7. TAPHONOMY OF THE BACKLAND SOILS

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7.1 Introduction

The archaeological works in the New Street Gasworks site revealed post-medieval backland soil buried beneath the 19th-century Gasworks infrastructure. Four samples from the excavation were assessed in terms of their ability to further elucidate site formation processes and on-site occupation activities and one was selected for micromorphological analysis.

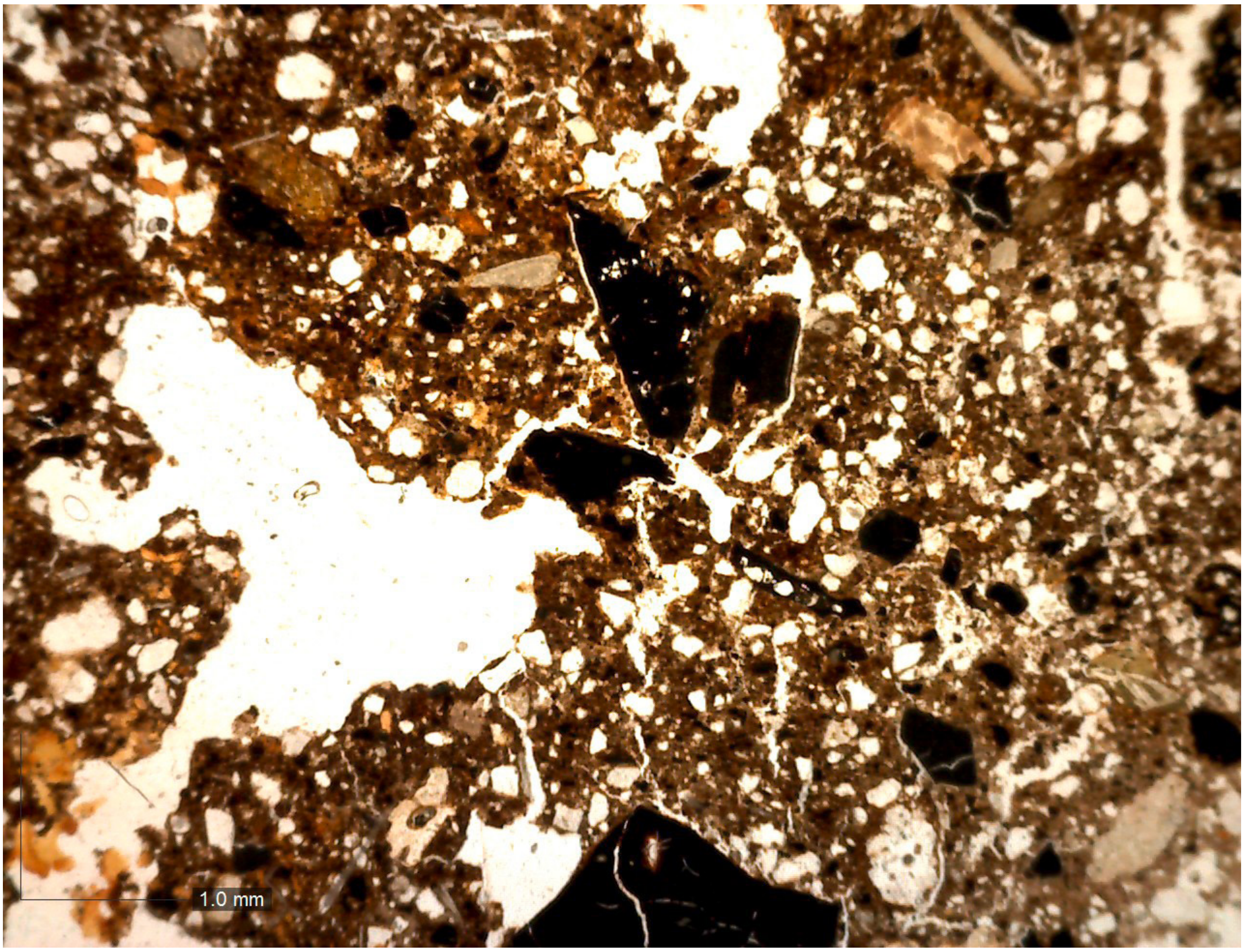
The analysis of microstratigraphy and microstructure of the archaeological sequences and examination of the relationships among construction features, sediments, and their archaeological findings is essential for interpreting natural depositional processes and palaeoenvironmental changes (Karkanas & Goldberg 2007: 63), human-induced soil formations and disturbances, land management and the use of space and structure of sites (Matthews et al 1997).

