ARCHAEOLOGICAL EVALUATION AT THE SITE OF THE NEW LIBRARY AND HERITAGE CENTRE, THE BUTTS, WORCESTER

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Part 1 Project summary

An archaeological evaluation was undertaken at the proposed site of the new library and heritage centre, The Butts, Worcester (SO 8467 5509). It was undertaken on behalf of Property Services, Worcestershire County Council, who intend to construct a new library and heritage centre for which a planning application is in preparation. The project is intended to augment a desk-based assessment and aimed to determine if any significant archaeology was present and if so to indicate what its location, date and nature were.

During the evaluation significant Roman deposits were located across the whole of the site. These included a cobbled surface, probably a road or trackway, in the north-east corner of the site. This appeared to be an extension of the surface noted in the earlier excavations to the east at 14–20 The Butts. The likely continuation across the site of this road or track will have a considerable importance on research into the Roman road network at Worcester and any potential Roman bridge or fording point. Also a number of ditches and a partially exposed pit containing cremated human (?) bone, were observed.

Overlying these Roman deposits a substantial layer of 'dark earth' extended across the upper reaches of the site. This deposit represented the reversion of the land back to agricultural usage in the post-Roman through to the post-medieval period. It has therefore been continuously reworked and does not have any great significance.

A small number of post-medieval brick cellars were noted towards the centre of the site.

In addition to the deposits revealed in the evaluation trenching, a series of boreholes located a layer of Roman iron slag on the lower western side of the site, indicating the presence of iron working. Also organic remains of a Roman date, on the edge of a former watercourse, were also revealed in the same area. The presence of iron slag layers provide another chance to further analyse and investigate this material, and might provide greater understanding of the character and development of the ironworking industry in Worcester.

Although only investigating a limited area of the site, the evaluation concluded that there are considerable areas of well-preserved Roman and post-medieval structural remains present, representing sequences of activity from at least the mid 1st - 2nd century AD.

Part 2 Detailed report

1. Background

1.1 Reasons for the project

An archaeological evaluation was undertaken at proposed site of the new library and heritage centre, The Butts, Worcester (SO 8467 5509), Worcestershire (Fig 1), on behalf of Property Services, Worcestershire County Council. The client intends to construct a new library and heritage centre, in partnership with Worcester City Council and the University of Worcester. The client intends submission of an outline planning application to Worcester City Council, who considered that a site of archaeological interest might be affected.

1.2 Project parameters

The project conforms to the *Standard and guidance for archaeological field evaluation* (IFA 1999).

The project also conforms to a project proposal (including detailed specification; HEAS 2006), which has been approved by Worcester City Council.

1.3 Aims

The aims of the archaeological evaluation were to - locate archaeological deposits and determine, if present, their extent, state of preservation, date, type, vulnerability and documentation. The purpose of this was to establish their significance, since this would make it possible to recommend an appropriate treatment, which may then be integrated with the proposed development programme. The project was intended to augment a desk-based assessment to which it will be appended.

The brief (Worcester City Council 2005) for the desk-based assessment identified a number of research questions, including the following:

- Roman road network (RP 3.7)
- Roman iron industry (RP3.19-3.23)
- Other Roman industries (RP 3.24)
- Sampling and analysis of dark earth (RP 3.26)
- The medieval defences: northern defensive sequence (RP 5.23)
- The city defences in the post-medieval period, including the Civil War (RP 6.14)
- The landscape of the 1651 battle (RP 6.15)
- The development of post-medieval industry in Worcester.

More specifically the following aim was identified.

- Location and condition of possible existing city wall and present ground levels along Rack Alley

2. Methods

2.1 Documentary search

Prior to fieldwork commencing a comprehensive desk based assessment was carried out by the Worcestershire Historic Environment and Archaeology Service (Miller *et al* 2005), which provided an historic and archaeological background for future archaeological investigations. An assessment of the present standing buildings on the site was also conducted in tandem with the desk-based report. A search of the planning record archives was kindly undertaken by James Dinn (Worcester City Council).

2.2 Fieldwork methodology

2.2.1 Fieldwork strategy

A detailed specification for the evaluation fieldwork was prepared by the Service (HEAS 2004) and agreed with Worcester City Council. As a result of the location of modern services, existing usage and temporary structures on the site, trench positions were slightly altered, though the trenches still provided a comprehensive coverage of the three key zones across the site (top of terrace, terrace slope and floodplain). The client had no rights of access to the properties investigated, existing buildings and the existing busy use of the properties meant that sample excavation to characterise the site's archaeology could not be achieved. No access was gained to the Transwipers and Coombers properties. The present evaluation may be considered as a first stage in the archaeological characterisation of the site. Access was kindly made available for intrusive works by Worcester City Council.

Fieldwork was undertaken at various times between 6th and 20th February 2005. The site reference number and site code is WCM 101277.

A total of six trenches, amounting to just over 36.80m² in area, were excavated over the site (an area of approximately 17200m²)., representing a sample of 0.21%. The locations of the trenches are indicated in Figure 2. Trenches 1, 2 and were located to compare to the closest of the archaeological investigations at 14-20 The Butts (WCM 100761, trench 4). Trench 4 was located in an area of a 19th century building, probably housing a horse-powered gin for the adjacent sawmill, as shown on the Netherton Estate map of 1846. Trenches 3 and 5 were located to assess the nature of the edge of the terrace and its relationship with the floodplain and were largely determined by the presence of existing buildings, services and access requirements. Trench 6, located in the far north-east corner of the present car park was located to assess the nature of the flood plain and upper levels of any deposits. The areas investigated were restricted by the need to maintain access and safety within the carpark and council depot.

