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St Leonard's Hospital, York: Environmental sample flotation assessment

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Cover photograph: Excavations in progress, 2001

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St. Leonard's Hospital, Museum St. York: Environmental Sample Flotation Report

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Introduction

One hundred and fifty bulk sediment samples ('GBA'/'BS') were processed for the assessment of their bio-archaeological potential between 18 September and 25 November 2011. The majority of samples were interpreted during excavation as either Stone-phase defences of the Roman legionary fortress and associated Intervallum activity; industrial activities from a series of hearth and ash deposits; an Anglo-Scandinavian timber building; infirmary undercroft relating to domestic occupation (including several possible and one more definitive cess pits); later 12th century ditch; food processing and metalworking areas of the later 13th century undercroft; chapel extension and stone-lined drain; and landscaped 19th century area leading to later land use for the construction of an air raid shelter in the mid-20th century.

The composition of the bulk samples was primarily silt with sedimentary and igneous inclusions of chert, limestone, marls, flints, quartz, hornfels and gypsum gravels. In some cases the silt was subsumed by conglomerations of mortar and plaster rubble including (1328) [100] and (1320) [094] from the Roman period; sample (3424) [162] from the early infirmary period; sample (1372) [126] from the later 12th century ditch and sample (5090) [197] from the later landscaping period in the 19th century, all showing evidence of extensive building/demolition activity. This concurs with the phasing evidence from the interim report. Processing of samples has resulted in the recovery of extensive ecofactual and artefactual assemblages, for which the data have been tabulated according to phase, group or set with special cases highlighted for further consideration. (Numbers in round brackets = context numbers; those in square brackets = sample numbers.)

A significant volume of botanical material was recovered from the site, dominated by carbonised material including large amounts of charcoal, seeds and cereal grains.

Both in terms of volume and weight, by far the largest assemblage was of industrial debris, consisting of mortar, plaster, concretions, red brick fragments, polygenic conglomerates and various intercalated residues. Red tile (fragmented) made up a number of samples, as did a local grey sandstone which was found in abundance, in varying degrees of thickness and resembling modern flagstone floor stones. In many cases there were signs of the stone having been worked. A large number of the building rubble residues also showed signs of ammonia absorption, exhibiting a green or yellow crystallised residue which released a pungent odour whilst drying following flotation that is suggestive of cess pit or ditch fills.

The bone assemblage was notably extensive and was characterised by mammal (including rodent) amphibian, fish and bird bones. Large amounts of bone were burnt and some calcined. Most samples from the majority of phases contained at least some bone.

The pottery assemblage reflected all phases of activity at St Leonard's, including a great number of sherds from the Roman through the early to later medieval periods. Most sherds were quite small (5–30mm) and some showed signs of use before deposition. They varied in terms of fabric and composition as well as in total numbers recovered. Rough local wares were

extensive, including sherds with large gritty inclusions in orange, pinks, browns and black as well as splash and green glaze. Around 30% of the pottery assemblage was Roman, 20% early medieval, 30% late medieval and 20% other. Metal assemblages included large amounts of iron artefacts but also significant quantities of lead, as well as slag from metalworking processes.

Waterlogged samples included a range of materials including twig, leaf, bark, nut (both entire nut and nutshell), leather and textiles (possibly wool). Other assemblages including those of glass and miscellaneous items were recorded within their corresponding phase, group or set.

