigned to one of these categories, and if so, how? A first approach was to equate (a) with the possession of a bung-hole, and (b) with the possession of a pouring lip (but no bunghole), and to assign all other vessels to class (c). This does not seem to work - Matthews and Green (1969, 8) suggest that lipped vessels could have been used for drinking, and quote the evidence from Dutch genre painting in support. Also, some of the unlipped jugs are large - almost up to a gallon in size - and it does not seem likely that they were drunk from. It therefore seems more useful to use capacity to distinguish 'drinking' from 'break of bulk' jugs. Examination of vessels generally accepted to be 'drinking mugs' - Raeren, Siegburg and 'Tudor Green' mugs (see table 12) - shows three apparent 'sizes' at about ½ pint, 1 pint and 2 pints, but none larger. Practical considerations too suggest an upper limit of about 2 pints for the drinking vessels. To function effectively, a 'break of bulk' jug would need a capacity of three or more times than of the associated drinking vessels, otherwise it would be simpler to fill the drinking vessels directly from the storage vessel. Similarly, a storage vessel would need a capacity of at least twice that of a 'break of bulk' vessel, or there would be no point in using the

latter. Looking at the capacities in table 12, this is just what we find: a group of types around 1 pint (biconicals, small barrel-shaped, 'Tudor Green', stoneware) and ranging up to 2 pints, a group concentrated around 3-4 pints, but ranging up to 6 or 7 pints (standard jugs, large biconicals, baluster and scale jugs), and a group between 2 and 3 gallons (bunghole pitchers, large jars). There are two exceptions - the conical jug ($2\frac{1}{4}$ pints, probably 'break of bulk') and the largest Parkside pitcher (presumably storage/production, but only $1\frac{1}{4}$ gallons). The apparent inability of the Cheam White Ware potters to produce very large vessels will be discussed below.

Accepting these limits, about 20% of the barrel-shaped jugs come into the 'break of bulk' category and the rest are classed as drinking jugs.

The functions of most of the other forms are readily apparent. The large dishes are generally thought to be milk pans, used in the making of cheese. The function of the small jars is unknown: some sort of storage seems most likely.

3.5.3 Internal comparisons

The amounts of pottery present in each stratigraphic phase (tables 3 and 6) can be re-organised into Pottery Groups as follows:

Pottery Group 1 consists of all the White Ware from Phase 1. It is generally more complete than the rest of the White Ware, and far more complete than the small amount of Red Ware from Phase 1 (see table 10), which is therefore seen as intrusive from Phase 2 or 3 (this possibility was noted during excavation). It consists mainly of drinking jugs (27 eves or 63%) and 'break of bulk' jugs (12 eves or 28%). It appears to be mainly in situ material associated with the pre-kiln features (T2L2 is the best example of this), possibly from a firing accident, although some of the material from T1L4 appears to be more broken and may be earlier (see M30, table 11).

Pottery Group 2 consists of all the White Ware from Phases 2-5. It is homogeneous in terms of both the percentages of different types present (table 3) and the degree of breakage (table 10). All the White Ware from Phase 2 comes from outside the kiln itself, and is thought to be derived from pre-kiln features during the firing of the kiln. Phase 3 consists mainly (78%) of dumping in the stokeholes,

with about 13% from the barrel (see M8; fig. 8), and small amounts inside the kiln structure and above it (3% and 6% respectively). The very small amount from Phase 4 appears to be just similar material disturbed by modern features, while Phase 5 consists of 'topsoil' (i.e. dumping above the kiln and stokeholes) and 'unstratified' (i.e. separated from its identifying bags, labels, etc) material, and appears to match Phase 3 in all respects. The entire Pottery Group 2 thus consists of 134 eves, of which 86 (62%) are drinking jugs (using the result that 80% of barrel-shaped jugs are drinking jugs, see M31), 27 (20%) are 'break of bulk' jugs, with smaller proportions of other forms (see table 3).