Deposits considered not to be significant were removed using a wheeled excavator, employing a toothless bucket and under archaeological supervision. Subsequent excavation was undertaken by hand. Clean surfaces were inspected and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were recorded according to standard Service practice (CAS 1995). Significant archaeological deposits were sampled, and extensive structural remains were left *in situ.* On completion of excavation, trenches were backfilled by the replacing of excavated material and tarmac surfaces were reinstated.

A topographic survey was undertaken in the area to the south of The Butts along Rack Alley, aiming to locate the city wall and present ground levels.

In addition to the evaluation trenches a number of borehole surveys were carried out across the site to assess the nature of more deeply buried deposits (ARCA 2006), and to attempt to locate the presence of the former water course which once ran down the southern side of the

site, before cutting north-westwards along the western side of the study area (Miller *et al* 2005). The full report of the borehole survey is appended (Appendix 2; Wilkinson and Marter 2006).

2.2.2 Structural analysis

All fieldwork records were checked and cross-referenced. Analysis was affected through a combination of structural, artefactual and ecofactual evidence, allied to the information derived from other sources.

2.3 Artefact methodology, by Angus Crawford

2.3.1 Artefact recovery policy

All artefacts from the area of salvage recording were retrieved by hand and retained in accordance with the service manual (CAS 1995 as amended).

2.3.2 Method of analysis

All hand retrieved finds were examined. They were identified, quantified and dated to period. A *terminus post quem* date was produced for each stratified context. The date was used for determining the broad date of phases defined for the site. All information was recorded on *pro forma* sheets.

The pottery and ceramic building material was examined under x20 magnification and recorded by fabric type and form according to the fabric reference series maintained by the service (Hurst and Rees 1992; Hurst 1994).

Artefacts from environmental samples were examined, commented upon and included in the Table 1 quantification.

Pottery fabrics are referenced to the fabric reference series maintained by the Service (Hurst 1994).

2.4 Environmental archaeology methodology, by Elizabeth Pearson

2.4.1 Fieldwork and sampling policy

The environmental sampling policy was as defined in the County Archaeological Service Recording System (1995 as amended). Large animal bone was hand-collected during excavation and samples of 1 to 10 litres taken from 4 contexts of Roman and post-Roman date (See Table 1).

2.4.2 Processing and analysis

For context 109, a one litre sample was processed by the wash-over technique as follows. The sub-sample was broken up in a bowl of water to separate the light organic remains from the mineral fraction and heavier reside. The water, with the light organic faction was decanted onto a 300mμ sieve and the residue washed through a 1mm sieve. The remainder of the bulk sample was retained for further analysis.

Contexts 203, 309 and 612 were processed by flotation followed by wet-sieving using a Siraf tank. The flot was collected on a 300μm sieve and the residue retained on a 1mm mesh. This allows for the recovery of items such as small animal bones, molluscs and seeds.

The residues were fully sorted by eye and the abundance of each category of environmental remains estimated. The flots were scanned using a low power EMT stereo light microscope and plant remains identified using modern reference collections maintained by the Service,

and seed identification manual (Beijerinck 1947). Nomenclature for the plant remains follows the Flora of the British Isles, 3rd edition (Clapham *et al* 1989). In addition all residues were sorted with a magnet to pick up smithing waste and other metallic objects.

2.5 The methods in retrospect

The dimensions and locations of trenches across the site were constrained by the presence of existing buildings, services and access requirements. In Trench 4 the only deposits revealed were 20th century made-ground overlying a solid concrete floor surface (with carpet tiles) that was not excavated, and no archaeological deposits were identified. The suggested gin building was not therefore investigated.

Unfortunately access into the present industrial unit to the south of The Butts was permitted but could not be obtained, which meant that details of floor levels could not be obtained. However the exterior of the building and the present ground levels of Rack Alley were recorded, along with internal dimensions, taken from details from the planning archives held by Worcester City Council (Fig 3).

Due to time constraints, the two boreholes (BH 9 and 10) to the southern edge of the public car park, adjacent to The Butts, were not sampled. Though the completion of boreholes the north of the car park (BH7 and BH 8) still allowed for a full depositional profile along the length of the terrace slop (Appendix 2; Wilkinson and Marter 2006).

Nevertheless the results of the evaluation provided an excellent profile of deposit depths and date across the site, and the methods adopted allow a high degree of confidence that the aims of the project have been achieved.

3. Topographical and archaeological context

A comprehensive desk-based assessment was prepared (Miller *et al* 2005) prior to the commencement of fieldwork, which provided a background for the topographical and archaeological context of the site.

4. Results

4.1 Structural analysis

The results of the structural analysis are presented in Appendix 1. Tables 1-5 summarise the artefacts recovered and Tables 6-7 summarise the results of environmental analysis. The trenches and features recorded are shown in Figures 4-9 and Plates 1-12.

Roman deposits and structural remains were identified in Trenches 1, 2, 3 and 6. Sequences of medieval soil horizons and deposits were identified in all trenches except Trench 4. A number of structural remains in Trenches 3 and 5 have been assigned to the post-medieval period on the basis of fabric, stratigraphic relationships, allied with artefactual evidence. Trench 4 revealed only modern structures and deposits.

