

APPENDIX 14: ASSESSMENT OF CHARRED PLANT REMAINS & CHARCOAL

Anne Davis

1. Introduction

- 1.1 A total of 167 bulk soil samples were taken for environmental analysis during the excavation of the three sites in Zone 3; 64 came from ARC WNB 98, 51 from ARC HRD 99, and 52 from ARC 330 98. The sampled deposits came from a wide variety of features and ranged from late Bronze Age to medieval in date. Sample sizes ranged from 5 to 30 litres. An interim assessment report had been written previously on twelve of the samples from ARC WNB 98 (Giorgi 1997), and information from this has been included here.
- 1.2 The study of botanical material from this site should assist in determining the palaeo-economy of the settlement. This could include the functions of features and settlement areas, and the activities taking place there, in each of the periods represented.

2. Methodology

- 2.1 The samples were processed by flotation, using a Siraf flotation tank, with meshes of 0.25mm and 1.0mm to catch the flot and residue respectively. All flots and residues, were dried. The residues were fully sorted by eye for artefacts and biological material, except in a few cases, where substantial numbers of charred seeds and grains remained in the residue after processing. In these samples, the larger residue fraction (>2mm) was fully sorted, and the smaller retained for sorting at the post-assessment stage of the project. The flots were briefly scanned using a low-powered microscope, and the abundance, and general nature of plant macrofossils and any faunal remains were recorded, using the following scale for the number of charred items per sample:

+ = 1-10, ++ = 11-50, +++ = 51-100, ++++ = 101-1000, 1000+ = >1000.
- 2.2 Results were recorded on the MoLAS ORACLE CTRL botany database, subsequently translated onto RLE Datasets.
- 2.3 All samples with flots were included in the assessment. Most of the flots were less than 100ml in volume, but where they exceeded this, 100ml sub-samples were assessed. In a few cases, where samples were very rich and the plant remains quite uniform, these sub-samples were reduced to 50ml, but in all cases the estimated quantities are for the entire sample. Occasionally plant remains were recovered from the residues of samples with no flots, and these were also included.

3. Quantification

- 3.1 Of 167 samples processed, 81 produced flots and a total of 134 included charred plant material in flots and/or residues, although in many cases this consisted only of flecks of charcoal. Charred cereal grains were seen in 73 samples, and 23 of

these contained over 50 grains, although many other samples had fewer than ten grains. Cereal chaff was recorded from 30 samples (over 50 items in nine), and charred seeds from 58 samples (over 50 seeds in 11 samples). Preservation of the plant remains ranged from moderate to very poor. In the majority of samples charcoal was reduced to very small fragments, but pieces large enough for species identification were recorded from ten samples. No waterlogged plant remains were recovered from these sites. Assessment data for the more productive samples from each site are shown in the tables below.

- 3.2 In almost all samples wheat (*Triticum* spp.) seemed to be the predominant grain, with both glume wheats and free-threshing species present. Grains of barley (*Hordeum sativum*), rye (*Secale cereale*) and oats (*Avena* spp.) were also seen in some samples. Cereal chaff also came mainly from species of wheat and included glume bases, spikelet forks, and rachis fragments. The majority of charred weed seeds were from disturbed-ground species, with corn gromwell (*Lithospermum arvense*) seen in very great numbers in some samples from ARC WNB 98. Fragments of hazelnut (*Corylus avellana*) shell and stones of *Prunus* sp. were seen occasionally, and pulses, probably peas (*Pisum sativum*) or horse beans (*Vicia faba*) were quite abundant in some of the medieval samples.
- 3.3 The majority of samples included variable amounts of rootlets and/or moss, and sometimes uncharred seeds, presumably of modern origin. It is therefore possible that some of the charred plant remains are also intrusive. This is unlikely to be a problem where large and relatively uniform assemblages are concerned.