7.2 Stratigraphy

The in situ post-medieval backland soil deposits occurred at various depths between 39m and 42m AOD (Engl & Bailey 2006). This compared with the maximum recorded depths of 41.25m AOD for backland soil beneath the Waverley Station Vaults site to the west and 38m AOD for backland soil within the area to the immediate east. The natural subsoil or bedrock, underlying the archaeological deposits, varied from 2.9m (39.7m AOD) to 4.0m in depth (38.6m AOD).

7.3 Methodology

One sample was prepared for analysis using the methods of Murphy (1986) at the University of Stirling in the Department of Environmental Sciences. The thin



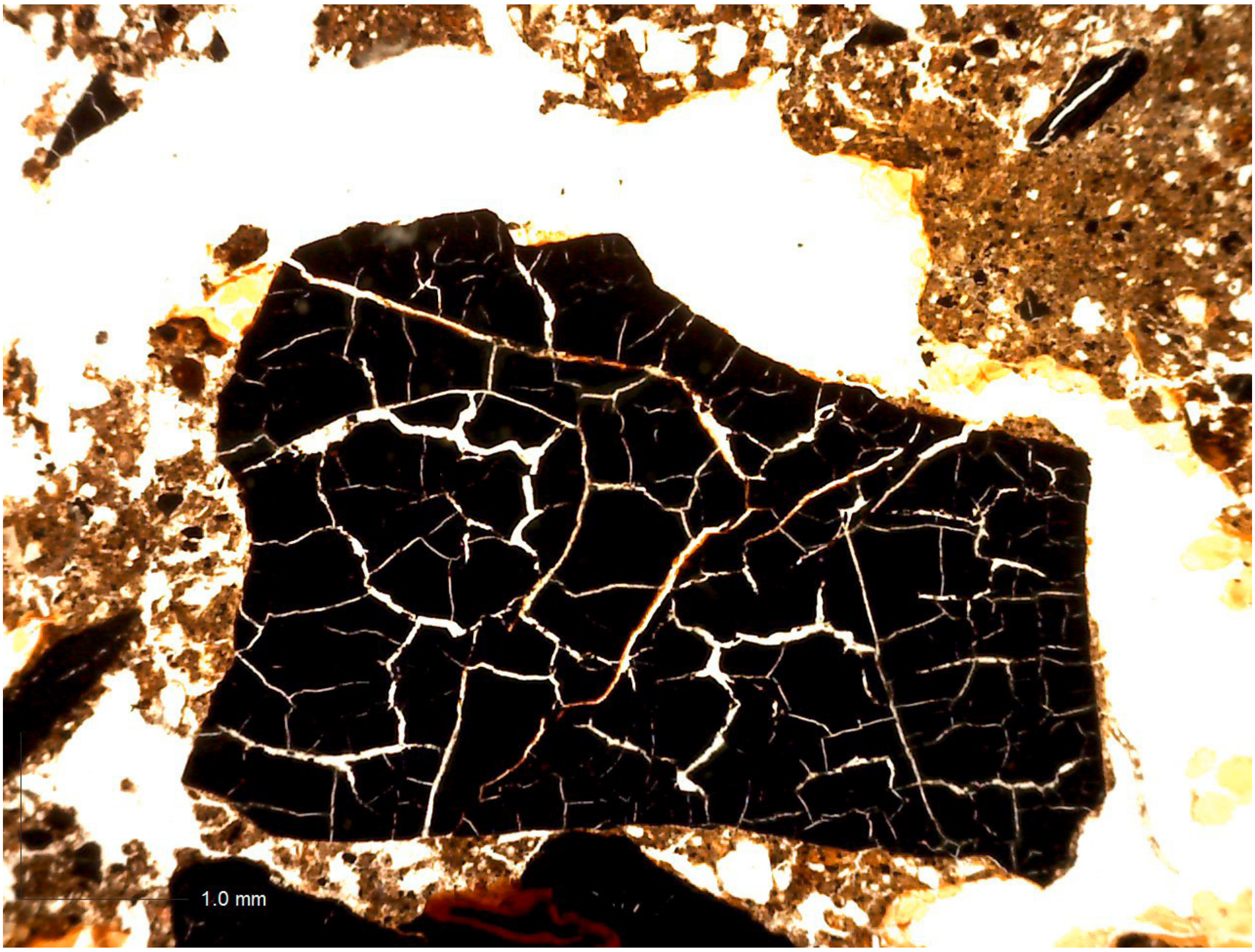
Illus 80 Channel and chamber microstructure Unit 1

