APPENDIX B ENVIRONMENTAL REPORTS

B.1 Charred plant remains

By Sharon Cook

Introduction

Thirteen bulk soil samples were taken during the excavation at Chellaston in Derbyshire in 2018. Five samples were taken from Area A of the site and eight from Area B. The samples were taken primarily for the retrieval of Charred Plant Remains (CPR) and artefacts.

Method

The bulk samples were processed in their entirety using a modified Siraf-type water flotation machine to 250µm (flot) and 500µm mesh (residue). The residue fractions were sorted by eye and all bone and artefacts removed while the flot material was sorted using a low power (x10) binocular microscope to extract cereal grains and chaff, smaller seeds and other quantifiable remains. Identifications were carried out using standard morphological criteria for the cereals (Jacomet 2006) and with reference to the Digital Seed Atlas of the Netherlands (Cappers et al. 2006) for identification of wild plant remains, as well as comparison with modern reference material. Classification and nomenclature of plant material follows Stace (2010).

Quantification of remains is as follows; cereal grains and the seeds of wild plants were only quantified for items of which more than half was present, this means that all cereal and seed counts may be used to reach an MNI (Minimum number of individual seeds). For legumes, chaff and nutshell fragments the count is for all observed fragments, this means these figures are not suitable for calculating MNI.

The Assemblages

Table 1 lists the charred taxa identified from each sample.

Area A (Western Area)

Samples 13 – 17 originate from Area A of the site, an area containing predominantly Iron Age features. The samples from this area have produced generally small flots with little charred material. Anthracite and small fragments of indeterminate clinkered material are present within all of these flots together with small quantities of fine modern roots and occasional modern seeds and insects. The charcoal is generally small in size with the majority of fragments heavily encrusted and in many cases having a metallic shiny appearance as a result of mineral precipitate. The few cereal grains are in generally poor condition with a clinkered appearance and heavy external encrustation, non-cultivated plant seeds are few and also in generally poor condition. Seeds include oat/brome (*Avena/Bromus* sp.), likely to be either a crop contaminant or to be growing around the periphery of fields and a small number of seeds indicative of damp ground including rushes (*Juncus* sp.), marsh

violet (*Viola palustris*), and sedge (Cyperaceae). These provide some tentative evidence that drainage was an issue on this site during the Iron Age., as has been suggested elsewhere (van der Veen 1992).

Penannular Ditched Enclosure and Associated Features

Ditch fill 5019 (sample 14) from Iron Age penannular enclosure ditch 4827 contains only small quantities of fragmented and small-sized charred material in poor condition. It is likely that the material was deposited gradually as a combination of lighter windblown material and through other processes such as silting.

The fill of the recut (5083, sample 17) at the enclosure entrance contains a similar assemblage of charred plant remains. The two samples from this ditch contain the largest assemblages from sampled features within Area A but as with the other material in the area of the site, all seeds, grain and charcoal are externally encrusted and have a shiny metallic appearance.

Undated posthole 4842 (sample 13) to the east of the entranceway of the enclosure, produced only small quantities of charcoal <2mm in size.

The small quantities of crop related material within this area indicates that any areas of crop processing and/or consumption are likely to be at a distance from the area of the penannular ditch.

Iron Age Field Boundaries

Ditch fill 5022 (sample 15) from boundary ditch 4988 to the northern edge of Area A, contains only a small amount of charred material, again heavily mineral affected. This is also the case for sample 16 from ditch fill 5063 (boundary ditch 4985 in the centre of area A). A sample was taken from the lower fill of this ditch during the earlier evaluation of the site (sample 9 – 4082) in the central area which contained a single indeterminate cereal grain and a seed which may have been modern as well as small charcoal fragments in poor condition and heavily mineral affected. While field boundary ditches are normally poor in charred remains as a result of their purpose as field dividers, the heavily mineralised condition of the material is consistent with the limited evidence from the uncultivated seeds (see above) that the area was generally wet.

Area B (Eastern Area)

Samples 51 – 58 originate within Area B, an area which is predominantly Roman in date. The samples from this area have produced on the whole much larger flots with a greater range of charred material. As with Area A, anthracite and small fragments of indeterminate clinkered material are present within all of these flots together with small quantities of fine modern roots and occasional modern seeds and insects. Some of the charcoal is large enough to be potentially identifiable, but the majority of fragments are again heavily encrusted and often have a metallic shiny appearance as a result of mineral precipitate. The cereal grain is in mixed condition with the majority having a clinkered appearance and heavy external encrustation, although occasional grains have survived well. The seeds of non-

cultivated plants are few and also in generally poor condition and include likely crop contaminants such as oat/brome, vetches, cleavers, docks and mayweed as well as rushes and sedges.