4.1.1 Phase 1 Natural

Natural deposits across were fully characterised (Appendix 2; Wilkinson and Marter 2006) and comprise:

- sandstones and mudstones of the Triassic period Eldersfield Mudstone Formation in the eastern part of the site;

- bedded alluvial sands and silts of the late Quaternary Elmore Member in the western part of the site.

The Eldersfield Mudstone Formation dips to the west and was clearly downcut by the River Severn and infilled by deposits of the Elmore Formation: the boundary between the two deposits runs north to south through the site (Appendix 2; Wilkinson and Marter 2006).

The geoarchaeological assessment recorded Eldersfield Mudstone Formation at a depth of between 1.40m and 1.50m below present ground surface (BH 3: 15.80m AOD, BH 4: 16.20m AOD and BH 5: 14.50m AOD [Appendix 2; Wilkinson and Marter 2006]). Elmore Member deposits were recorded at a depth of 3m – 6.60m below present ground surface (BH 1: 10.60m AOD; BH 2: 12.30m AOD: BH 7: 10.90m AOD and BH 8: 8.40m AOD [Appendix 2; Wilkinson and Marter 2006]). The Elmore Member deposits are up to 6m deep, and the sediments consist of channel sands and gravels overlain by silt and clay floodplain deposits. These deposits drop in maximum height by 3m from north to south, probably due to channelling which removed the upper part of the deposit before the Roman period (Appendix 2; Wilkinson and Marter 2006, 8, fig 5).

The geoarchaeological assessment concluded that the surface of natural deposits was much more varied than the current surface topography, and that subsequent deposition had evened out the underlying topography, in particular infilling a deep channel across the southern part of the site, where natural deposits of the Elmore Formation are buried beneath 7m of Roman and later deposits (Appendix 2; Wilkinson and Marter 2006, 9).

Underlying natural deposits were encountered in Trenches 2 and 3. Elmore Member deposits were noted in Trench 2 and weathered deposits of the Eldersfield Mudstone Formation deposits in Trench 3.

4.1.2 **Phase 2 Roman**

Trench 1 (Fig 4)

Although this trench was located to the east of the site, close to the previous excavation at 14–20 The Butts (Burrows and Cutler 2004), Roman artefacts were surprisingly devoid in the majority of contexts. A small, partially exposed pit (context 110, Fig 4, Plate 1) in the south-west corner of Trench 1 contained four small fragments of Roman pottery along with a small assemblage of cremated human (?) bone. The probable cremation is dateable to the 2nd to 4th century based on the pottery. One fragment of medieval pottery was also found within the deposit, but it was concluded that this was intrusive; the fragment was exceptionally small and may have found its way into the lower deposit via worm or root action. This pit truncated a probable ditch aligned north to south that was only visible in the southern section of the trench (context 113, Fig 4, section C). Though there was no direct dating evidence from the fills of the ditch, the form and stratigraphic evidence indicates a Roman date.

A fragment of residual Roman brick was recovered from the 18th to 20th century demolition layer (103).

Trench 2 (Fig 5)

A 0.20m thick layer of sub-rounded cobbles (205, Fig 5, Plate 3), roughly 0.05m diameter, was observed 1.35m below the present ground surface. Though its exact nature was unclear it is possible that it is a continuation of the Roman road/trackway that had been observed during the excavations to the east (Burrows and Cutler 2004). The edge of this layer was not observed in the trench, so its orientation could not be established, but the location and form seemed to confirm this as part of the western extension of the road.

The surface of the cobbled layer clearly sloped downwards to the north, not reflecting the natural topography of the area. It is possible that the well-defined slope of the surface

indicated that the trench was located close to the edge of the feature were it may possibly be close to an external ditch. The dark earth soil directly above the cobbles contained Roman pottery, iron slag and tile dating to the 2nd century AD. Unfortunately there was no direct dating evidence from the cobbled surface itself.

Trench 3 (Fig 6)

Roman deposits in this trench consisted of a ditch terminus (cut 310, Fig 6, Plate 5) and a sequence of re-deposited alluvial clay and slag layers above and below, though it was not clear whether the upper layers (304, 305) were part of the original ditch fill, or if they had subsided into the ditch at a later date. These were not clear, as the full extent of the ditch cut was not visible within the limited dimensions of the trench. The visible extent of the ditch indicated that it was a square-cornered, flat-based terminus. The rest of the ditch most likely extends uphill to the east, towards the site of Roman activity at 14–20 The Butts. The primary fill of the ditch terminus (309) contained Roman pottery dating to the 2nd century AD. The overlying slag layer (305) dated to the mid-1st to 4th centuries. Although large quantities of slag were present no sign of any hammerscale was detected.

The ditch cut two earlier deposits, a layer of clay (306) and an earlier slag layer (313). Although this earlier slag layer produced no dating evidence, stratigraphically it was dated to the 1st to 2nd century. These dumps of iron slag are consistent with other evidence for Roman ironworking in Worcester between the 1st and 4th century AD (Jackson 2004).

The later overlying post-Roman plough soil deposit (303) produced a large number of interesting and unusual residual Roman pottery sherds. The pottery assemblage from this context contained fragments of mortaria and a tankard base, dating to the 1st – 3rd centuries.

Trench 5 (Fig 8)

Although no discernable features in Trench 5 could be attributed to the Roman period, a quantity of Roman pottery and a single Roman broach, dating to between the mid 1st – 2nd century AD, were found within the two probable post-Roman buried plough soil horizons (505, 506, Fig 8, Plate 10).

