CHARCOAL FROM 15TH /16TH -17TH CENTURY DEPOSITS

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(The cross-references denoted '*CQ*' in this paper relate to *Charter Quay, The Spirit of Change*, Wessex Archaeology 2003)

Charcoal was recorded from numerous contexts across the site, but two deposits in the industrial/ working area were significantly larger than most. Context 4030, on the north side of the Hogsmill, formed a dense spread within a late 15th/16th century 'structure', while, sited to the south of the Hogsmill, the sample was from a late15th – early 17th century kiln 2095 (possibly used for malting). The charcoal in these deposits was well preserved, and the sample from kiln 2095 contained a high proportion of roundwood fragments. Species identification was undertaken on both samples to establish likely sources of origin, e.g. from structural use or fuel deposits. In addition, the roundwood in kiln 2095 was potentially important since it provided a rare opportunity for the comparative study of growth patterns, woodland management, and seasonality for a range of woody species.

Materials and methods

Charcoal was extracted from bulk soil samples by flotation and sieving at Wessex Archaeology. The flots and residues were extremely productive. Subsamples (approximately 10%) were examined from both samples, i.e. for the sample from kiln 2095, 30g of the total weight of 330g, and for sample of context 4030, 390g of the total weight of 2305g. The charcoal in both samples was extremely well preserved and firm. Eighty three roundwood fragments from kiln 2095 were examined and details of diameter widths, numbers of growth rings, growth rates, presence of bark, season of felling and tool marks were recorded. It should be noted that measurements of stem diameters are from charred material, when living these stems may have been up to 40% wider. Charcoal from context 4030 was more comminuted and comparable data was not available.

Both samples were prepared for examination using standard methods. Fragments from each sample were fractured to expose fresh transverse surfaces and sorted into groups based on the anatomical features observed using a x20 hand lens. Representative fragments from each sample were selected for detailed study at high magnification. These were fractured to expose the tangential and radial planes, supported in washed sand, and examined using a Nikon Labophot microscope at magnifications of up to x400. The anatomical structures were matched to prepared reference slides.

Results

The results of the charcoal analysis are summarized in Table CH1 and discussed in detail below. The anatomical structure of the charcoal was consistent with the taxa or groups of taxa given below. It should be noted that the anatomical structure of some related taxa can not be distinguished with any certainty, for example, members of the Salicaceae (*Salix* and *Populus*). Classification follows that of *Flora Europaea* (Tutin, Heywood *et al* 1964-80).

The broadleaf taxa identified included:

Aceraceae. *Acer* sp., maple
Aquifoliaceae. *Ilex* sp., holly
Betulaceae. *Alnus* sp., alder; *Betula* sp., birch
Corylaceae. *Corylus* sp., hazel
Fagaceae. *Fagus* sp., beech; *Quercus* sp., oak
Oleaceae. *Fraxinus* sp., ash
Rosaceae. *Prunus spinosa*, blackthorn
Salicaceae. *Salix* sp., willow and/ or *Populus* sp., poplar
Ulmaceae. *Ulmus* sp., elm

Spread within 'structure' , context 4030

A thick, compact layer of charcoal was located in context 4030 (Tr 3) on the northern side of the Hogsmill (see *CQ* p. 51). The charcoal spread was adjacent to numerous postholes in an area associated with (unidentified) industrial activity. The deposit consisted of roundwood (including chunks measuring up to about 600mm in the longest axis), smaller fragmented pieces of roundwood and charcoal dust. The condition of the charcoal was unusually firm and well preserved, with occasional pieces appearing to be less charred than most, i.e. dark brown (as opposed to black) and extremely difficult to fracture. Taxa identified included oak (*Quercus*), alder (*Alnus*), hazel (*Corylus*), birch (*Betula*), willow/ poplar (*Salix/ Populus*), ash (*Fraxinus*) and holly (*Ilex*) (see Table CH1).

Bark was retained on most of the roundwood and, when absent, the cambial surface of the wood (interface between wood and bark) was present. The season of felling was recorded for 66 of the 83 pieces examined and demonstrated that all except one (willow/ poplar) were felled during the dormant period (Table CH2). Wide early growth rings, often indicative of coppicing, were recorded in 49 pieces, while the remainder included only average growth rates (Table CH2). Some fragments of oak, alder, hazel and birch included bands of 5 or 6 very closely spaced rings towards their outer edges. Stress patterns such as these result either from periods of local competition/ environmental changes or from climatic effects, e.g. severe weather, prolonged cold or draught.