sections have been described using the terminology of Bullock et al (1985) and Stoops (2003). The coarse/fine limit of 10µm is used for both the mineral and organic components. Samples were observed in plane polarised light (PPL) and cross polarised light (XPL) at magnifications of ×50, ×100, ×200 and ×400. Thin section description was conducted using the identification and quantification criteria set out by Bullock et al (1985) and Stoops (2003), with reference to MacKenzie & Adams (1994) and MacKenzie & Guilford (1980) for rock and mineral identification, Fitzpatrick (1993) for further identification of plant material, and Schweingruber (1978) for identification of charcoal. Full details of the methods used are described in the archive report (Roy 2018).

7.4 Results

The sample was found to comprise two broad microstratigraphic units distinguished on the basis of observed difference in porosity and size and quantity of exotic components. Unit 1 is contained within the base of the sample and in thin section it was observed to consist of a mixed heterogeneous sediment. The microstructure is complex and locally variable and includes massive and channel and chamber (Illus 80). Fine material comprises fine dark brown organic coatings to mineral grains and fine charred material which occurs between the sand grains. Organic inclusions comprise few individual reddish-brown cells with very few poorly preserved plant tissue and organ fragments, frequently with only the outer lignified tissues remaining. Few internally amorphous black probable charred fragments are distributed throughout the matrix. A single charred cereal grain was also identified. Observed pedofeatures include the aforementioned organic coatings and occasional dusty clay and silt coatings to voids.

Unit 2 is present within the upper 30% of the sample, where it had a diffuse boundary with the



Illus 81 Probable charred peat fragment with yellow clay staining to voids

underlying unit and was distinguished by its darker colour and higher proportion of organic material (charred and uncharred). The context was a poorly sorted sand deposit with a complex microstructure of 5% to 10% unaccommodated channels and vughs with undulating void walls and locally weakly separated granular microstructure. The unit contained frequent charred plant material including common opaque fragments of cellular charcoal and amorphous blackened charred and cracked organic matter which may be burnt peat (Illus 81). Frequent silt, very fine sand and fine sand-sized black particles were probably comminuted charred particles. Observed pedofeatures were limited to rare brown typic Fe/Mn nodules (50–500µm) and rare dusty and silty coatings to voids.

The mineralogy of the sand grains and lithology of the rock fragments from throughout the sample sequence represent a soil parent material, sandy soils derived from colluvial deposits overlying sandstones (Bown & Shipley 1982), present over much of the surrounding area. Minerals are often present as individual grains and mineral aggregates. Observed rock fragments are predominantly of sedimentary type (see MacKenzie & Adams 1994). In both units quartz grains dominated the coarse mineral (>10µm) component of the sample with feldspars commonly present. The grains were predominantly sub-angular to sub-rounded and randomly distributed throughout the matrix. The most abundant grain size in all samples was medium sand (200–500µm) to coarse sand-sized (500–1000µm) quartz grains. Other minerals present in the samples included feldspars biotite, mica and chlorite, each of which constitute <2% of the coarse mineral content. No patterning or significant variation in mineral content was observed within the sample. No erratics introduced by human occupation were observed within the sample.