4. Provenance

- 4.1 Samples from late Bronze Age and Iron Age features in the area of Hazell's Farm on ARC 330 98 (Figure 5), and mid-late Iron Age deposits in Area A/B on ARC WNB 98 (Figure 6), were mostly devoid of any plant remains except charcoal flecks. Twelve samples from pit fills at the former site however, and five from ditch- and pit fills at the latter, contained very low numbers (less than 10) of charred cereal remains and/or weed seeds. A charred fruit of ?*Prunus* sp. was also found in a ARC WNB 98 pit fill. Four of the ARC 330 98 samples included a few identifiable fragments of charcoal.
- 4.2 Over 50 cereal grains, and smaller quantities of chaff and weed seeds were found in three samples from the late Iron Age/early Roman ovens/hearths/firepit fills in Area A/B on ARC WNB 98 (Figure 10). Six samples from ditch fills and other contemporary features in this area contained smaller charred assemblages, and a cremation sample included a little identifiable charcoal.
- 4.3 A number of very large assemblages of charred plant remains were recovered from Roman features in Area C, ARC WNB 98(Figure 16). Two of these, from the fill of a roadside ditch, and a pit fill at the eastern end of the area, consisted predominantly of cereal chaff and may represent local crop-processing activities. A further seven samples, from pit fills within a square enclosure to the north of the east to west driveway, each contained many hundreds of cereal grains, chaff and weed seeds. Varying amounts of charred material were found in four samples associated with clay oven (Plate 5), but one, possibly a rake-out deposit, contained very many chaff fragments, with a smaller number of cereal grains. Some of these remains are likely to represent fuel used in the oven, but others

may also provide clues as to its function. Samples from the enclosure ditches in this area contained very few plant remains.

- 4.4 Abundant charred plant remains were again found in samples associated with the partially excavated Roman malting oven or 'corn dryer' at ARC HRD 99 (Figure 7, Plate 6). Cereal grains predominated in the ten samples from this feature, and in four of these many hundreds or thousands of grains were estimated to be present. All these samples included very many weed seeds, and two also had many chaff fragments. Around 100 grains, and identifiable charcoal, were seen in a sample from a hearth or kiln on the same site, and there were occasional charred remains in samples from other features, including ditch and pit fills.
- 4.5 Two of the three samples from a tread deposit within a medieval sunken building in Area A/B, ARC WNB 98 (Figure 13), contained many charred cereal grains, mostly wheat. A substantial number of charred pulses were also seen, most of them probably peas, as well as occasional fruit stones.
- 4.6 At ARC HRD 99 five samples associated with a medieval malting oven or kiln contained very many charred cereal grains, rachis fragments and weed seeds (Figure 7, Plate 7). Two of these samples also contained identifiable charcoal. Occasional charred plant remains were also present in medieval ditch fills from this area.

5. Conservation

- 5.1 The dried flots, and plant material from the residues, have no particular conservation requirements.

6. Comparative material

- 6.1 Very little comparative material has been found in the area. A few grains of spelt wheat and six-row, hulled barley were recovered from four Iron Age pits at Farningham Hill in the Darent Valley (Vaughan 1984), and similar remains were found in a late Roman ditch at the Keston Roman villa site. These also included several grains of spelt, as well as a few glume bases and spikelet forks from the same species, one oat grain, and a grass seed (Hillman 1991). While these remains are very limited, they are similar to those found from the same periods at the Zone 3 sites, and on other sites in southern England. A charcoal sample from Keston contained mostly pieces of probable hawthorn (*Crataegus* sp.) (Straker 1999).

7. Potential for further work

- 7.1 Few plant remains were recovered from the Bronze Age and Iron Age samples within Zone 3, so their value in answering the project aims is limited. Very little material of this date, and from this area of Kent, has been previously studied however, and analysis of the 12 samples will improve our knowledge of cereal use and cultivation in these periods. Identification of the four charcoal samples will give an idea of the wood species being exploited.