The charred diameters of the roundwood fragments (Table CH2) ranged from 10 - 81mm, with most within 10 – 40mm. Willow/ poplar roundwood tended to be wider than average due to faster growth. The age of felling (based on number of growth rings, Table CH3) mostly ranged between 6 and 15 years. Some older stems were present but none exceeded 33 years. There was no evidence of heartwood. An oblique tool mark on a narrow hazel stem clearly showed that it had been lopped rather than sawn or snapped.

The density of the charcoal spread, and the similarity in character of the individual pieces (i.e. preservation, origin from roundwood, etc) suggested a common source for the whole deposit, rather than a gradual accumulation of fuel debris from various sources (which would manifest more variable stages of degradation). This suggestion is supported by the absence of other rubbish (e.g. pottery, food processing debris, etc). Origins from either burnt structural remains or fuel deposits were considered. If from structural remains, it is feasible that the wider diameter willow/ poplar stems served as posts (although as such would have perished quickly), while the narrower gauge roundwood derived from hurdles. Hurdles typically include long pliable rods from species such as alder, hazel, willow and ash (Edlin 1949); the use of oak, holly and birch would have been unusual. It is doubtful that such a wide range of species would have been combined together in the construction either of hurdles or roofing.

A fuel deposit, therefore, seems a more plausible explanation, especially as the area was probably used for some type of industrial activity. The fuel may have been used either as wood fuel or charcoal. If the former, the use of roundwood would have provided a hot although possibly short-lived heat source. If the latter, the calorific value of the fuel would have been considerably enhanced through its conversion to charcoal. Given the uniformly excellent condition of the charcoal (sometimes only lightly charred) is tempting to suggest that the spread represents the remains of a (?covered) charcoal fuel store. It could be anticipated that layers of much smaller fragments and, particularly, charcoal dust would accumulate beneath the fuel. There was no evidence to suggest *in situ* burning, so it seems unlikely that charcoal derived from a burnt-out wood stack.

Kiln 2095

A charcoal-rich spread occurred close to a kiln structure dated to the late 15th – early 17th century (see *CQ* p. 31, Fig. 55). The charcoal was mixed with charred cereal grains, and the layered deposit appeared to have built up over a period of time. The kiln, a circular tile and brick oven structure, was sited to the south of the charcoal deposit, with a flue extending northwards into the charcoal deposit. It therefore seems reasonable to conclude that the charcoal represents fuel debris from the malting process. The charcoal included relatively large fragments (e.g. up to 20mm in the longest axis) but no whole radial segments of roundwood. The range of taxa identified included oak (*Quercus*) sapwood and heartwood, ash (*Fraxinus*), beech (*Fagus*), elm (*Ulmus*) sapwood and heartwood, birch (*Betula*), alder (*Alnus*), maple (*Acer*), hazel (*Corylus*), blackthorn (*Prunus spinosa*) and willow/ poplar (*Salix/ Populus*) (see Table CH1). Oak, ash and beech occurred more frequently than other taxa – suggesting that these made up the bulk of the fuel (although this conclusion is based on a small percentage of the charcoal). Some of the oak derived from fast-grown wood, but it was not possible to assess similar growth in other taxa.

Discussion

Contextual evidence implicates material from kiln 2095 as almost certainly spent fuel residues from an oven, probably for malting grain. The origin of the material in context 4030, however, is more speculative, but from the evidence available this also appears to have originated from fuel (see above). The vast size of the sample, and its uniformly excellent condition and similarity in character suggests unused charcoal fuel, which leads to the interesting possibility that the context could be the remains of a charcoal fuel store (see above). However, to what end charcoal fuel would have been employed in this part of the site is uncertain. Charcoal fuel burns at high temperatures and was particularly important for metal-working (prior to the use of coal), but there was no evidence of smelting or smithing at this time in the vicinity of the charcoal spread. It is also difficult to tie in the use of charcoal fuel with any of the major local industries, which, during the 16th and 17th centuries, included boat-building, tanning, milling and brewing. Charcoal may have been used here in domestic braziers for heating, in common with London practices (Galloway *et al* 1996).

Alternatively, if the residues represent wood fuel debris, then the regular use of faggots in, for example, bakers ovens (faggotts burnt within the oven were swept out when the oven was hot enough for baking), would have produced a waste heap of narrow-gauge roundwood charcoal in a relatively short period of time.