Roman Enclosure

The secondary fill of ditch re-cut 7764 (sample 52) in the northern part of the enclosure contained little charred material, mainly from uncultivated plants. The few identified seeds are of similar species to those observed within the Iron Age features although in slightly greater numbers. A single barley grain (*Hordeum* sp.) may indicate the addition of barley as a crop during this period although as a single seed it may be intrusive.

Southern Pit complex and hearth

Three pit fills were sampled from the pit complex to the South of Area B: pit 7629 (sample 56), 7671 (sample 57) and 7672 (sample 58). Whilst sample 56 contains little charred material (although the only example of a possibly cultivated legume came from this sample), samples 57 and 58 are richer. Pits 7671 and 7672 are shallow intercutting features whose relationship could not be clearly established. Samples 57 and 58 contain very similar charred assemblages with cereal grain as well as fairly abundant glume bases (*Triticum spelta/dicoccum*), spikelet forks and rachis fragments, including those of barley (*Hordeum* sp.). Although identification was impeded by the poor condition of the remains, the cereal grains which could be further identified include wheat (*Triticum* sp.), barley (*Hordeum* sp.) and two grains from pit 7672 which may be rye (*Secale cereale*). The seeds of wild plants are a combination of common crop contaminants and plants of waste ground and peripheral areas which prefer damp ground.

The relatively large amount of material (for this site) is likely to be the result of a dump of waste material possibly the waste from the processing of a small quantity of crop material which may be an indication of the piecemeal cleaning and processing of grain for domestic purposes and burning of the waste as fuel. Of the samples from pits 7671 and 7672, pit 7671 contains the richer assemblage and it is possible that they were both filled with material of the same origin.

Sample 55, from the fill of 7664 comprises mostly charcoal with heavy external encrustation and little other charred material. The flot was only part scanned as a result of its large volume but generally it seems likely that this deposit is a dump from a hearth or other small fire.

Sample 54, from hearth 7627 to the north of the pit complex also comprises mostly charcoal with heavy external encrustation. The few seeds present are likely to be accidental inclusions.

L shaped Structure and associated ditch

Possible fire pit 7643 to the northeast of the L-shaped ditch 7757 (sample 53) has produced one of the richest assemblages on site. The flot contains abundant cereal grain the majority of which is clinkered and highly fragmented and therefore largely unidentifiable, as well as

chaff, both glume base fragments (*Triticum* sp.) and rachis internode fragments which while highly fragmented are likely to be barley (*Hordeum* sp.). Large numbers of detached embryos are present, probably from more than one type of cereal, together with coleoptile/radicula fragments. The majority of embryos do not appear to be sprouting and at least some of the coleoptiles/radicula have been detached from the embryo as a result of pre-sprouting fragmentation rather than as a result of length. However, some of the unidentified grain appears to have collapsed while others have become extremely fragile, which is likely to be a result of sprouting.

The majority of the unidentified grain is likely from its general size and overall shape to be wheat or barley with grains of oat or brome (*Avena/Bromus*) also common. No definite identification of barley has been made, but small quantities of wheat, oat and rye are present. The large quantity of oat/brome type seeds makes it tempting to consider oat as a crop in this area, however the poor condition and similarity between grains of cultivated oats, wild oats and brome means that it is more prudent to conclude that these are crop contaminants.

Of the non-cultivated plant seeds, the most commonly represented are grass seeds and rushes (*Juncus* sp.). The grass seeds are likely to be either crop contaminants or plants growing at field edges while the rushes are likely to have grown in more peripheral areas, although it is possible that the presence of rush seeds is the result of the use of rushes as roofing or flooring material in a nearby structure. As with the samples from Area A, damp loving plants and common crop contaminants form the majority of the assemblage which suggests the cultivation of heavier soils.

It would seem likely judging the condition and make up of this assemblage that sample 53 represents the destruction of spoiled grain, with some crop/clearance waste. While grain could have spoiled in storage after transportation from elsewhere, the presence of weed seeds and other waste makes it more likely that the crops were grown locally.