A high degree of bioturbation within both units was observed, as indicated by reworked fabric and the random, occasionally clustered, distribution of natural and anthropogenic components. Fragmentation by biological activity in the soil was visible in the large quantity of finely comminuted charcoal and pedofeatures and inclusions dissected by post-depositional channels.

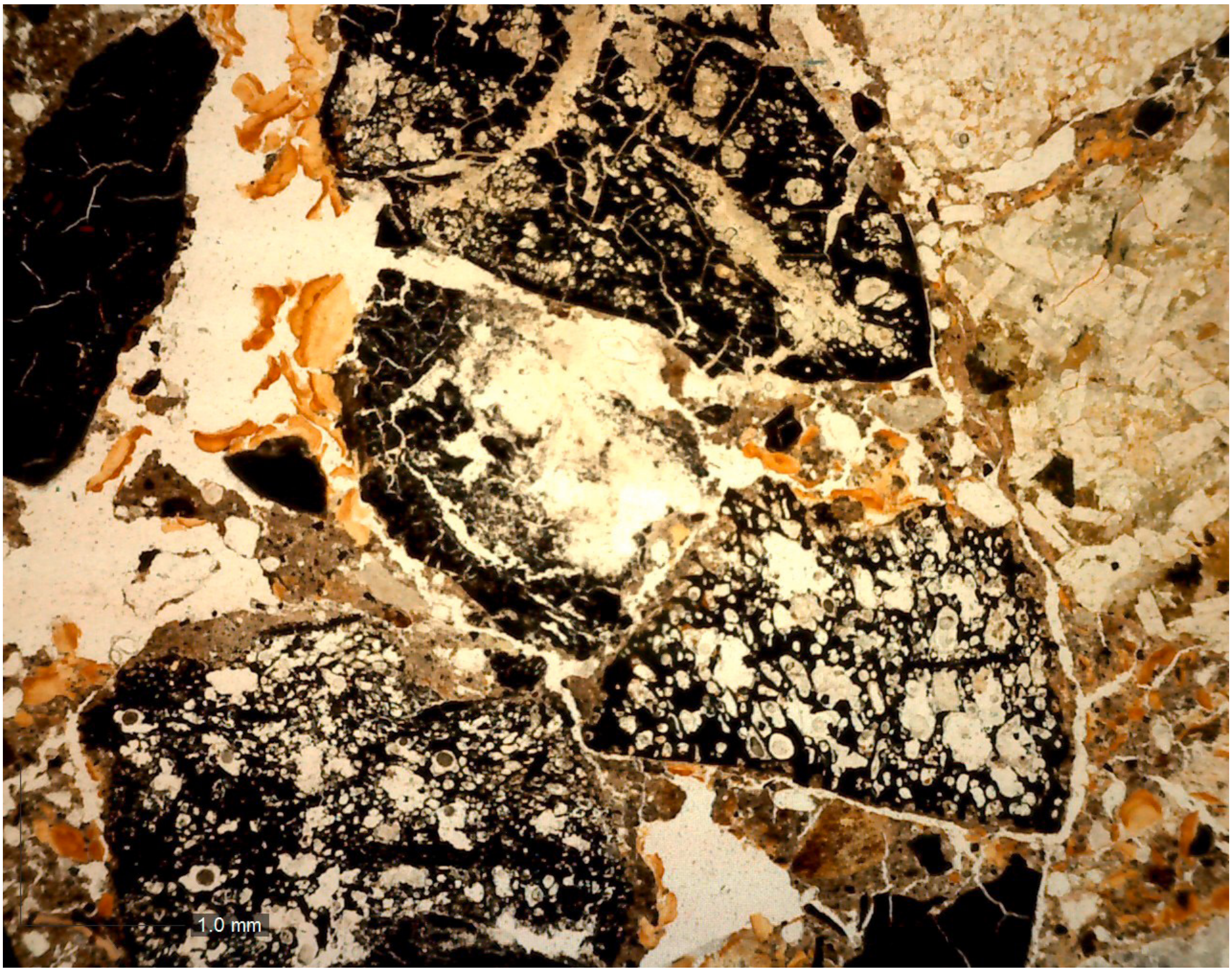
The sample had a largely undifferentiated b-fabric, likely because the dark amorphous organic matter staining masked the interference colours of the clay. The birefringence of the fabric was low. Phytoliths were rarely observed and where seen were generally disarticulated and poorly preserved, preventing identification of type, although their presence was generally indicative of grass vegetation. Both layers contained large quantities of charred amorphous fine organic matter including fine charcoal which obscured visibility within the groundmass.