Pottery Group 3 consists of all the Red Ware. It is homogeneous in terms of percentages of different types present (table 6) and very homogeneous in terms of breakage (tables 9 and 10), with one exception, a small group of relatively more complete vessels just to the north of the kiln (T2L5 and T9L2, see M30). This small group is seen partly as a primary dump, presumably from the last firing straight into the stokehole, while the rest of the dumped pottery is seen as secondary, from a nearby waster heap into the stokeholes (82%), or into and over the kiln (6%). A further 27 eves appear to have accumulated while the kiln was in use (stratigraphic Phase 2) - almost all of this is from the stokeholes and only fourteen small sherds (less than 1 eve) come from inside the kiln.

A key question in the internal chronology of the site is - to what extent do Pottery Groups 2 and 3 overlap? In other words, to what extent (if any) was White Ware, as well as Red Ware, fired in this kiln? The more likely possibilities are:

(i)	no overlap:	all Pottery Group 2 is earlier than all Pottery Group 3. (a) no hiatus (b) hiatus
(ii)	partial overlap:	some Pottery Group 2 is earlier than all Pottery Group 3, and some Pottery Group 3 is later than all Pottery Group 2.
(iii)	partial overlap:	some Pottery Group 2 is earlier than all Pottery Group 3, but no Pottery Group 3 is later than all Pottery Group 2.

(iv) partial overlap: some Pottery Group 3 is later than all Pottery Group 2, but no Pottery Group 2 is earlier than all Pottery Group 3.

(v) total overlap: Pottery Groups 2 and 3 are completely contemporary.

These are illustrated in fig 24. Other possibilities seem less likely, because evidence from other sites (see 3.5.4) suggests that, in general terms and not just the production of this one kiln, the Red Ware is later than the White Ware.

Since most of the material is derived from secondary dumping, there is relatively little evidence from the site to settle this point. Only Red Ware was found inside the kiln in Site Phase 2 deposits, but there were only fourteen sherds in all. The primary dumping within T2L5 and T9L2 (see above) contained only Red Ware - White Ware was present in these contexts but in the state of fragmentation consistent with secondary dumping. There is thus no evidence that White Ware was fired in this kiln, especially in the last firing. But it would be impossible to prove that no White Ware was ever fired in the kiln. These arguments tend to support possibilities (i) and (ii): the writer's (subjective) opinion is that the overlap, if any, was short, and that only a small amount of White Ware, if any at all, was fired in this kiln.

A comparison of the three Pottery Groups, in terms of the percentage of each form of vessel, can now be made, bearing in mind that the figures relate to the wasters and not to actual production. Although the percentages are therefore likely to be biased, it is argued that they are also likely to be consistent, i.e. the same biases are likely to persist. Thus although one cannot place too much relevance on one set of percentages, it is permissible to compare them and look for trends (for a similar argument, see Freke and Craddock 1979, 89) as in table 13. Between Groups 1 and 2 the proportion of drinking jugs stays constant, while the barrel-shaped form takes over from the biconical. The proportion of other (especially lipped) jugs decreases, while no other category contributes more than 5% to the total. In Group 3 there is an apparent complete change, as the proportion of drinking jugs declines dramatically (64% to 2%). However, if we compare Group 2 without drinking jugs with Group 3 there are strong similarities: other jugs/pitchers and cooking pots are the two most

frequent categories in each case, followed by small jars, dishes and lids (but not in the same order). The only new categories in Group 3 are large jars (which are far larger than anything made in the White Ware), costrels and lamps (both of which are present in the Parkside assemblage). The Group 3 (i.e. Red Ware) assemblage can thus be seen as the Group 2 (i.e. latest White Ware) assemblage stripped of its drinking jugs, but in otherwise similar proportions. The main exceptions are the lids, which are actually less frequent in Group 3 than Group 2, but since they cannot be regarded as vessels in their own right (a lid has to be a lid of something) some special factor may be responsible.