Trench 6 (Fig 9)

A partially-exposed possible linear feature (610, Fig 9, Plate 11) was exposed 1.30m below the present car park surface, 13.28m AOD. The exact nature of the feature was undefined as it extended under the eastern section, though a natural deposit can be disregarded as the feature extends along the edge of the flood plain rather than descending the slope. Five sherds of Roman pottery dating between the mid 1st – 2nd centuries AD were retrieved from the fill of this feature.

The deposits below the linear feature consisted of three layers of buried soils (611, 612) and an alluvial layer at the base (613). Layers 611 and 612 contained abundant pottery dating to the early Roman period. Deposit 612 was considerably darker in colour to that of the overlying deposit 611, though they may have been laid down at the same time and under similar conditions, deposit 612 being darker as it has been subjected to staining by contaminated water containing oil and diesel, which has been resting on the surface of the water table.

Within the lower alluvial deposit (613) a single sherd of early Roman pottery was found. This alluvial deposit was not fully excavated due to safety concerns though it had been clearly been laid down during flooding episodes of the River Severn during the Roman period.

Roman pottery from the mid-1st to 2nd century was recovered from the deposits above 610, though it is unclear as to whether these deposits represent Roman activity or later reworking of the soils.

The boreholes

The geoarchaeological assessment of the borehole data pointed to the significance of deeply buried deposits of Roman date in the western and southern part of the site (Appendix 2; Wilkinson and Marter 2006, 9-11, figs 3-5). Pottery, burnt animal bone, and iron slag were found in three boreholes. In the centre of the site, deposits with iron slag were encountered 1.26m below ground surface at 14.5m AOD, (BH2), whilst at the western edge of the site iron slag layer was encountered 3.58m below ground surface at 11.70m AOD (BH1). The analysis concluded that Roman deposits dip to the west, flowing a slope in the underlying Elmore Formation created by channelling (Appendix 2; Wilkinson and Marter 2006, 9, fig 4). At the south-west corner of the site, Romano-British artefacts with iron slag were encountered 5m below ground surface, at between 8.3m and 10m AOD, and associated with organic-rich deposits (BH8). The geoarchaeological assessment concluded that this variation was probably due to Romano-British material, including dumps of iron slag, infilling a former channel of the Severn. In the southern part of the site this rubbish was probably dumped into the margin of a slow-flowing stream.

4.1.3 Phase 3 Post-Roman and Medieval

Although no features were revealed in any of the trenches that could be securely dated to the post-Roman/medieval periods, two buried soil horizons were noted across the extent of the site (except Trench 4). These soil horizons consisted of an overlying firm mid greyish brown silty clay with occasional large sub-rounded pebbles and an underlying darker greyish brown clayey silt with frequent small sub-rounded pebbles. These two deposits only contained Roman pottery from the 1st to 4th centuries and no later material. It is possible that these deposits are in origin dark earth deposits, which elsewhere in Worcester have been identified as developing in the later Roman period (se below, Section 7.1). It is apparent that these soils have been subjected to considerable reworking in the medieval or later periods.

Trench 1

A single, very small sherd of pottery dating broadly to the medieval period was found within the fill of pit 110. The fill of this pit is of Roman date and this sherd is likely to be intrusive.

Trench 2

A single sherd of un-stratified medieval pottery was recovered from this trench, dating from the 11th – 16th century.

4.1.4 Phase 3 Post-medieval

Trench 3

In the south-east corner of the trench part of a brick structure was observed (377, 308, Fig 6, Plates 4, 6), though partially truncated and not fully exposed, it appeared to consist of a brick floor and a brick wall aligned north to south. This feature is likely to be the remains of a mid-18th to late 19th cellar.

Within deposit 303, a probable post-Roman plough soil, a small number of post-medieval tile fragments were found, the presence of these artefacts suggests that either the plough soil has been re-worked from the Roman through to the post-medieval period, or that these two fragments are intrusive. The insertion of the nearby cellar is indicative of later post-medieval activity.

Trench 5

Two brick structures within this trench may be assigned a post-medieval date, one wall running north to south (516), and another wall running east to west (509). The north to south wall (516, Fig 8, Plate 8) was clearly earlier than the east to west wall, the construction cut for wall 509 truncated wall 516. This north to south wall appeared to be the lower courses of a shallow brick foundation. The brick structure only appeared in the eastern section of the trench and therefore was not excavated fully, so a complete profile was unobtainable. However enough of the wall was exposed to determine that it was three courses deep, the lower course being slightly wider than the upper two. The wall was sat within a flat-based cut and on top of a silty clay bedding; the base of the wall was at 15.83m AOD. Each end of the wall had been truncated by later features, the northern end had been cut by the construction cut for the later cellar wall (509), and the southern end had be cut by insertion of a modern feature, probably a manhole relating to the ceramic service pipe (520) which could be seen in the southern and western sections of the trench. Brick samples taken from this wall dated to between the mid-17th to late 19th century.

To the north of the trench the external face of a brick cellar wall was revealed (509, Fig 8, Plate 9) dating from the mid-18th to late 19th century. The wall appeared as two sections of brick structure, one at each end of the trench and the gap between the two had been in-filled at a later date with another brick wall (522). Both the original cellar wall and the later insertion were not fully exposed, both extending below the base of the trench at 14.76AOD. The original cellar wall consisted of at least eleven courses of brick, the later insertion butted the earlier walls and consisted of at least seven courses of bricks, some of which were blue bricks. Although only the other face of the cellar wall was visible, it was possible to determine that the cellar extended to the north, though the complete dimensions remain unknown. The silty sand deposit with frequent brick fragments (510) visible above and behind the later wall (522) is likely to represent the internal backfill of the cellar after its abandonment.