The two samples were very different in character. Charcoal from the earliest context (15th/16th century) consisted entirely of roundwood (oak, alder, birch, hazel, willow/ poplar, ash and holly), while the later fuel deposits (15th-17th century), associated with the malting oven included both heartwood and sapwood suggesting the use of relatively wide logs (predominantly oak, beech, ash and elm) mixed with narrower roundwood (including maple, alder, hazel, blackthorn, birch, willow/ poplar).

Woodland management

It is interesting that neither beech nor elm were identified from context 4030, whereas both were frequent in kiln 2095. This could be attributed to different sources of supply, or the preferential use of wood species and/ or size (i.e. billets versus narrow roundwood). In medieval London oak and beech billets were usually supplied from 'talwood' as opposed to coppice (Galloway *et al* 1996). Growth patterns recorded in roundwood sections from context 4030 indicated a high ratio of coppice wood. Much of the charcoal/ wood appears to have been supplied from coppices grown on rotational cycles of between 6 and 15 years, although oak was probably cropped on a slightly shorter cycle of <10 years. Cropping the roundwood/ rods followed the traditional pattern of felling during the dormant season.

Kingston was well within the catchment area for provisioning London with fuel via the Thames (Galloway *et al* 1996), and most woodlands around Kingston were probably dedicated to this lucrative fuel trade (see *CQ* p. 51). Indeed, the river would probably have been the route used to import fuel supplies to the industrial sites alongside the wharves at Kingston.

Conclusion

Charcoal was examined from two unrelated contexts associated with the industrial area of late/ post medieval Kingston, located either side of the Hogsmill, close to the Thames. Both samples were almost certainly fuel deposits. One sample was unequivocally associated with kiln 2095 was malting oven, while the primary use or origin of context 4030 remains unknown (speculative suggestions include a charcoal store and residues from bakers ovens). Evidence from roundwood from context 4030 indicated that coppice wood was gathered from a range of species (oak, alder, birch, hazel and willow/ poplar) grown on relatively short rotational cycles and cropped during the dormant season. The two samples exhibited differences in species content and fuel size (billets/ roundwood), which could be attributed to either their application or source of fuel supply.

References

Edlin, H.L. 1949 *Woodland crafts in Britain*, Batsford

Galloway, J.A., Keene, D. and Murphy, M. 1996 Fuelling the city: production of firewood and distribution of fuel in London's region, 1290-1400, *Economic History Review,* 69 (3), 447-472,

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CHARCOAL TABLES

Table CH1. Taxa identified from late 15th/ 16th - 17th century contexts

Feat.	*Cxt.*	*Samp*	*Acer*	*Alnus*	*Betula*	*Corylus*	*Fagus*	*Fraxinus*	*Ilex*	*Prunus*	*Quercus*	Salicaceae	*Ulmus*
Kiln 2095	2068	14	1	4	11	1	40	42	-	1	23s, 18h	3	10
Layer	4030	75	-	22r	17r	14r	-	1r	1r	-	20r	8r	-

Key: r = roundwood; s = sapwood; h = heartwood

Table CH2. Sample from context 4030: roundwood diameters, season of felling* and evidence of coppicing.

The number of charcoal fragments recorded is indicated.
*In some instances growth rings were too narrow to assess the season of felling.

Genus	**Roundwood diameters in mm**								**Season of felling**		**Coppiced**
	10-20	21-30	31-40	41-50	51-60	61-70	71-80	>80	summer	winter	
Alnus	6	7	6	1	1	1	-	-	-	20	14
Betula	1	3	5	4	3	1	-	-	-	15	11
Corylus	2	10	2	-	-	-	-	-	-	12	11
Fraxinus	1	-	-	-	-	-	-	-	-	1	-
Ilex	-	1	-	-	-	-	-	-	-	1	-
Quercus	10	2	6	1	1	-	-	-	-	15	11
Salicaceae	-	-	2	-	3	-	2	1	1	2	2

Table CH3. Context 4030: growth ring counts in roundwood

The number of charcoal fragments examined is indicated.

Genus	**Number of growth rings**					
	6-10	11-15	16-20	21-25	26-30	31-35
Alnus	8	8	2	3	-	1
Betula	5	8	1	1	2	-
Corylus	4	8	2	-	-	-
Fraxinus	-	1	-	-	-	-
Ilex	-	-	-	-	1	-
Quercus	17	3	-	-	-	-
Salicaceae	1	-	1	4	2	-