## APPENDIX 1: PALAEOENVIRONMENTAL METHODOLOGIES

### A1.1 Plant remains

*Mhairi Hastie*

#### A1.1.1 Introduction

The analysis of the plant remains concentrates on the carbonised cereal grain and chaff, and other plant remains (including weed seeds, nutshell, fruit remains, etc) that were recovered from the samples retained during the excavation.

#### A1.1.2 Methodology

For the analysis of palaeoenvironmental remains, 1,040 bulk soil samples were retained during the excavation. All of the soil samples were processed through a system of flotation: the floating debris (flot) was collected in a 250μm sieve and material remaining in the tank (retent) was washed through a 1mm mesh.

In order to gain a quick characterisation of the samples a random selection, over 60% of the total samples (including both the flot and retent fractions) from each excavated area (Areas A–H), were scanned using a low-powered binocular microscope to assess the quantity and quality of plant remains present in each sample.

A database was compiled recording the quantity and diversity of the plant remains present. The aim was to characterise the deposits, highlighting any samples that were distinctive, and any trends in the data. The plant material recovered was split into six main groups: cereal grains, chaff remains, straw fragments, weed seeds, rhizomes and hazelnut shell. The quantity of wood charcoal present in each flot fraction was also recorded, although these are not further discussed.

**Table 26** Four-point scale for abundance of plant remains

| Scale | Abundance | Approx. quantity |
|---|---|---|
| + | Rare | 1–10 items |
| ++ | Occasional | 11–50 items |
| +++ | Common | 51–100 items |
| ++++ | Abundant | 101 + items |

The quantity of the plant remains was recorded using a four-point scale (see Table 26).

#### A1.1.3 Detailed identifications

Twenty-eight samples found to contain high concentrations of cereal grains ( '+++' or '++++') were fully sorted, and the plant remains identified and counted. All identifications were made with reference to the modern collection of CFA Archaeology Ltd, and standard seed atlases.

Where very large quantities of carbonised plant remains were present, the sample was subdivided using a riffle box, and a proportion of the plant remains sorted and identified. The quantity of grain and other plant remains in these samples was then multiplied to give an estimate of the total in the full sample; estimates are identified by a number followed by an (e).

### A1.2 Charcoal analysis

*Michael Cressey*

#### A1.2.1 Introduction

The objective of the charcoal analysis was to obtain an insight into the local woodland composition using a spatial approach to determine the relative frequency of the species of wood exploited for fuel and construction (eg roundwood and timber) across the site. This is a very generalised approach which accepts there is a range of biases affecting the charcoal assemblage, including differential use of wood at the time it was exploited, preservation within the buried environment (taphonomic agencies), size selection during identification and importantly the lack of radiocarbon-dated local pollen diagrams close to the study area.

A preliminary charcoal assessment was undertaken on the retent fraction to establish the quantity and quality of the assemblage. Follow-up analysis was then carried out to determine the overall species composition on samples recovered from the variety of pits, post holes and other negative features within Areas A–H. Species were selected for radiocarbon dating on the basis of these results. The assemblage was also examined to assess the quality and degree of abrasion and vitrification of the charcoal assemblage. Taphonomic processes, in particular remobilisation within the buried environment can, depending on the nature of the soil surrounding it (sand/gravel or both), lead to abrasion. This causes rounding-off of the edges of the charcoal fragment resulting in amorphous fragments. Vitrification leads to a glass-like appearance within the vascular structure of charcoal and is attributed to intense heating as a result of secondary burning.

#### A1.2.2 Methods

Charcoal was collected by hand during the excavation and in bulk samples, which were processed using a flotation tank (see above, Section A1.1). Large samples of charcoal (over 100g) were split in a riffle box to produce sub-samples in order to speed up the sampling process. Smaller samples were processed using routine methods. In all cases, counts were limited to 25 identifications per sub-sample using a binocular microscope at magnifications ranging between ×10 and ×200. Generally, identifications were carried out on transverse cross-sections. Anatomical keys listed in Schweingruber (1992) and in-house reference charcoal was used to aid identifications. Asymmetry and morphological characteristics were recorded. Vitrified charcoal fragments, possibly a result of secondary burning, were recorded but in general this material is usually not identifiable owing to increased fusion of the vascular structure. In this report 'roundwood' is used as a term of reference for branch wood that has not been modified. Where applicable, woodworking evidence such as squaring and trimming has been noted. Samples <4mm are considered to be below the level of identification (BLOI).