3.5.4 Comparisons with other kiln groups

Group 1 is very similar to the published group from the Parkside kiln, a summary of which is shown in table 14.

The correspondence between the forms found at both sites are very close (see Marshall, 1924, figs 6, 7, 8, 11, 12) and the proportions within the two assemblages differ in only one significant respect: the presence of 20% of Class B 'measures' at Parkside. Otherwise the differences are what one could expect from two 'samples' from a single 'population', although the methods of counting do not, strictly speaking, yield comparable figures.

These general similarities conceal some differences in detail, especially of decoration. They are:

(i) red or black painted decoration: present on three pitchers and the two vases at Parkside (ibid. figs 12-14), absent in Group 1;

(ii) incisions on strap handles: present on pitchers and vases at Parkside (ibid. figs 9, 13), absent in Group 1;

(iii) shallow horizontal grooving: absent at Parkside, present on some biconical jugs, standard jugs and jars in Group 1;

(iv) handle attachment for rod-shaped handles: 'skewered' and 'dowel' at Parkside (ibid. fig 10), skewered only in Group 1.

The similarities are so great that the two assemblages are seen as roughly contemporary. The differences in decoration may reflect the preferences of two individual potters (or groups of potters) and perhaps even as a way of distinguishing between the two ("trademarks?")

Both Group 1 and Group 2 differ greatly from the Kingston (Eden Street) group (Hinton, 1980). The fabric colour is much the same (ibid. 380) but the Kingston fabric is generally much sandier. The Kingston biconical jugs are squatter than the Cheam (ibid. fig. 2, nos 1-3), but have similar grooving on the shoulder. The standard jugs (ibid. no 6) are similar, with the Parkside-type incised handle. A high proportion of the Kingston jugs are of baluster form (ibid, nos 8-12) which is almost unknown at Cheam. Perhaps the most important difference is the presence of a large number of cooking pots at Kingston (ibid. nos 13-18), as well as large dishes and bowls (ibid. nos 19, 20, 22, 23, 24). It may be that the sandier fabric, being more 'open', is better able to cope with repeated heating and cooling to which these forms would be subjected. The stamped and applied decoration which is a distinctive feature of the Kingston ware is completely absent at Cheam, but the biconical jugs have in common the shallow grooving just above the girth. Bungholes are present at Cheam, but not at Kingston. In general terms, the Kingston pottery looks earlier than either of the Cheam Groups: more detailed evidence will be presented later (3. 5. 5).

Group 3 can be paralleled by six kiln assemblages in the region - Hareplain (Kelly, 1972), Kingston Guildhall Extension (Richardson, 1980, 387; Nelson, 1981), Knighton (Mynard and Barton, 1969); Lower Parrock (Freke and Craddock, 1979); Standon High Cross (Moodey, 1968) and Woolwich Ferry Phase 1 (Blockley, 1978, 43-52). There are also similarities with unpublished pottery from South Lambeth (Ashdown, 1964) (see map, fig 14). Statistical comparison of the assemblages is difficult because of differences in terminology and methods of quantification, but has been attempted in table 15. Once again, it must be remembered that we are comparing proportions of wasters, not of production. The main components of most of the assemblages are pitchers (often with bungholes) and flanged bowls and/or dishes. Cheam is apparently atypical in having fewer dishes and more cooking pots (cauldrons and pipkins) than the other groups, but bowls and dishes may well be overstated at all except Cheam and Lower Parrock, because they give rise to more rim sherds than the other forms. In general terms, these kiln groups show the typical late medieval assemblage of bunghole pitcher, cooking pot and flanged dish/bowl, together with smaller proportions of lids, costrels, chafing dishes, etc. Drinking vessels of any sort are rare, except at Lower Parrock.