4.1.5 Phase 3 Modern

Trench 1

Substantial reinforced concrete to a depth of 0.26m below the present ground surface was present across the trench. This concrete sat on a thin layer of gravel hardcore. Below this was a layer of brick rubble (102) that relates to the demolition of modern structures. Directly below this demolition layer a steep sided, probable circular pit (108 Fig 4, Plate 2) was partially exposed. The pit was 1.35m wide, and at least 0.5m deep. As the pit only appeared in the northern section and extended below the base of the trench a complete plan and section was not exposed. Finds from the two fills of the pit (106, 107) indicate a date between the 17th and 20th century.

Trench 2

Made-ground consisting of loose sand, gravel and rubble of the present yard surface (201) was noted to a depth of 0.28m below current ground level (18.65m AOD).

Trench 3

The tarmac yard surface and associated hardcore (301) was observed in this trench to a depth of 0.25m below current ground level (15.92m AOD). A series of modern demolition layers were visible below (302, 316), cut into these was a foundation cut (314) containing a concrete footing below remnants of a brick wall. To the west of this wall was a single clay deposit (315) that probably represented an associated floor surface.

Trench 4

Modern deposits relating to the late 20th century clearance of the area extended across the trench, comprising the present reinforced concrete yard surface, demolition rubble, consolidation material, grade one road stone and tarmac. (401, 402, 403, 404, 405). These deposits directly overlay a concrete floor surface (407). This surface would have originally been an internal surface (remnants of carpet tiles were still present *in situ*) within the now demolished building to the north of the present stores (building 4: Miller *et al* 2005).

Trench 5

Substantial reinforced concrete to a depth of 0.25m below the surface lay above a gravel hardcore layer, this in-turn overlay a second layer of concrete (508). This second layer of concrete may have been an earlier surface, or was laid down to provide a solid sealed layer above the loose cellar backfill below.

To the southern edge of the trench two modern cuts were observed (514, 521). Cut 521 contained a redundant ceramic waste pipe, whilst the function of cut 514 in the south-western corner of the trench remained unclear it is likely to be associated with the waste pipe, such as a manhole or other access.

Trench 6

Made-ground (601, 602) was present to a depth of 0.24m below current ground level (14.58m AOD) and related to the construction of the present car park.

5. Artefact analysis, by Angus Crawford

The artefactual assemblage recovered is summarised in Tables 1-6.

5.1 Artefactual analysis

The pottery assemblage retrieved from the excavated area consisted of 223 sherds of pottery weighing 2260.5g. In addition fragments of tile, brick, slate, oyster shell, slag, animal and possible human bone, vessel glass, clay pipe stems and a copper alloy brooch were recovered. The group came from seventeen stratified contexts and could be dated from the Roman period onwards (Table 1). Level of preservation was generally good with only a few sherds displaying moderate to high levels of abrasion.

Context	Material	Type	Total	Weight (g.)
103	Ceramic building material	Brick	1	34
106	Ceramic building material	Brick	2	60
106	Clay	Pipe	2	4
106	Tile	Roof	1	40
107	Ceramic building material	Brick	3	1234
107	Slate	Roof	2	61
107	Tile	Roof	2	125
109	Bone	Human?	7	13
109	Pottery	Medieval	1	1
109	Pottery	Roman	4	3
200	Pottery	Medieval	1	27
200	Pottery	Roman	1	11
202	Pottery	Medieval/post-medieval	1	3
202	Tile	Roof	2	29
203	Pottery	Roman	67	252
203	Slag	Fe	1	35
203	Tile	Roman	1	36

Context	Material	Type	Total	Weight (g.)
300	Pottery	Post-medieval	2	49
300	Tile	Roof	1	35
303	Pottery	Rom	12	542
303	Slag	Fe	1	13
303	Tile	Floor	1	85
303	Tile	Roof	3	128
305	Ceramic building material	Roman	1	23
305	Slag	Fe	3	613
306	Pot	Roman	1	9
307	Ceramic building material	Brick	1	1966
308	Ceramic building material	Brick	1	3880
309	Bone	Animal	11	151
309	Pottery	Roman	46	331
406	Tile	Roof	2	227
500	Pottery	Medieval/ Post-medieval	1	25
505	Pottery	Roman	29	188
505	Tile	Roof	4	73
505	Slag	Fe	1	61
506	Bone	Animal	2	17
506	Ceramic building material	Brick	1	18
506	Cual	Brooch	1	12
506	Pottery	Roman	6	78
509	Ceramic building material	Brick	3	12380
510	Asbestos	Pipe	1	633
515	Glass	Vessel	1	2
516	Ceramic building material	Brick	2	6300
603	Pottery	Post-medieval	13	506
603	Pottery	Post-medieval/modern	2	44
603	Shell	Oyster	1	54
603	Tile	Roof	1	185
607	Bone	Animal	8	1664
607	Pottery	Roman	1	32
608	Pottery	Post-medieval	2	33
608	Pottery	Roman	1	18
608	Slag	Fe	1	26
609	Pottery	Roman	5	20
609	Tile	Roman	3	21
611	Pottery	Roman	1	12
612	Bone	Animal	1	23
612	Pottery	Roman	25	59.5
613	Bone	Animal	2	21
613	Pottery	Roman	1	19

Table 1: Quantification of the assemblage

5.2 **Discussion of the pottery**

All sherds have been grouped and quantified according to fabric type (Table 2). Few diagnostic form sherds were present with the majority of sherds datable by fabric type only to their general period or production span.