Methodology

Sample Processing

Bulk samples were floted for the recovery of environmental and artefactual evidence using standard methods and a Siraf flotation system. Waterlogged samples were gently agitated in water and the contents teased apart and recorded before double bagging into suitably sized sample bags using the parent water and stored in marked 10L containers within a cold room. Samples for flotation were gently agitated in water over a 500 micron mesh within a flotation drum and settling tank recycled water system with the washover (flots) retained on 300 micron and 1mm Endicot sieves. Flots were wrapped in blue acid-free paper, tagged and recorded before being air dried on 420 x 300mm trays in a warm drying room. The retents were laid out separately on plastic trays and examined visually before being tagged and dried in the same fashion as the flots. Once dried, the residues were sorted using 4mm and 2mm Endicot sieves and a Schott KL-1500 LCD cold light, with components individually retained in plastic bowls. Components sorted individually included: bone (mammal, bird), bone (fish), shell (marine), shell (snail), seed, CV (carbonised vegetation)/cinder, wood, metal, glass, pottery, stone, worked stone, quartz, CBM (ceramic building material), mortar, concretions and miscellaneous items such as leather and textiles. A magnet was employed at the beginning of sorting each sample in order to locate magnetised stone and metals. Once sorted, each separate component was bagged and labelled, then grouped together with all other examples of that particular artefact for submission to the appropriate individual specialists. Once all the residues were processed in this manner they were weighed on a digital scale, double bagged and returned to their original plastic containers for storage. Sorted artefacts and ecofacts were weighed individually and then collectively (per classification) before being committed to a Microsoft Excel spreadsheet. The flots were weighed on an Ohaus CS200 digital scale and then volume assessed before being grouped together with the carbonised material sorted from the relevant retent and boxed for further analysis.

Botanical Material

Botanical material sorted from each flotation retent was stored with the corresponding flot for future analysis. Charcoal was recorded from the majority of phases represented, suggesting that there has been a strong reliance on wood for domestic and industrial practices at this site over time. The identification of charcoal can assist greatly in the interpretation of the function of a feature, confirming domestic occupation fuels, industrial processes and construction, whilst recording changes in species selection and use over time that might relate to changes in local availability, status and trade or importation. It is recommended that charcoal from a selection of samples representative of each phase of occupation be identified in order to help confirm the function of particular features. Cereals and seeds from selected contexts relating to different phases of occupation should also be analysed and interpreted in order to address particular questions relating to changes in domestic practices, status and wealth over time.

Vertebrate Remains

Mammal and bird remains were recorded using the Protocol for Recording Vertebrate Assemblages outlined by the Environmental Archaeology Unit, University of York (Dobney et al 1999). For each context a number of observations were recorded on the overall condition of the assemblage. These include bone preservation, colour, breaks of fragments (angularity) and fragment size. Evidence of butchery, carnivore gnawing, burning or post-depositional recent damage was recorded where appropriate.

Bone fragments were identified to species using comparative material and published identification guides (Schmid 1972; Barone 1996). When this was not possible, fragments were grouped into the following categories: large mammal (horse/cow/large cervid size), medium mammal 1 (sheep/goat/pig/small cervid size), medium mammal 2 (dog/cat/hare size), small mammal (vole, mouse, shrew, rat, etc). All other fragments were recorded as unidentified mammal, bird or fish. Fish remains were counted and grouped into class sizes based on the width of the vertebral centrum: small (<5mm), medium (between 5mm and 20mm) and large (>20mm).

Results

Phases 11–21: Undisturbed natural/Prehistoric activity

Phases 11–21 contained small amounts of both carbonised botanical material and animal bone, from 0.5g bone in (1393) [138] to 7.2g in (1390) [136], in which the residue had a high ammonia odour and a loose orangey alluvial gravel of average 2–10mm size. A sample of bird bone and fish scale in (1396) [140] highlights the minimal amount of deposition from Set 104 within this phase although metal deposits of 2.2g and 4.4g were noted from (1390) [137] and (1396) [140] that suggest some metalworking activity.

Phase 31: Roman (first fortress – turf and timber)

Moderate amounts of charcoal were recovered from the retents of Roman phases. Metal was not extensive, with two fragments picked up by magnet from (1392) [133] and (1351) [134] weighing 0.1g each. Other materials recorded from this phase were 2.8g mortar and 1.0g plaster from (1445) [172].