The fabrics of all six groups are roughly similar, and those of Cheam, Kingston and Woolwich are virtually indistinguishable. Other common features are the relatively low usage of glaze, especially on the pitchers, and the use of white painted decoration, which is also common in Sussex (Barton, 1979, 122) and East Anglia (Rahtz, 1969, 102-3, fabric M, nos 74-9) in the 15th and 16th centuries.

The Kingston assemblage is the most similar to Cheam Group 3 - all the main categories are represented, and even in detail the forms are extremely alike. It is very probable that the same potter (or potters) was responsible for both groups. There is no direct evidence as to which group is earlier, or whether the potter was working in both places at more or less the same time (they are only 8 km, 5 miles, apart). Subjectively, there appears to be more good quality glaze (dark green, mottled) on the Kingston cooking pots than on those from Cheam, hinting perhaps that Kingston is slightly later and some technical difficulties had been overcome.

At Woolwich, some forms are similar, for example the large jars (Blockley, 1978, no 7), the dishes (ibid. nos 15-16), costrel (ibid. no 26) and chafing dish (ibid. no 28). The Woolwich jugs (ibid. nos 1-3) are not like those from Cheam, and at Woolwich rod handles predominate, while at Cheam jugs and pitchers more commonly have strap handles. A major difference is the high proportion (15%) of wall-sided dishes with horizontal handles at Woolwich (ibid. nos 8-9), most of which have interior white slip and clear glaze, i.e. are Guy's Ware as defined by Dawson (1979, 44). At Cheam the few examples of this form have a distinctly 'experimental' appearance, and the glaze has generally failed to 'take' when applied over the slip (this seems to be a common fault at Cheam.) Some of the flanged dishes from Woolwich are also decorated in this way (e.g. ibid. no 14) but none from Cheam. Pulled feet are common at Woolwich on jugs and jars (ibid. no. 6) and dishes (ibid. nos 14, 17) but at Cheam only occur on a few pipkins, while small thumbed feet are usual on pitchers and jugs. Cooking pots from both groups have three applied feet. In general terms, there are considerable signs of Dutch influence (see Brears, 1971, 17-9, for a discussion of Dutch characteristics) at Woolwich (i.e. Guy's Ware, pulled feet, horizontal handles, tripedal cooking pots) but far less at Cheam.

The simplest assemblage is that from Standon, which apparently consists only of pitchers, dishes and cooking pots. The dishes are similar to no. 104 and the cooking pots to no. 80 in general terms, and the pitchers (the only form to be illustrated in detail) are extremely similar to no. 59, even to details of the handle attachment. No white paint or bungholes are recorded. The group was dated by Renn (1964) to the late 14th century, but the evidence is not given.

The predominant bunghole pitchers at Hareplain differ from the Cheam examples in the shape of their rims and bungholes, and are rarely knife-trimmed (Kelly, 1972, 165). The rims of the Hareplain bowls and dishes are very varied but some are very similar to those from Cheam. Again, knife-trimming seems rare. The same can be said for the cooking pots. Hareplain has a few bases imitating Raeren stoneware: such imitations are notably absent at Cheam.

At Lower Parrock the jugs (Form 1; Freke and Craddock 1979, 91-4), especially their rims, are unlike the examples from Cheam. There are greater similarities in the cooking pot/jar/pitcher range (Form 2.1-2.3, ibid. 94) with triangular or square rims, but the other cooking pot forms (Form 2.4-2.7) are not found at Cheam. There are considerable differences in detail in the other forms, e.g. dishes (Form 4), chafing dishes (Form 5). There is no trace at Cheam of the French influence so strong at Lower Parrock (ibid. 87).

The similarities with Knighton are general and technical only. For example, both Cheam and Knighton bunghole pitchers have a strap handle, knife-trimmed base, simple collared bung and slight rilling in the body (Mynard and Barton, 1969, nos 1-5) but the details of rim and handle are quite different. Flanged dishes (ibid. nos. 14-18) and cooking pots (ibid. no. 22) also differ in details of rim or handle.