- 7.2 Many of the samples from Roman (and possibly late Iron Age) features, in different parts of the study area, were very rich in charred plant remains, and have the potential to contribute substantially to our knowledge about the palaeo-economy of the settlements. Oven and hearth features in ARC WNB 98 Areas A/B, C, and on ARC HRD 99 all contain rich assemblages of charred plant remains, which can be used to investigate their functions, and to compare the nature of the materials used as fuel. Very large assemblages from ten pitfills inside the square enclosure in ARC WNB 98 Area C, and from a ditch fill and pit fill nearby will help to determine the nature and economy of this settlement, and also what crop-related activities were taking place. Samples with moderate-sized assemblages from Roman ditch and pit fills will provide extra background data on cereal use and processing.
- 7.3 Charred plant remains from the medieval sunken building in ARC WNB 98 Area A/B, which included pulses and fruit stones as well as cereal remains, may be useful in determining the function of the feature. These remains will also provide information on the economy of the site and, to a limited extent, the diet of its inhabitants. The function of the medieval oven/kiln in ARC HRD 99 may be revealed by analysis of the plant remains associated with it. Plant materials used as fuel in this feature can also reflect aspects of the site economy.
- 7.4 Comparisons should be made between the settlement areas, both within and between periods. In addition to exploring the importance of different cereals, and the implications of cereal chaff, to the functions of features and the economy of the site, assemblages of arable weed seeds should also be compared. Analysis of their soil and habitat preferences may indicate possible areas of origin for the crops, and may vary between periods or settlement areas.
- 7.5 Due to the very large assemblages in many samples, it may be desirable to select representative samples for analysis, where several samples have been taken from the same, or closely related contexts. It is suggested that all 17 of the prehistoric samples (which contain few plant remains) should be analysed, together with five from the late Iron Age/early Roman settlement (ARC WNB 98, Area A/B), ten from Roman levels in Area C, and six from ARC HRD 99. From medieval deposits it is suggested that two samples from area A/B and three from ARC HRD 99 should be analysed. Final selection should take place in consultation with stratigraphic specialists, prior to the commencement of analysis.
- 7.6 Flots from the selected samples will be sorted, and macrofossils from flots and residues identified and counted, using a low-powered microscope. Large flots and assemblages will be sub-sampled, and sufficient sub-samples sorted to produce at least 500 items. The remaining flot will then be rapidly scanned for any new species not seen in the sub-samples. Where partially sorted residues containing charred remains have been retained, these too will be sub-sampled if necessary, and the same proportions of flot and residue sorted. Analysis of the results will include calculating the relative abundance of each cereal, and of grains, chaff and weed seeds, in each sample and within features and areas. The environmental preferences and soil requirements of weed species will also be investigated. Charcoal samples would be identified to species where possible, using an epi-illuminating microscope.
- 7.7 The tasks may be itemised as the requirement to complete the recording and analysis of the 43 suggested samples, and preparation of the report:

- Sorting and identification of charred remains from 43 flots and retained residues
- data entry
- preparation of tables
- analysis
- preparation of publication report

8. Bibliography

Giorgi 1997 *An interim report on the assessment of charred plant remains from twelve environmental bulk samples*. MoLAS archive report.

Hillman G. 1991 'A sample of carbonised plant remains' in B. Philp et al *The Roman villa site at Keston, Kent. First report (excavations 1968-1978)*. The Kent Archaeological Rescue Unit. p.292.

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Table 63: Assessment of Charred Plant Remains & Charcoal from ARC WNB 98

Key: gp: Group; SG: Subgroup

sample details						flot and residue details						residue		
gp	SG	Context no.	sample no.	Feature type	sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	size (ml)	% sorted
22	452	268	35	Ditch	10	10			+	+	+	Modern moss.	4000	100
22	452	269	34	Ditch	20	20			+	+	++	Modern moss.	3000	100
22	454	278	33	Ditch	5	2			+	+	++	Some rootlets.	2000	100
23	446	510	30	Pit	5	30	+		+	++	+	1 complete charred fruit - Prunus? Mostly unch'd roots, pods, stems, wheat rachis.	4000	100
23	447	451	28	Posthole	5	30	+		+	++	++	Mostly rootlets.	2000	100
38	167	2163	81	Grave	10	50			+		++++	Cremation? Flot all charcoal, few frags identifiable.	1500	100
74	57	818	72	Pit	5	5	+		+		++	Rootlets.	800	100
81	299	518	16	Grave	10	20	+		+		1000+	Lithospermum seeds, few grains.	200	100
81	309	372	2	Oven	10	20	+++	++	++	+	+++	>50 grains. Rootlets.	300	100
81	312	302	1	Oven	10	20	+++	++	++	+	++	C.50 grains, mostly wheat. Rootlets.	300	100
82	267	381	3	Ditch	20	20	++	+	+		+++	C. 12 grains, poor condition. Many rootlets.	5000	100
82	278	426	19	Ditch	?	10	+		+		++	Rootlets	2000	100
82	279	392	10	Ditch	20	10	++		++	+	+++	Grains mostly wheat. Few rootlets.	2000	100
82	286	526	59	Ditch	20	10	+	++	+		++	C.10 glume bases; grass & legume seeds.	4000	100