Phase 32: Roman (activity associated with the first fortress)

(3591) [237] was notable in that a small amount of seed was recovered. The metal assemblage from this phase was quite substantial, including miscellaneous metal objects from (3583) [230] and (3591) [237] from Group 302. This appeared to include iron nails and a small amount of iron slag, suggesting metalworking near to this part of the site. A small metal fastener 2.44g in (3616) [246] might support this. The pottery finds from this phase are consistent with domestic activity and consisted of small sherds of gritty grey ware which were quite coarse in (3583) [230] and (3591) [236], with orange finer fabricated sherds and small sherds of Samian ware found in (3618) [247]. Context 3616 [246] was noteworthy in the amount of pottery recovered, including orange/pink gritty ware with small sandy inclusions and two sherds from a black-coloured rough local ware pot with large gritty inclusions. Three sherds from the same grey, smooth fabricated, beaded vessel with burnt internal residue were also recorded from this sample. Industry involving burning is suggested by the metalwork and hearth and ash deposits within the Intervallum to the rear of the turf rampart. The waterlogged finds finds from (3616) [246] also show evidence of industrial activity and included off-cuts from different gauges of leather and possible sheepskin. Some of the skins exhibited signs of piercing. Twigs of possible

hazel and an entire acorn were found within this sample, as well as hazelnut shell. Roasted acorns make a beverage that has probably been drunk in the UK since prehistoric times, and hazelnuts are an excellent calorie source that stores well overwinter. The finds assemblage reflects an area of intense activity including industrial as well as domestic practices.

Phase 33: Roman (second fortress – stone)

Evidence for construction of the second stone fortress defences is well attested by the industrial assemblages, which reflect a period of intense building and demolition. Context 3454 [167] retained large amounts of varying materials including slag, ceramic building materials and mortar as well as small amounts of coal. Other samples, such as (1328) [100], yielded concretions and in (1320) [094] ceramic building material including large fragments of red tile. The metal assemblage was quite small but consistent throughout most of the samples in this phase and was recorded between 0.9g in (1355) [119] and 5.82g in (3490) [192] and mainly consisted of iron fragments highly oxidised. The small amount of pottery was consistent in this phase and dated to the late 1st to early 2nd century AD. It included mainly small grey gritty sherds but a larger assemblage in (1309) [091] included a very light brown pot sherd with yellow flecked inclusions. The CV assemblage was of interest and included quantities of nutshell from (6025) [232] and (6040) [235]. The retent from (3551) [218] included a large amount of charcoal that is worthy of further analysis.

Phase 35: Roman (activity within the Multangular Tower)

The metal artefacts recovered from (5142) [238] consisted mainly of iron nail fragments, heavily oxidised but with no other noteworthy characteristics. This phase seems to have been associated with activities within the Multangular Tower which recorded crushed mortar floors and silty deposits. These were evident but not excessive in (5142) [238] which yielded ceramic building materials only and no crushed mortar. However, the pottery assemblage from the same sample consisted of large heavy fragments of rough black pot with heavy sand and quartz inclusions, orange gritty ware with sandy fabric and grey smooth fabricated vessel sherds. The botanical assemblage from the retents was moderate, including 2.3g of charcoal from the retent of (5142) [238]. Flots were rather more productive and the analysis of a selection of them will assist in the interpretation of activities within this phase of the site.

Phase 36: Roman (activity associated with the second rampart)

The botanical assemblage from retents relating to this phase included charcoal with weights ranging from 0.5g in (3485) [186] to 6.94g in (3485) [187]. In total, 2.96g of metal was also retrieved from (3485) [186] but was not distinctive enough for further description. Although small, the pottery assemblage was consistent throughout this phase with the largest assemblage 18.69g, coming from (3485) [187]. This comprised orange gritty ware and grey wheel turned vessel sherds with a smooth paste and provided the sample with a late 3rd/early 4th century date. The deposits seem to be from the foot of the rampart in Trench 3 and, according to the interim report, suggest an accumulation of waste over a prolonged period. That ties in with the red brick and ceramic building material debris 14.0g in (3485) [186]. Much of (3485) [187] was contaminated with flecks of putative algae of which only 50% was sorted due to the excessive amount present. Small pieces of white plastic were also recovered.

Phase 38: Roman (replacement of rear of Multangular Tower by a rampart)

A significant amount of building material and debris was recovered from this phase, 129.3g of ceramic building materials from (3111) [038] consisting of red tile fragments, mortar which had traces of red paint, brick and concretions of varying conglomerations. Local yellow/grey sandstone fragments were also recovered, some of which appear to have been worked. This would support the theory that debris was utilised to form part of the rampart that lay against the

south side of the Multangular Tower. Metal artefacts weighing 10.2g were found in (5150) [243] and consisted of heavily oxidised lumps of what appears to be iron and a single copper rivet. Ceramics weighing 4.8g from (5150) [243] included a small sherd of red pottery with a white outer fabric. Charcoal weighing 5.6g was recovered from the retent of (5150) [243].