A relevant assemblage is that associated with the 15th century kiln excavated at Farnborough Hill in 1972 (Holling, 1977, 61). Here "typical cisterns and jugs with slashed handles and thumbed bases, deep pans with wide flanged rims, and cooking pots with flanged or bifid rims" in a coarse sandy white fabric were found together with a number of typical 'Tudor Green' forms in a much finer fabric. The author dates this kiln to the late 15th century, but evidence from London (see below) suggests that these products were common by the mid 15th

century. The coarse component is thus contemporary with, and complementary to, Cheam Group 2, and is very similar in general terms, and apparent function, to Cheam Group 3.

3.5.5 Dating evidence from other sites

The main source of dating evidence for the white Cheam Ware, and for Surrey White Ware in general, comes from large groups of pottery from Trig Lane (Milne and Milne, 1978; 1981) in the City of London, which can be securely dated by dendrochronological and coin and structural evidence. This evidence has been discussed in detail elsewhere (Orton, 1981): only the more relevant points will be repeated here. The groups are dated to c 1260, 1275, 1335, 1365, 1430 and 1440, and no information is at present available for intermediate or later dates. Within a steadily increasing proportion of Surrey White Ware, Kingston Ware (Hinton, 1980) and a finely sandy fabric with a glossy green glaze predominate from c 1260-1335. The common forms are jugs (mainly baluster or metallic skeuomorphic types) and cooking pots. From c 1365 the jugs are apparently replaced first by biconical and later (c 1440) also by barrel-shaped jugs from Cheam and large pitchers from Farnborough Hill. The standard jugs, by contrast, are not found after c 1375 (but there is c 55-year gap until the next group). The Kingston cooking pots with their characteristic T-shaped rims (see Hinton, 379, nos. 13-18) continue until c 1375, but are replaced by Farnborough Hill types in the 15th century groups. Large bowls and dishes occur from c 1335 onwards, at first in the Kingston fabric but in Farnborough Hill fabric in the 15th century. Of the less common forms, cauldrons (with long flat-section feet and angular handles, clearly imitating metallic prototypes) occur from c 1335 to the end of the sequence, and chafing dishes occur in the c 1440 group. Lamps (i.e. Marshall's 'saucers') occur c 1335-1430, but lids like those from Group 2 only occur c 1440.

A large deposit from Baynards Castle, dated c 1480 on documentary evidence (P. Marsden, pers. comm.) consisted mainly of a typical Farnborough Hill assemblage together with Cheam biconical jugs. Typologically, this does not look later than the '1440' group at Trig Lane. A Cheam barrel-shaped jug, containing a hoard of coins dated to c 1450, has been found in Reigate (Bird and Turner, 1974).

The coarser types of Surrey White Ware (i.e. excluding the so-called 'Tudor Green' Ware) are rare in the London area after this date, and examples found in groups dated to c 1480-1520, e.g. Toppings Wharf Building VIII (Orton et al, 1974, 76), St. Thomas Street cellar (Orton, 1978, 379-84), Guy's Hospital L10/11 and L9/5 (Dawson, 1979, 57-60) and Baynards Castle (unpublished group c 1500, P. Marsden, pers. comm) are all thought to be residual.

The occurrence of the Cheam Red Ware and similar fabrics (collectively known as 'Tudor Brown', see Orton, 1979a, 31) seems generally to correlate with the arrival of Raeren mugs in the London area (sites referred to above). Archaeologically this seems to occur c 1480 (see Dawson, 1979, 60 for a discussion of the evidence). The sequence of Cheam and Kingston White Wares then Cheam White Ware, then Cheam Red Ware with Raeren stoneware, is also recorded from 199 Borough High Street (Turner, 1971). On the other hand, some of the Red Ware forms were present in L12 at Guy's Hospital (Dawson, 1979, 57-8), before the earliest occurrence of Raeren mugs, and a group consisting of Cheam-type white biconical jugs and Hareplain-type red pitchers has been found at Bayham Abbey, Sussex. (A. Streeten, forthcoming).