sample details						flot and residue details						residue		
gp	SG	Context no.	sample no.	Feature type	sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	size (ml)	% sorted
85	306	916	74	Pit	20	20	+++	++	++		++	C.70 grains-poor cond. Weeds eg Centaurea, Lathyrus/Vicia, Rumex spp. Rootlets.	1500	100
95	64	1051	54	Ditch	10	30	+	+	+		++	V. few wheat grains, glume bases, legumes. Many rootlets.	2000	100
97	102	1009	7	Pit	30	200	++	++	++	++	+++	Grain poorly preserved. Wheat glume bases, barley rachis. Rootlets. 3000		100
97	108	1008	6	Pit	30	25	++			++	++	10-20 grains. Rootlets.	300	100
97	111	1026	8	Pit	30	100	++	+	+	++	++	10-20 grains, poor preservation. Rootlets.	4000	100
97	114	1027	11	Pit	30	0	++++	++++	1000+	+	++++	Lithospermum & grass seeds. Grain poor, most wheat.<4mm res. unsorted. Rootlets.	2000	85
97	114	1056	65	Pit	30	60	++++	++++	++++		++	Wheat. Lithospermum & grass seeds. Gl bases, sp forks, rachis. Rootlets.	1500	90
97	114	1032	12	Pit	30	150	++++	++++	++++		++++	Mainly wheat grains, glume bases. Lithospermum seeds. Rootlets. 3500		100
97	114	1033	13	Pit	30	100	++++	++++	++++		++++	Mainly wheat grains, glume bases. Lithospermum seeds. Rootlets. 1000		100

sample details						flot and residue details						residue		
gp	SG	Context no.	sample no.	Feature type	sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	size (ml)	% sorted
97	117	1036	14	Pit	30	200	++++	++++	++++	++		Mainly wheat grains, glume bases. Lithospermum seeds. Rootlets. 2000		100
97	117	1043	26	Pit	30	150	+++	++	+++		+++	Mainly wheat grains, glume bases. Weed seeds. Prunus sp. Rootlets. 4000		100
97	118	1046	27	Pit	30	50	++++	++	++	++	++	100+grain, most wheat, poor cond. Many mollsc.<4mm res unsorted. Rootlets.	3500	90
98	4	1262	69	Ditch	20	30	+++	1000+	++		++	>1000 chaff frags, c80 grains, mostly wheat. Rootlets.	500	100
111	8	1201	68	Pit	10	40	+++	1000+	++	+	++	1000s gl bases, sp forks. c100 grains, mostly wheat. Rootlets.	500	100
114	68	1281	78	Oven	10	20	++	+	++		+	C.20 grains, hazelnut, weed seeds. Rootlets.	500	100
114	69	1270	71	Oven	10	10	+	+	+	+		Rootlets.	2000	100
114	70	1279	70	Ditch	10	40	+++	++++	++	+	++	C.50 grains, >100 chaff. Weeds Lithospermum, Ranunculus, Rumex spp.	1000	100
	231	292	75	Floor	20	50	+++	++	+++	++	++	>50 ?peas, few ?beans, Prunus sp., weed seeds. Uncharred seeds.	1500	100
	231	292	76	Floor	20	2	++		+		++	Few pulse fragments. c.10 grain including rye.	1500	100
	231	292	77	Floor	20	30	++++		+++		++	Much wheat. C.40 ?peas, ?beans, Prunus sp., weed seeds.	1000	100