The discussion below is a summary of the finds and associated location or contexts by period. Where possible, *terminus post quem* dates have been allocated and the importance of individual finds commented upon as necessary.

5.3 **Roman**

The majority of the pottery assemblage was Roman in date, comprising 201 sherds for 90% of the assemblage. Within this group the dominant fabrics were locally produced Severn Valley wares with oxidized organically tempered Severn Valley ware being the predominant (fabric 12.2, 98 sherds) closely followed by oxidized Severn Valley ware (fabric 12, 74 sherds). While Severn Valley wares are produced throughout the Roman period, the presence of the organically tempered variant is indicative of settlement activity during the mid 1st to 2nd century.

Other local Roman fabrics identified included four sherds of reduced organically tempered Severn Valley ware, dating to the mid 1st to 2nd and a single sherd of reduced Severn Valley ware dating to the mid 1st to 4th century. The Malvernian industry was represented by a single rim sherd of handmade Malvernian ware (fabric 3, context 303). Interestingly, this sherd appears to be a transitional form with a Romanised everted rim more often associated with wheel made Malvernian products. This fabric and form combination is suggestive of a second century date of manufacture. Three further sherds of Malvernian ware were present (context 309) but in such abraded condition it was impossible to distinguish whether they were of hand made or wheel thrown type.

Non-local wares included fourteen sherds of black burnished ware (fabric 22, contexts 203, 309, 505, 506 and 612,dating from 120AD to 4th century), and a single sherd of fine sandy grey ware (fabric 14, dating to the mid 1st to early 3rd century) and a sherd of central Gaulish samian (fabric 43.2, dating from 120AD to the late 2nd century). A substantial mortaria rim sherd (context 303) was identified as being Oxfordshire mortarium (fabric 33) but proved difficult to closely date other than the 2nd to 3rd century. Two small sherds of Nene Valley ware were also present (fabric 28, contexts109 and 612.) dating from the 2nd to 4th century, with the sherd from 109 possibly associated with, what appears to be, cremated human remains.

Other Roman finds included ceramic building material in abraded condition with brick from contexts 103, 305 and 506, and tile from contexts 203 and 609. A copper alloy trumpet brooch (context 506) could also be dated to between the mid 1st to 2nd century. Evidence for ironworking during the Roman period was identified from small quantities of waste slag from contexts 203, 303, 305 505 and 608, though no hammerscale was recovered.

Context	Fabric	Fabric name	Total	Weight (g.)
109	12	Oxidised Severn Valley ware	1	1
109	12.2	Oxidized organically tempered Severn Valley ware	2	1
109	28		1	1
200	12.2	Oxidized organically tempered Severn Valley ware	1	11
203	12	Oxidized Severn Valley ware	32	5
203	12.2	Oxidized organically tempered Severn Valley ware	29	212
203	12.3	Reduced organicall tempered Severn Valley ware	2	7
203	22	Black burnished ware	3	25
203	43.2	Central Gaulish samian	1	3
303	12.2	Oxidized organically tempered Severn Valley ware	9	254
303	14	Fine sandy grey ware	1	47
303	3	Hand made Malvernian ware	1	44
303	33	Oxfordshire white mortarium	1	197
306	12	Oxidized Severn Valley ware	1	9
309	12	Oxidized Severn Valley ware	34	27
309	12.2	Oxidized organically tempered Severn Valley	8	254

Context	Fabric	Fabric name	Total	Weight (g.)
		ware		
309	22	Black burnished ware	1	45
309	3/19	Malvernian ware	3	5
505	12.2	Oxidized organically tempered Severn Valley ware	25	166
505	12.3	Reduced organicall tempered Severn Valley ware	2	20
505	22	Black burnished ware	2	2
506	12.2	Oxidized organically tempered Severn Valley ware	5	73
506	22	Black burnished ware	1	5
607	12.2	Oxidized organically tempered Severn Valley ware	1	32
608	12.2	Oxidized organically tempered Severn Valley ware	1	18
609	12.2	Oxidized organically tempered Severn Valley ware	5	20
611	12.2	Oxidized organically tempered Severn Valley ware	1	12
612	12	Oxidized Severn Valley ware	6	2
612	12.1	Reduced Severn Valley ware	1	5
612	12.2	Oxidized organically tempered Severn Valley ware	10	33
612	22	Black burnished ware	7	19
612	28	Nene valley ware	1	0.5
613	12.2	Oxidized organically tempered Severn Valley ware	1	19

Table 2: Quantification of the Romano-British pottery by fabric

5.4 **Medieval**

Only two sherds of pottery were dated to the medieval period. These were a single sherd of Worcester type sandy glazed ware (fabric 64.1) from context 200 and dating from the 11th to 16th century and a single sherd of miscellaneous medieval ware (fabric 99, context 109) broadly dating to the period.