Phase 39: Roman (activity on the second rampart)

The charcoal assemblage recovered from retents was variable in terms of volume, although several pieces were of reasonable size and would provide good environmental information pertaining to species selection during this phase of occupation. It is recommended that several of the larger retents and their corresponding flots be analysed. The metal assemblage was significant, including 48.5g recovered from (3480) [182], although highly oxidised. A notable pottery assemblage was also recorded from (3477) [180], (3480) [181] and (3480) [182], including 72.34g from (3480) [182] and 9.0g from (3477) [180], comprising sherds of varying fabrics some of which appeared to be painted or stained. The building debris contained within samples from this phase reflect an enormous amount activity tentatively suggesting the foundation trench of the lower part of a timber staircase up to the wall walk (Group 304, Set 311). (3480) [182] contained a large volume of ceramic building material, with a further 50.8g from (3477) [180], comprising mortar, concretions and ceramic building materials including local grey/yellow local York sandstone. This phase also contained two rubbish pits which were backfilled once they had fallen out of use which might explain the vast amount of building debris recovered from samples.

Phase 41: Early medieval (subsequent activity to the rear of the rampart)

Charcoal was of moderate volume within the retents relating to this phase. Analysis of botanical material from the flots and retents from selected contexts would assist in the interpretation of features and provide information relating to changing agricultural practices and status. The assemblages in this phase contained 21.0g of green stained materials that could be copper or copper ore from (3475) [176] and more evidence of the same material in (3475) [176] and 0.4g in (3473) [174]. However, the deposits are tentatively described as a combination of organic dumps and natural deposits so the green residue could also result from natural processes associated with ammonia residues. Nevertheless, some definite metal artefacts were recovered from (3473) [174], including what appears to be iron fragments, heavily oxidised. There were few finds from the residue of (3473) [174] apart from small igneous pebbles 3-10mm and orangey/brown in colour. (3475) [176] was reported as being consistent with dumping and an assemblage of concretions, plaster and CBM may bear this out. Plaster proliferated within this phase and (3473) [174] contained small plaster fragments stained green, again possibly a response to ammonia present within these dumps. A large quantity of concretions were also recorded from (3469) [170], similar in colour and odour to the rest of the building rubble recorded from this phase. The pottery from (3475) [176] was noted as small sherds of orange gritty and grey gritty ware. Two animal teeth, probably mammal, were recovered from (3475) [176] and (3469) [175].

Phase 51: Early Hospital (truncation of fortress rampart)

This period is associated with early hospital activity. Materials within the residues compare favourably with this interpretation, primarily in relation to evidence of building activity, especially Group 308, Set 316 and Group 115, Set 158. These yielded enormous amounts of CBM, plaster, concretions, coal, mortar, metalworking slag and associated industrial materials, suggesting significant building works. Industrial evidence in relation to iron smelting or smithing was negligible other than (3428) [164], in which were recorded 3.0g of coal, 14.6g of metalworking slag and 41.4g of pot boilers. The pottery recovered during excavation of this phase gives it an early 12th century date although no pottery was discovered from any of the

retents that were sorted from this phase. (3424) [162] yielded oyster shell and metal artefacts, most of which appeared to be composed of iron and heavily oxidised. Moderate amounts of CV were recovered from retents relating to this phase, the largest assemblage being 11.3g in (3424) [162] and 19.3g charcoal and 0.02g cereal grain in (3428) [164]. The presence of cereals within the residues would suggest strongly that further grain will be present in moderately significant quantities and it is suggested that a representative selection of samples be analysed further in order to characterise the botanical materials present in relation to land use and domestic practice.