Pits and post holes

The upper fill of Pit 7550 (sample 51) contained the only charred assemblage comparable in quantity and diversity with that present in sample 53. The cereal grain, while still in poor condition, is less fragmented and slightly better preserved than is the case in other samples and as a result a larger percentage is identifiable to genus if not to species. Wheat, barley and oats are all present as well as oat/brome together with a significant quantity of cereal chaff with in excess of 1000 glume base fragments present as well as a smaller but not inconsiderable quantity of rachis internode fragments which are unfortunately too broken up to identify further.

The much smaller quantity of embryos and coleoptiles as well as the less fragmented nature of the grain argues for a slightly different origin for this material to that in sample 53. There is far less evidence of possible crop spoiling and together with the considerably larger quantity of chaff and wild plant seeds it would seem a reasonable hypothesis that this is the result of crop processing such as coarse sieving and dehusking with the grains present being those that either became broken during the process or accidentally spilled into the waste.

As with the other pit samples on this site the deposit is likely to be a deliberate dump of waste.

Vivianite staining was observed on many fragments of the charred material in this sample which is an indicator of prolonged waterlogged conditions.

Discussion

The scant and poorly preserved charred material from Area A perhaps indicates that this area was unsuitable for cereal cultivation during the Iron Age, probably being used as pasture/grazing although it is worth noting that the majority of samples from this area originate in ditch rather than pits while the richer samples from Area B come from pit fills with the nearby ditches being almost devoid of material.

The samples from Area B contain a greater quantity of charred material including grain and chaff from glume wheat (probably predominantly spelt as the most commonly cultivated cereal in the region in the later Iron Age and Roman periods (Monkton 2006)), barley and probably rye. This pattern is fairly typical for Roman sites locally; the main crops cultivated were wheat (spelt with occasional emmer and bread wheat (*T. aetivum* type)), and hulled barley (*H. vulgare*) including six-row. Rye has been found as an occasional crop and wild or cultivated oats possibly as a weed of crop (*Ibid*.). The charred seeds from uncultivated plants are again fairly typical and include plants which are commonly found in arable fields including oat/brome, vetches, grasses and various other plants such as cleavers (*Galium aparine*) and mayweed (*Tripleurospermum* sp.) and are regularly found within assemblages of this type and date. Stinking mayweed (*Anthemis cotula*), identified in sample 51 and only identified in the east Midlands region from the Roman period onwards, is considered to be an indicator agricultural intensification in the Roman period with the cultivation of heavy clay soils (*Ibid.).* The presence of rushes and sedges, are probably also indicative of the cultivation of these heavier, damp soils.

The abundance of cereal chaff particularly in sample 51 is again reminiscent of other Roman sites in the region again probably indicative of agricultural intensification. At Carsington in Derbyshire a deposit largely consisting of spelt chaff found in a late 3rd-4th century building was thought to represent dehusking of wheat for local consumption (Monkton 2006).

The possible presence of rye (*Secale cereale*) grains in small numbers is interesting as this crop is largely associated with the Saxon period and not commonly found on earlier sites, although it has been occasionally recorded from Roman sites in the east midlands such as Dunston's Clump in Nottinghamshire (Monkton 2006). Other Roman examples from sites further north include finds from York (Williams 1979), Verulamium (Helbaek 1952), Scotch Corner and Walton-le-Dale (Hall & Huntley 2007). It is believed that rye was introduced to Germany during the Roman period (Mills 2006) however; the general consensus is that rye when present for this period in Britain represents small groupings of crop contaminants as opposed to being a crop in its own right (Campbell 2016, Senser & Hawkes 1980). The brittle floret of the rye grain makes them particularly prone to casual dispersal which may also affect their likelihood of appearing within an assemblage.

Conclusion

The samples taken during both the evaluation and excavation stages of this site provide little evidence for Iron Age farming practices, although small scale cereal cultivation is likely. Samples dating from the Roman period included greater quantities of charred remains but again indicate probably fairly small-scale arable farming for local consumption. In keeping with other sites in the region there is evidence suggesting the cultivation of heavy clay soils in the Roman period. Again consistent with the regional picture, the primary cereal seems to have been wheat, probably spelt, with barley and possibly rye as secondary crops. A single charred legume from sample 56 may indicate the consumption of peas or beans, but generally pulses are unlikely to become charred and any food preparation would have taken place in settlement areas, so the cultivation and use of this foodstuff is likely to be under-represented.

Cultivated soils in both the Iron Age and Roman periods are likely to have been be damp, as they are at the site today, since many seeds within the assemblage are from plants with a preference for these conditions. Waterlogged conditions locally are also indicated by vivianite staining in sample 51 and mineral encrustation, which affected the material in samples from across the area.