Context	Fabric	Fabric names	Total	Weight (g)
109	99	Miscellaneous medieval ware	1	1
200	64.1	Worcester type sandy glazed ware	1	27

Table 3: Quantification of the medieval pottery by fabric

5.5 **Post-medieval and modern period**

The post-medieval and modern period assemblage consisted of 21 sherds of pottery. The range of fabrics included types commonly found on sites within Worcestershire. These included post-medieval red and orange wares (contexts 300, 603 and 608) dating to the 18th century, creamware (fabric 84, context 603) that was at its height between 1760 and 1780, porcelain and modern stone china (fabric 83, both from context 603) dating to the 19th to 20th century.

Two sherds of oxidized glazed Malvernian wares (fabric 69 contexts 202 and 500) were dated to this period, but as production of the fabric begins in the late 13th century and continues into the early 17th century, there is the possibility that they are of medieval date.

Further finds from this period also included fragment of roof tile that, again, has a production spanning the medieval and into the post-medieval period. However, all of the brick finds

from the assemblage were of Roman or post-medieval date suggesting that the roof tile is also post-medieval.

Context	Fabric	Fabric name	Total	Weight (g.)
202	69	Oxidized glazed Malvernian ware	1	3
300	78	Post-medieval red wares	2	49
500	69	Oxidized glazed Malvernian ware	1	25
603	78	Post-medieval red wares	1	121
603	84	Cream ware	6	198
603	83	Porcelain	1	43
603	85	Modern stone china	1	1
603	90	Post medieval orange ware	6	187
608	78	Post-medieval red wares	2	33

Table 4: Quantification of the post-medieval and modern pottery by fabric

As a result of the quantification the following context *terminus post quem* dates have been attributed:

Date range	Material	Total	Weight (g.)	Specialist report?	Important research assemblage?
	Animal bone	31	1889	N	N
	Oyster shell	1	54	N	N
11-16C	Pottery	1	1	Y	N
120-4C	Pottery	12	38	Y	Y
120-L2C	Pottery	1	3	Y	Y
1-2C	Copper alloy brooch	1	12	Y	Y
13-17C	Pottery	1	25	Y	N
13-18	Roof tile	2	125	Y	N
13-18C	Roof tile	4	73	Y	N
13-18C	Roof tile	7	232	Y	N
1650-1784	Ceramic building material	1	2700	Y	N
17-18C	Clay pipe	2	4	Y	N
17-19	Ceramic building material	3	1234	Y	N
17-19C	Ceramic building material	2	60	Y	N
19-20	Bottle glass	1	2	Y	N
1760-80	Pottery	6	198	Y	Y
1784-1850	Ceramic building material	3	12380	Y	N
1784-19C	Ceramic building material	3	9446	Y	N
18C	Pottery	11	390	Y	N
19-20C	Pottery	2	44	Y	N
19-20C	Roof slate	2	61	N	N
19-20C	Tile	4	497	Y	N
20C	Asbestos pipe	1	633	N	N
2-3C	Pottery	2	60	Y	Y
2-3C?	Pottery	1	197	Y	Y
2-4C	Pottery	2	1.5	Y	Y
2C	Pottery	4	122	Y	Y
L11-14C	Pottery	1	27	Y	Y
L13-E17C	Pottery	1	3	Y	N
M1-2?	Pottery	2	7	Y	Y

Date range	Material	Total	Weight (g.)	Specialist report?	Important research assemblage?
M1-2C	Pottery	97	1045	Y	Y
M1-4C	Ceramic building material	2	52	Y	Y
M1-4C	Pottery	78	54	Y	Y
M1-4C	Iron slag	3	74	Y	Y
M1-4C	Tile	4	57	Y	
M1-4C?	Ceramic building material	1	23	Y	Y
M1-4C?	Iron slag	4	674	Y	Y
M1-E3	Pottery	1	47	Y	Y

Table 5: Summary of the assemblage

5.6 Significance

This assemblage indicates a site of some importance during the early period of Roman settlement. The inclusion of mortaria, Romano-British and imported fine wares as well as the trumpet brooch and Roman ceramic building material, would indicate some level of domestic activity on the site and the strong likelihood of encountering further settlement remains in the area.

The later medieval, post-medieval and modern finds indicate that limited activity was occurring on site during these periods. The small quantity and condition of the finds complement the evidence of agricultural and later, industrial and commercial use of this area.

6. Environmental analysis, by Elizabeth Pearson

The environmental evidence recovered is summarised in Tables 6 and 7.

6.1 Hand-collected animal bone

Only a small assemblage (24 fragments, 1.3 kg) of animal bone was hand-collected on site. Horse femur, humerus, metatarsal and rib bones (some of which were butchered) were recorded in context 607. As this was a small assemblage, it was considered that little detailed information would be gained from further recording.

Context	Sample	Context type	Description	Period	Sample volume (L)	Volume processed (L)	Residue assessed (L)	Flot assessed (L)
109	4	pit	possible cremation, fill 110	ROMAN	1	1	Y	Y
203	1	layer	dark earth/	POST-	10	10	Y	Y

Context	Sample	Context type	Description	Period	Sample volume (L)	Volume processed (L)	Residue assessed (L)	Flot assessed (L)
			ploughsoil	ROMAN				
309	2	ditch	terminus, fill 310	ROMAN	10	10	Y	Y
612	3	layer	sandy, silt	ROMAN	10	10	Y	Y

Table 6: List of environmental samples

6.2 Flotation samples

Roman

Small charcoal fragments were abundant and occasional fragments of animal bone were recovered, most of which were burnt. The burnt bone has the appearance of bone burnt at a high temperature (white with bluish tones) and may be the remains of a human cremation.