Phase 53: Early Hospital (medieval activity within Interval Tower SW6)

The Phase 53 Early Hospital is recorded as relating to occupation within Interval Tower SW6, within which the pottery seems to be an accumulation of late 1st and early 2nd century Roman sherds. This record is corroborated by the assemblage, 2.9g from (1260) [57] and 36.4g (1265) [62] of orange sherds <30mm recorded from the retents. Metal artefacts recovered from (1251) [47] and (1265) [62] comprised iron nails and unknown magnetic material. The building rubble, 1083g of CBM in (3431) [168], was quite extensive and was recorded as mortar and concretions, whilst (1419) [145] included crushed mortar and CBM. The botanical assemblage varied but included modern mosses as a storage artefact. The carbonised assemblage included 19.5g of charcoal from (1265) [062] and 4.5g of charcoal along with 0.3g of wood in (1250) [043].

Phase 54: Early Hospital (activity on the truncated rampart south-east of Interval Tower SW6)

No pottery was recorded from the retents in this particular phase but a large amount of building material including 427.7g of mortar and 39.7g CBM from (1419) [145] may indicate deposition or backfill of stakeholes with construction material within the truncated rampart. This is further supported by the presence of 126.5g of slag and 24.2g of iron within (3463) [169]. The botanical assemblage was not significant in this phase but included 4.1g of charcoal from the retent of (1419) [145].

Phase 61: Hospital Infirmary (construction of the original undercroft)

The CV assemblage from (3336) [135] was again contaminated with what looked like modern mosses and grasses but also included charcoal in the retent. A significant assemblage of building materials was evident in (3336) [135] including CBM and mortar which was crushed and mixed with orange/red brick-type material. One 120mm fragment of probable red floor tile was also recorded. The metal assemblage from this phase was minimal and only 8.34g of miscellaneous metal artefacts are recorded from (3336) [135]. The building material rubble backs up the suggestion of a deposit from the large foundation pits for the piers that supported the undercroft vaulting.

Phase 62: Hospital Infirmary (infilling of Interval Tower SW6)

The archaeological interpretation of this phase is the partial demolition and infilling of Interval Tower SW6, suggesting that large amounts of demolition materials might be present in retents from this particular series of bulk samples. The retents from (1180) [110], (1180) [109] and (1134) [19] support this interpretation, including 490.8g of CBM and 430.3g of mortar in (1180) [110], and a further 40.7g of CBM in (1134) [019]. Pottery from (1180) [109] was a mix of 1st century Roman and 12th to 14th century sherds, including grey gritty fragments with large sand and quartz inclusions. A well-preserved large mammal tooth (possibly horse) was also found within (1180) [109]. The metal assemblage included 21.7g of what appears to be iron from (1180) [109] and [110], again heavily oxidised but exhibiting forms akin to nail heads. The CV assemblage was more substantial from this phase and 33.5g of charcoal was recovered from the retent of (1180) [110].

Phase 63: Hospital Infirmary (activity within the original undercroft)

The pottery assemblage from Phase 63 included 55.3g of large sherds >10mm of yellow fabric with shell inclusions and orange sherds with a smooth sandy paste in (3104) [031]. Rough grey pot remains including a small < 10mm rim sherd were also recorded. A mammal tooth (possibly horse) was recovered from (3104) [031]. The retent from this sample may have been from the occupational deposits of the undercroft floor and exhibited signs of cess or byre flooring materials as suggested by the pungent odours of ammonia when agitated during the drying and sorting processes. A small sherd of black glass and several off-cuts of what was perceived to be waterlogged textile in poor condition were recorded within this sample. 7.3g of pottery was recorded from (3111) [038]. The pot was partly fused into a conglomerate with mortar and mussel, whelk and oyster shell, a large mammal tooth (possibly pig) and a large mammal rib. This conglomerate retained the heavy acrid odour of ammonia when wet. Large amounts of building materials including CBM, mortar, concretions and plaster were evident in most samples throughout this particular phase, most notably in (3205) [096] which had the largest volume of CBM and mortar. The metal assemblage from this phase varied between samples, but was generally composed of iron with 37.6g in (3104) [033] and 37.3g in (3116) [046] which was badly oxidised and only visible as an orange/brown clump with high magnetic reading. Charcoal in retents varied between 3.2g in (3294) [117] and 128.0g in (3155) [082] and could provide further information relating to form and function of features within this phase. Another mammal tooth (possibly pig) was recovered from (3480) [182], as well as an off-cut of what appeared to be textile, again in poor condition which was recorded and retained in a waterlogged state for further analysis.