Sample No		13	14	15	16	17	51	52	53	54	55	56	57	58
Context No		4843	5019	5022	5063	5084	7552	7621	7644	7660	7665	7530	7534	7535
Feature		4842	5018	5020	5061	5083	7550	7617	7643	7627	7664	7629	7671	7672
Group			4827	4988	4985			7762						
Area		A	A	A	A	A	B	B	B	B	B	B	B	B
Description		Fill of posthole	Fill of Penannular Ditch	Upper fill of Pit	Upper fill of Ditch	Fill of ditch re-cut	Upper fill of Pit	Middle fill of Ditch	Basal fill of Pit	Fill of Hearth	Single fill of Pit	Single fill of Pit	Single fill of Pit	Single fill of Pit
Phase		U/D	IA	LBA/EIA	LBA/EIA	IA	Roman	Roman	Roman	Roman	Roman	Roman	Roman	Roman
Volume (L)		25	40	10	40	40	40	35	38	8	35	38	34	28
Flot Volume (ml)		2	10	2	10	18	75	5	50	5	200	20	65	50
Flot scanned		100%	100%	100%	100%	100%	100%	100%	100%	100%	50%	100%	100%	100%
Charcoal														
	>4mm		+			+	+			+	+++	+	+++	+++
	2-4mm		++			+++	+++		+++	+++	++++	++	++++	++++
Cereal grain														
Triticum sp.	wheat						30#		24#			2#	9#	
cf Triticum sp.	cf. wheat						7#		8#				7#	3#
Hordeum sp.	barley						5#	1#						
cf Hordeum sp.	cf. barley						9#						3#	1#
Avena sp.	oat						12#		3#					
Avena/Bromus	oat/brome					1#	55#		87#				4#	1#
Secale cereale	rye								4#					
cf Secale cereale	cf. rye								3#					2#
Cerealia	indet cereal		3#	1#		2#	277#	1#	299#				74#	25#
Chaff														

Triticum dicoccum/spelta	emmer/spelt glume base		3#			2#	>1000 #		309#			6#	112#	27#
Triticum dicoccum/spelta	emmer/spelt spikelet forks						13#		2#				10#	
Cerealia	Indet rachis						386#		106#	2#			17#	7#
Hordeum sp.	barley rachis												15#	2#
Cerealia	detached embryo						24		181				1	
Cerealia	Coleoptiles/radicula						3		68#					
Avena sp.	oat awns						***							
Nuts/Legumes/etc														
Legume >4mm	pea/bean											1#		
Wild Species														
Fumaria officinalis	common fumitory						2							
Fabaceae	pea family						3#							
Vicia/Lathyrus sp. >2 mm	vetch/vetchling/tare, etc (157)						5#		2#					1#
Vicia/Lathyrus sp. <2 mm	vetch/vetchling/tare, etc (157)			1#			29#		1#			1#		2#
Viola palustris	marsh violet		1			1								
Polygonaceae	knotweed family								1#					
Persicaria sp.	knotweed						2	1	2					
cf Persicaria sp.	cf knotweed								5#					
Rumex sp.	docks						27#	7#	2#				6#	1#
Rumex acetosella	sheep's sorrel						4#		2					
Stellaria media	common chickweed					1		6					9#	1
Amaranthaceae	goosefoot family								4#					
Chenopodium sp.	goosefoots						7		9					
Atriplex sp.	oraches								4					
Montia fontana	blinks						2		6				2#	1
Galium aparine	cleavers (Large seeded)						1#							

Galium aparine	cleavers (Small seeded)						1							
Veronica hederifolia	ivy-leaved speedwell					1	1#	8	6?	5		1	2	
Asteraceae	daisy family						26#		6#					
Anthemis cotula	Stinking mayweed						33#							
Anthemis cf cotula							6#							
Leucanthemum/Tripleurospermum	Oxeye daisy/mayweed						14#		13#				5#	
Tripleurospermum sp.	mayweed					1#								
Juncus sp.	rushes					1	2		18					
Cyperaceae	sedge family		1										3#	
Isolepsis setaceae	bristle club rush						3						2	
Carex sp.	sedges (2 sided)						2#							
Carex sp.	sedges (3 sided)						3#							
Poaceae	grass seeds (various)						22#		32#			1#	2#	3#
Other														
Indet.	seed/fruit		1#				33#	1#	18#				9#	5#
Raphanus raphanistrum	Wild radish seed capsules						3 + 10#		1 + 5#				1#	
. # Fragmented, vitrified or missing some external indicators. *1-5, **5-25, ***25-50, ****50-100, *****100+														

APPENDIX C BIBLIOGRAPHY

Barker, G and Gamble, C (eds.) 1985 *Beyond Domestication in Prehistoric Europe*. Academic Press. London.