In slightly later groups, for example Gateway House (c 1530) and Whitehall (1532) the Tudor Brown Ware seems rather more 'advanced', with greater and more successful use of glaze, and zones of white slip (i.e. Guy's Ware), and more complicated rim forms, especially on cauldrons.

The evidence suggests that the dating is as follows:

Group 1 and Parkside:	second half of 14th century, or possibly early 15th century
Group 2:	mid 15th century
end of Cheam White Ware:	c 1480
Group 3:	c 1480-1500

3.5.6 Distribution of Cheam Ware

(i) White Ware

The study of the distribution of Cheam White Ware is made difficult by the following factors: (a) from 1923 until 1968, Cheam was the only known source of Surrey White Ware, and all sorts of Surrey White Ware tended to be called

'Cheam Ware'. Published or catalogued attributions are therefore unreliable; (b) since the Cheam White Ware assemblage does not cover the whole range of functions for which pottery was produced in the 14th and 15th centuries, its absence at a site may be due to either distributional or functional differences. For example, if only cooking pots were found at a site, one would not expect any of them to be from Cheam, although Cheam Ware (in the form of jugs) might be readily available in the area.

With these reservations in mind, a number of published and unpublished groups of medieval pottery from London and the Home Counties were examined, and divided into four groups:

(1) groups where all the jugs of late 14th-15th century date (excluding exotic imports) appear to be from Cheam (shown as filled circles on map, fig 26)

(2) groups where some of the jugs of late 14th-15th century date appear to be from Cheam (shown as hollow circles on map, fig 26)

(3) groups where none of the jugs of late 14th-15th century date appear to be from Cheam (shown as crosses on map, fig 26)

(4) groups with no jugs of late 14th-15th century date (shown as dashes on map, fig 26)

The resulting distibution map shows several sites which have not yielded groups of a suitable date, or which may have been abandoned before Cheam Ware was produced. Nevertheless, a general pattern seems to emerge, with the distribution heavily concentrated in and immediately around London. With three exceptions, relatively little is found south of the North Downs, even only a few miles away. The presence of fairly large amounts of Cheam White Ware at Bayham Abbey (A. Streeten, forthcoming) and Bodiam Castle (Myres, 1935) is inexplicable at present. A small amount of Cheam White Ware has recently been found in Eastbourne, in association with Spanish tin-glazed wares (L. Stevens, pers comm). The general extent of the distribution seems greatest north-west of London, perhaps because of the collapse of the South Hertfordshire/North Middlesex industries of the 13th/early 14th centuries.

From this evidence, it is tentatively suggested that Cheam White Ware was

mainly distributed through London, rather than directly from Cheam.

(ii) Red Ware

One cannot really talk of the distribution of Cheam Red Ware as such, because it is indistinguishable from Kingston Red Ware and very difficult to distinguish from Woolwich Phase 1 and possibly Standon High Cross pottery (see M36-7). Even if we study the distribution of pottery which might be from Cheam, relatively little can be found away from the kiln sites (compared with Cheam White Ware, for example), presumably because of the short production life of the pottery (see M40). Nevertheless, an attempt has been made to define sites at which Cheam and similar Red Ware as (1) a major proportion of late 15th century pottery (filled circles on map, fig. 27), (2) a minor proportion of late 15th century pottery (hollow circles on map, fig. 27), (3) not present in late 15th century groups (crosses on map, fig. 27), (4) not present, but no late 15th century pottery (dashes on map, fig. 27).

The distribution does seem to be more restricted than that of the White Ware (cf. fig. 26), and is apparently centred on Southwark. This may, however, be because more (and larger) groups of the 'right' date have been found in Southwark than in London, and future excavations may redress the balance.

3.6 Other finds

Both roof- and floor-tiles were found on the site. The floor-tiles appear to be wasters and may have been made in the kiln, while the 'roof' tiles are more likely to be part of the structure of the kiln. No finds other than pottery and building material were retained or recorded.