Table 64: Assessment of Charred Plant Remains & Charcoal from ARC HRD 99

Sample details	flot and residue details	residue
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SG	context no.	Sample no.	Feature type	Sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	vol (ml)	% sorted
725	14	19	Demolition	20	40	+++		+++		>1000	c.50 grains -wheat, rye, oats. c.50 weeds. Few id ch'cl frags. Moss.	500	100
727	163	46	Layer	10	50	++++	+++	+++		>1000	c.800 grains+frags. Rachis frags. Arable weeds + <i>Prunus</i> sp. Moss.	4000	100
738	184	49	Occupation	10	40	>1000	+++	+++		>1000	>1000 grains, most ?bread wheat. Rachis frags. 400ml unsorted res. ?id ch'cl. Moss.	500	20
741	187	50	Occupation	10	40	++++	+	++		>1000	c.200 grains, most ?bread wheat. Moss.	400	100
747	169	47	Oven	10	10	++++		++		>1000	c.150 grains, most ?rye & ?bread wheat.	1500	100
758	3	2	Hearth	5	2	+++				+++	c.100 grains, most wheat - poor cond. ID charcoal. Modern moss.	500	100
800	18	41	Pit	10		++		+		++	10-15 grains, 1 large legume.	1500	100
805	63	24	Layer	10		++					20-30 grains, most wheat & oats. Poor condition.	1000	100
809	102	29	Demolition	30	10	++		+		++	c.15 grains, few legume seeds. Rootlets.	2000	100
809	102	30	Demolition	20	20	+	+	+		+++	1 wheat rachis. Much moss.	1000	100
810	103	31	Layer	10	30	>1000	+	++++		>1000	>300 grains + more in 300ml unsorted res.>300weeds,most legumes. Little moss.	800	60
810	103	32	Layer	10	10	++				++++	25-30 grains - poor condition. Moss.	500	100
810	132	42	Layer	10	15	++		+		+++	c.15 wheat & barley grains, fragmentary. Moss.	1000	100
810	132	44	Layer	10	5	+		+			Flot mainly clinker.	500	100
810	132	57	Layer	10	10	+++		++		+++	c.100 grains - most wheat. Frag of <i>Prunus</i> sp.	1000	100

sample details					flot and residue details							residue	
SG	context no.	sample no.	Feature type	sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	vol (ml)	% sorted
810	217	58	Layer	10	300	>100 0	++++	++++		>1000	Flot 90% grain. Most ?spelt/emmer. Glume bases,sp forks. 600ml unsorted res.	3000	80
810	218	59	Layer	10	100	>100 0	+++	+++		>1000	Flot 99% grain. Most wheat. Glume bases, sp forks. 600ml uns res. Id ch'cl. Moss.	2500	75
819	219	61	Oven	5	30	++++	++	+++		>1000	c.400 grains, mostly wheat. Glume bases.100ml unsorted res. Moss.	300	67

Table 65: Assessment of Charred Plant Remains & Charcoal from ARC 330 98

sample details					flot and residue details							residue	
SG	context no.	sample no.	feature type	sample vol (l)	flot vol (ml)	grain	chaff	charred seeds	unch'd seeds	charcoal	comments	vol. (ml)	% sorted
	no.	no.		vol. (l)	vol. (ml)			seeds	seeds				sorted
3002	112	13	Pit	20						++	?id charcoal	1000	100
3004	110	9	Pit	20						+	Id charcoal	300	100
3008	121	20	Pit	10	10	+	+	+	+	++	Wheat grains	200	100
3009	141	21	Pit	8	10	+	+			+++	Few grains, glume base. Rootlets, moss.	500	100
3011	315	60	Pit	10	15	+			+	++	Few grains. Rootlets.	1000	100
3012	138	16	Pit	4		+				+	1 grain, 1 frag.	2000	100
3013	561	144	Pit	30				+		+++	Hazelnut shell frag.	500	100
3014	146	44	Pit	30	20	++		+		++++	C.6 grains. Charcoal sample. Roots & moss.	1000	100
3014	264	53	Pit	20	80	+	+			>1000	Few grains & glume base. Some id charcoal. Rootlets.	500	100
3015	148	22	Pit					+			2 frags hazelnut shell	300	100
3015	149	23	Pit	7	30	+	+	++	+	++++	Few wheat grains+glume bases. Moss & rootlets	1500	100
3036	325	65	Pit	10		+				+	3-4 grains	2000	100
3039	344	67	Ditch	10		+			+	+	2 grains	200	100
4162	225	54	Pit							+++	Id charcoal	200	100