Observed anthropic indicators within both units included cellular wood charcoal, charred sediment, and burnt and unburnt mammal bone. Within Unit 1 at the base of the sample, a cluster of blackened nodules with vesicular structure was found (Illus 82), which has likely developed during burning composed of incompletely burnt carbonaceous matter, formed from characteristic vesicular lumps indicative of the coal-burning process (see Canti 2017: 144–5). Sub-angular and sub-rounded fragments of isotropic dark glass featuring possible olivine crystals are likely fragments of slag (see Angelini et al 2017). They have vesicular porosity, which is derived from bubbles of gas trapped during the heating process. Rounded droplets of slag, *c* 200µm in diameter, were also observed. A single charred seed was also identified at the top of Unit 1. Anthropic indicators within Unit 2 also include pottery fragments, clay pipe and fish bone.

Iron and manganese replaced organic material within localised areas of the sample. The observed chemical changes appeared to be localised and possibly reflect variations in the acidic anaerobic and damp conditions required for them to occur.

7.5 Discussion

Early maps show the largely undeveloped nature of the Canongate backlands until the late 18th century. The sample was removed from an area shown as gardens or perhaps lightly cultivated horticultural or orchard ground. Dusty clay coatings such as those observed within the sample are commonly associated with agriculture and ground clearance activities and thus are consistent with the land use shown on early maps. Clay coating features are explained by Jongerius (1983) as derived from the splash effect of the rain on a bare surface, most often cultivated. In a forest context, the combination of the local deforestation and the rigorous preparation



Illus 82 Vesicular melted charred materials – possible coal

of the soil surface (levelling, digging, trampling) necessary for charcoal burning would generate a periodic long-term bare surface conducive to dusty clay coating and intercalation formation. Marked iron and manganese staining within the upper unit indicates the context to be a relatively poorly drained soil, high in organic matter and affected by some groundwater gleying. These characteristics are indicative of podsol formation and also indicate that the site was located within an open vegetated area in damp conditions

The anthropic components identified micromorphologically suggest that domestic refuse or fuel may have been added to the soil. This would be consistent with a cultivation soil that has been deepened either by the deliberate addition of mineral material as manure or by the dumping of domestic waste. The loose well-separated microstructure reflects the dumping of material testified by the juxtaposition of reworked aggregates with different origins.

The identification of two distinct microstratigraphic units within this single sample is reminiscent of a dark earth, ie the outcome of pedogenetic transformations acting on originally well-stratified urban archaeological deposits. The sample thus represents a palimpsest of different activities and natural processes. The upper unit is increasingly organic, with evidence for more intensive biological activity giving an increasingly pellety structure towards the top of the profile and indicating that this deposit was left open to the elements for sufficient time to allow for partial reworking and homogenisation. The frequency of charcoal also decreases upwards. These changes are indicative of a change in anthropic influence on this deposit, possibly reflecting a slight change in activity in the immediately surrounding environs.

The presence of anthropic indicators such as slag throughout the profile (particularly in the upper unit) is indicative of nearby industrial influences. Dennison suggests that in the 17th century craft and trade activities in the vicinity of the site were extensive and that 'the craftsmen of Canongate continued to outnumber merchants since the burgh now functioned very much as a manufacturing suburb of Edinburgh' (Dennison 2005: 98). The identified exotic industrial components within the sample contrasts with the backland soil analysis at the nearby Waverley Vaults site, where the only identified anthropic indicators comprised charcoal (Fouracre 2007). The inclusion of slag, pottery, clay pipe and burnt and unburnt bone noted here are indicative of a deposit influenced by nearby occupation and possibly industry.