3.6.1 Floor tiles

(i) Red fabric

These are summarised in table 16; more details are available in Appendix 4.

These tiles are large, about 200m (8 in) square, as far as can be judged from the few complete edges, and apparently from 25-38mm (1 - 1½ in) thick. Most (80%) have split into laminations during firing. It seems that the intended decoration is usually either white slip covered with a clear glaze or a mottled green glaze with no slip, but in a high proportion (60%) the glaze has failed to 'take'.

There is one example with more complex decoration - a (Tudor?) rose crudely incised through the white slip and glazed over (no. 130).

(ii) White fabric

One small fragment of white floor tile, about 9mm (3/8 in) thick, comes from Phase 1.

Floor tiles seem to represent a small, and unsuccessful, aspect of the production of this kiln.

3.6.2 Roof tiles (all in red fabric)

These are more difficult to quantify, as counts can be based on corners or peg-holes, leading to different estimates of tile-equivalents (see table 17).

Widths, which cannot often be measured, range from 145-155mm ($5\frac{3}{4}$ - 6 1/8 in) (2 tile-equivalents) or 165 - 175mm ($6\frac{1}{2}$ - 6 7/8 in) (1 tile-equivalent). Only one length could be measured, 190mm ($7\frac{1}{2}$ in). The total area covered by these tiles would be about 0.6 - 1.1 sq. m (7 - 12 sq. ft), compared with a total surface area of the pedestals of about 2.8 sq. m (30 sq. ft) and a surviving surface area of 1.2 sq. m (13 sq. ft).

Seven fragments of 'roof' tiles have runs of glaze on them, of which three also have scars of pots in the glaze. These have been used as kiln furniture, presumably as the surface of a pedestal. It seems likely that the others were also so used.

A small stack of mortared tiles, used as blocking in the central channel (see M5 is also present.

3.6.3 Bricks

Of several small fragments present, only six can be measured: they are 50mm (2 in) thick and 100 - 110mm (4 - 4.3/8 in) wide, of unknown length.

3.6.4 Stone

Several fragments of Greensand (probably Reigate Stone) were recovered. They were flash-glazed on the interior (i.e. concave) surface and showed tooling on the other surfaces.

3.6.5 Other

There are about twelve small pieces of baked clay, with impressions of grass (?) in them. They are unlikely to come from a clay dome, and are perhaps just accidentally fired lumps of potting clay.

3.6.6 Other pottery

There is very little pottery other than Cheam Ware present.

Roman: one rim sherd of colour-coated ware.
? New Forest, burnt (Phase 3)

Medieval: two rim sherds (Phase 3)

Post-medieval/modern:
red wares, porcelain, stoneware, 'china',
clay pipe stems and drainpipe fragments (Phase 3,
presumably derived from the modern intrusions).

Postscript

Since this report was submitted, wasters similar in form to Cheam Red Ware have been published from a supposed late medieval kiln site at South Woodham Ferrers, Essex (Couchman, 1980, 67-9). The forms appear to be mainly jugs or pitchers (ibid 6, nos 4-6, 8, 9, 11-20, 24-32), with a few large jars (nos 1-3) and a possible cooking pot (no 7), but the group is small (136 sherds). The fabric seems to be sandier than at Cheam, with mica and ironstone inclusions. White slip decoration is used. The group is dated to 'slightly earlier than c 1450', but the evidence is not given.

Similar but finer pottery was found at Widford, Essex (ibid, 59-61) in association with a coin of Edward IV (1461-83), Tudor Green sherds and one sherd of 'brown speckled stoneware'. Forms include jugs (ibid 60, nos 3-5, 8) cooking pot (no 4a) and large dish (no 6). The fabric is paralleled to fabric M at Writtle (see M65) and to Rochford (Eddy, forthcoming), where it is dated 1495-1525.