#### A1.2.3 Charcoal identifications

Seventy-four samples were below <2mm and could not be identified. The bulk of the assemblage is represented by fragments where the morphology of the individual fragments have no coherent shape (ie non-cylindrical typical of branchwood). *Quercus* (oak) fragments into small plate-like fragments as a result of splitting along its multiseriate rays. Larger-diameter charcoal was more common in the grab-samples and is typical of branchwood.

The complete sub-sampled 4mm charcoal assemblage is represented by 1,114 individual identifications and five individual species of tree. *Alnus glutinosa* (alder) is the least abundant, represented by only two fragments. *Salix* sp. (willow) is low in frequency, with only six fragments present. *Betula* sp. (birch) is also low in frequency, with 37 fragments weighing 14g in total. The understorey shrub *Corylus avellana* (hazel) is represented by 433 samples (260g) while *Quercus* sp. (oak) is the most abundant species, attaining 329g represented by 636 individual fragments.

### A1.3 Soil micromorphology

*Clare Ellis*

Thirty Kubiena tin samples were taken from a variety of representative features, including pits, ditches/gullies and occupation deposits. The summary results are presented in the relevant sections, and full descriptions are available in the archive.

#### A1.3.1 Strategy

*Chris O'Connell*

Where possible, Kubiena tin samples were taken in order to understand and/or confirm the depositional sequence of fills within features as interpreted in the field by means of archaeological excavation. Ring ditches were targeted where possible with the aim of testing the animal byre hypothesis. However, practical considerations limited sampling by Kubiena tins; the majority of the features were filled with a single fill, thus limiting the evidence for an understanding of depositional sequences; similarly, the shallow depths of the fills of many of the features prohibited the use of a Kubiena tin; the often stony and gravelly nature of some of the feature fills also precluded the use of this kind of sampling.

#### A1.3.2 Thin-section manufacture and description

The samples were prepared for thin-section analysis at the Micromorphology Laboratory following the methods of Murphy (1986). The samples were assessed using a MEIJI ML9200 polarising microscope following the principals of Bullock et al (1985), Fitzpatrick (1993) and Stoops (2003). A range of magnifications (×40 to ×400) and constant light sources (plane polarised light – PPL, cross-polars – XPL, circular polarised light and oblique incident light – OIL) were used in the analysis.

### A1.3.3 Objectives

The specific objectives of the analysis were:

- to determine the character and nature of the various deposits
- to explore and identify modes of formation and accumulation.

### A1.3.4 Summary descriptions

The sampled deposits range from coarse sand to silt and are either poorly sorted or moderately sorted. The dominant mineral is quartz, with minimal amounts of feldspar. The rock fragments are derived from a number of igneous, volcanic, sedimentary and metamorphic lithologies; most are weathered. The vast majority of the sampled contexts have been extensively reworked by soil fauna, evidenced in the prevalence of faecal pellets in the form of microaggregates. Consequently, the dominant microstructures are granular or crumb, with many showing elements of both (complex). These types of microstructure are reflected in the relative abundance of pores and voids. Most of the contexts contain fragments of root. Fungal spores occur in the majority of the contexts; some are clearly burnt and other are not.

The majority of the sampled contexts have a significant amorphous organic content that is burnt or charred; a few contexts contain limited quantities of amorphous organic matter that has not been burnt. Most contexts are reddish-brown to brown when observed in PPL; this is due to the presence of ferrihydrite as well as the colloidal organic matter. In XPL the contexts are isotropic (undifferentiated b-fabric) because of finely crystalline iron and amorphous organic matter.

Post-depositional alteration features that occur in the majority of the contexts include limited impregnation of the matrix material by sequioxides; evidence of probable partial waterlogging. A significant number of samples also contain clasts of sequioxides, broken and redeposited coatings of iron oxide; this breaking-up of the iron oxide would have been caused by bioturbation. Calcium oxalate replacement of roots is very rare and was observed in a minority of contexts.