Phase 64: Hospital Infirmary (ditch south-east of the original undercroft)

The botanical material from this phase of the site was extensive. Most significant was 457.26g of charcoal and various large fragments of wood in (1383) [132], which were recorded and retained wet for further analysis. Other waterlogged material from (1383) [132] included three separate pieces of varying thickness of leather in good condition that appeared to be off-cuts. Of note within the pottery assemblage was 69.2g of fine orange pottery sherds with a smooth fabric. The finds from these samples support the interpretation of this phase as originating from the waterlogged ditch to the south-east of the undercroft; they suggest dumped discarded waste. A large amount of plaster (160.5g) was recovered from (1372) [126], 142.4g from (1383) [132] and 134.6g from (1420) [148], which would support the archaeological interpretation of these features as the foundation of cobbles set in mortar at the north-west wall. Notable volumes of concretions, 232.8g from (1372) [126] and 107.7g from (1420) [148], may add more weight to this interpretation. (1420) [148] also yielded a small assemblage of metal of miscellaneous types.

Phase 65: Hospital Infirmary (further activity south-east of the undercroft)

A fairly extensive CV assemblage was recovered from Phase 65, including charcoal weighing 37.3g in the retent of (1286) [073]. A moderate amount of coal, 6.2g, was also recovered in (2192) [026]. The metal assemblage yielded 13.5g of copper or copper ore in (1319) [098] and 42.1g of iron fragments in (1420) [148]. This supports the interpretation of a hearth and possible smithing activity adjacent to the undercroft in the south-east part of Trench 1 although only 0.5g of smithing slag from (1345) [108] was recovered from that area. Large amounts of CBM were recorded within this phase, the largest assemblage being 389.7g in (1345) [108] and 67.8g in (1169) [023], consisting of red broken tile and orange/red brick-type material. A small pottery assemblage was recovered and consisted of 8.9g of grey gritty and red glazed sherds in (1341) [103], together with a fragment of green melted glass.

Phase 66: Hospital Infirmary (undercroft extended to the south-east)

A small amount of coal was recovered from this phase including 11.0g in (1355) [119]. A moderate amount of charcoal was also recovered from retents, including 15.5g in (1340) [105], in addition to the flots. 4.7g of metal artefact was retrieved from the retent in (1355) [119] together with a substantial building material assemblage, as characterised by sample (1355) [119], which contained significant amounts of CBM and mortar. The pottery assemblage was even more extensive, with 84.0g of mainly black local ware with shell inclusions and orange gritty ware with a smooth fabric in (1355) [119].

Phase 67: Hospital Infirmary (occupation within the undercroft extension)

A large amount of coal (44.1g) was evident in (1099) [014], recorded together with slag fragments. This may link with pit deposits from the undercroft extension. 11.4g of charcoal was recovered from (2063) [004], together with 10.4g of light orange gritty pottery and an animal tooth (possibly pig). (2063) [004] had a strong odour of ammonia when wet, suggesting it originated in a cess pit fill. Green glazed and gritty red sherds with shell inclusions were noted in (2064) [005]. The building debris consisted of 7.8g of CBM which was red brick-type material, heavily sooted.

Phase 82: Garden of Antiquities (first archaeological investigation of the undercroft in the mid-19th century)

Only 1.2g of pottery was recovered from this phase; it consisted of a small sherd (<10mm) of green glazed ware in (2063) [004]. The botanical assemblage in retents included small amounts of charcoal (4.9g) in sample (5090) [197] and 0.3g in (5096) [199]. There were no metal artefacts from this phase although 592.6g of CBM was recorded from (5090) [197] and 475.2g in (1321) [099] which links in with several episodes of intense demolition activity, including the undercroft and the removal of all post-medieval deposits.

Conclusions/Recommendations

The artefactual material has been returned to York Archaeological Trust for specialist analysis. Animal bones will undergo assessment analysis in comparison with hand-recovered materials in order to identify any differences in taxon representation. The botanical material has been retained for further discussion in relation to specific archaeological questions that may be answered by the analysis and identification of such material from selected assemblages.

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