Bird, D 2016 *Agriculture and Industry in South-Eastern Roman Britain*. Oxford, Oxbow.

Cambell, G 2016 Market Forces – A Discussion of Crop Husbandry, Horticulture and Trade in Plant Resources in Southern England. in *Agriculture and Industry in South-Eastern Roman Britain* by D Bird. Oxford, Oxbow.

Cappers, R.T.J, Bekker R.M, and Jans, J.E.A 2006 *Digital Seed Atlas of the Netherlands*. Groningen Archaeological Studies 4, Barkhuis Publishing, Eelde, The Netherlands. www.seedatlas.nl

Cook, S 2017a The Environmental Samples in *Boulton Moor, Chellaston, Derby (Phase 4).* Archaeological Evaluation and Excavation Report. Oxford Archaeology.

Cook, S 2017b The Environmental Samples in *Land at Boulton Moor, East of Chellaston Lane (Phases 3 & 4), Derby.* Archaeological Evaluation Report. Oxford Archaeology.

Hall, A and Huntley, J 2007 A review of the Evidence for Macrofossil Plant Remains from Archaeological Deposits in Norther England. Research Department Report Series 87/2007, English Heritage.

Helbaek, H 1952 *Early Crops in Southern England*. Proc. Prehist. Soc., London.

Hillman, G. C. 1981 Reconstructing crop husbandry practices from charred remains of crops. In R. Mercer (ed.) *Farming Practice in British Prehistory*, 123–162. Edinburgh, Edinburgh University Press.

Historic England, 2011. *Environmental Archaeology. A guide to the theory and practice of methods, from sampling and recovery to post-excavation* (2nd edition). Centre for Archaeology guidelines.

Jacomet, S 2006 *Identification of cereal remains from archaeological sites* (2nd edition). Archaeobotany Lab, IPAS, Basel University.

Jones, M K 1985 Archaeobotany beyond subsistence reconstruction.in *Beyond Domestication in Prehistoric Europe*. By G.W.W. Barker and C. Gamble (eds.). Academic Press. London. 107-128.

Kenward, H K and Williams, D *1979 Biological evidence from the Roman warehouses in Coney Street.* The Archaeology of York AY 14(2). London, CBA.

Mercer, R (ed.) 1981 *Farming Practice in British Prehistory*, 123–162. Edinburgh, Edinburgh University Press.

Mills, T *2006 A Study Of European Cereal Frequency Change During The Iron Age And Roman Periods.* Unpub Phd, Sheffield.

Millett, M, Revell, L and Moore, A 2016 *Oxford Handbook of Archaeology*, OUP, Oxford

Monkton, A, 2006 An archaeological resource assessment and research agenda for environmental archaeology in the East Midlands region, pp. 259-286 in Cooper, N J (ed.) *The Archaeologyof the East Midlands: an archaeological resource assessment and research agenda*. Leicester Archaeology Monographs 13, University of Leicester

Oxford Archaeology, 2017 *Sampling guidelines* (4th edition), Unpublished document.

Oxford Archaeology, 2017 *Land at Boulton Moor, East of Chellaston Lane (Phases 3 & 4), Derby.* Archaeological Evaluation Report. Oxford Archaeology.

Oxford Archaeology, 2017. *Boulton Moor, Chellaston, Derby (Phase 4).* Archaeological Evaluation and Excavation Report. Oxford Archaeology.

Sencer, H, A & Hawkes, J, G 1980 On the origin of cultivated rye. *Biological Journal of the Linnean Society,* 13: 299-313. Downloaded from https://academic.oup.com/biolinnean/article-abstract/13/4/299/2682752 on 01 July 2018

Stace, C 2010 *New Flora of the British Isles*, 3rd Edition. Cambridge: CUP.

van der Veen, 1992 Crop Husbandry Regimes – *An Archaeobotanical Study of Farming in northern England 1000BC – AD500.* Sheffield Archaeological Monographs 3. JR Collis.

Williams, D 1979 The plant remains. In: Kenward H K and Williams D. *Biological evidence from the Roman warehouses in Coney Street.* The Archaeology of York AY 14(2). London: CBA. 45-100.