Only occasional charred plant remains were recovered from the remaining two samples (Table 7). These included a single charred fragment of spelt wheat chaff (*Triticum spelta* glume base) from a sandy, silty layer (612), and unidentified grass (Gramineae sp indet) and cereal (Cereal sp indet) grains from a ditch terminus (309). A small number of fishbone and scales were also found in the ditch terminus (309).

Post-Roman 'dark earth' or plough soil

No identifiable environmental remains were recovered from this context (203), although fragmented charcoal and slag or clinker was abundant.

Latin name	Family	Common name	Habitat	309	612
Triticum spelta glume base	Gramineae	spelt wheat	F		+
Cereal sp indet grain	Gramineae	cereal	F	+	
Gramineae sp indet grain	Gramineae	grass	AF	+	

Key:

Category of remains	Quantity
A= cultivated ground	+ = 1 - 10
B= disturbed ground	++ = 11- 50
C= woodlands, hedgerows, scrub etc	+++ = 51 -100
D = grasslands, meadows and heathland	++++ = 101+
E = aquatic/wet habitats	
F = cultivar	

Table 7: Charred plant remains

6.3 Discussion

These remains indicate only a low-level of occupation debris in these deposits. The cereal and grass remains are likely to have been either accidentally charred during crop processing, or as a result of cereal crop waste being thrown on to fires.

6.4 Significance

The environmental remains on this site are poorly preserved and are of low significance, though the small area of the site sample would militate against this truly reflecting conditions on the site.

7. Synthesis

7.1 Pre-Roman topography

The underlying topography, as indicated by the borehole survey, revealed that the western part of the site consisted of earlier deposits that dip sharply to the west and south. This suggests that the former channels of the River Severn once flowed over the western part of the site and created deep channels (Appendix 2; Wilkinson and Marter 2006). The natural deposits are overlain by up to *c* 7m of dumped deposits of Roman and post-medieval date.

No evidence of prehistoric activity was found during the evaluation. The available data suggests that the floodplain had an uneven topography in the pre-Roman period, and that wet channels were used to dump waste material from the Roman period onwards. Fieldwork at the Newport Street development (2005) suggests that this complex deposit sequence is a feature of the floodplain at Worcester, obliterated by channel infilling and dumping from the Roman period onwards (R Jackson pers comm).

7.2 Roman occupation

The indication from previous archaeological investigations in the area, especially the excavation immediately to the east (Burrows and Cutler 2004) suggested that deposits dating to the Roman period were likely to be found during the evaluation. This earlier excavation identified well-preserved Roman deposits across the entire footprint of the development (2nd to mid 4th century). It was suggested that activity may diminish further to the west, although this was not established (Burrows and Cutler 2004).

Although this evaluation provided only a limited insight into the below ground archaeology, significant Roman artefacts were recovered from both residual and sealed contexts from all the trenches except Trench 4 (only excavated to a depth of 0.75m). The evidence indicated that Roman activity extends westwards into the area occupied by the present council depot. A metalled track or road flanked by ditches was excavated at 14-20 The Butts and extended across the north-east corner of the site on a north-west to south-east alignment: this trackway was potentially observed in Trench 2. Although the cobbled surface in Trench 2 was not clearly defined as a road, there was clearly a band of cobbles that ran along the projected line to the road excavated to the east.

The ditch in Trench 3 clearly terminated on the western edge of the gravel terrace, overlooking the River Severn floodplain. The ditch ran down from the location of Roman activity located higher up the gravel terrace to the east. Pottery from the main fill of the ditch (309) dated from the early Roman period, overlying the main fill of the ditch was a thin layer of concentrated iron slag, though it was not clear whether this layer was originally part of the fill of the ditch, or that it may have been part of a later slag deposit which had subsequently subsided into the lower, softer fills below over time. These deposits were sealed by a later re-deposited alluvial clay layer.

Above the Roman deposits in Trench 3 was a substantial layer of post-Roman plough soil containing residual Roman pottery. In Trench 2, the layers overlying the cobbled surface was identified as a 'dark earth' deposit in origin (Appendix 2; Wilkinson and Marter 2006). A model for the development of dark earth deposits in Worcester has been developed, based on detailed study at the Deansway site (Macphail 2004). The dark earth at Worcester originated as midden material mixed with large quantities of silty soil and peat brought in by grazing animals that were penned on the site during the later Roman period. The extent of dark earth deposits in Worcester suggests that cattle formed an important part of the settlement economy (Dalwood 2004b, 47). In this location, however, outside of the medieval city landuse of agriculture continued until the city expanded again in the 19th century, and the dark earths were continually reworked and deepened which, elsewhere (Farrier Street) has limited their potential significance (Macphail 1994, 84).

All the deposits were associated with a sizeable assemblage of artefacts, including pottery, roof tiles, and iron slag, although the largest amount of Roman material came from later reworked soils. The evidence for Roman occupation form this site extends knowledge of the extent of the Roman settlement at Worcester. An earlier attempt to map the extent of Roman occupation indicated that Roman occupation was very extensive although varying in intensity, comprising an area stretching from Britannia Square to south of the cathedral: an area of c 50ha (Dalwood 2004a, 16, fig 11). Although only a small number of samples were tested, the absence of hammerscale, which would indicate smithing activity, may be of interest.

The level of Roman pottery and features indicate that Roman activity was not solely confined to the higher levels of the gravel terrace to the east, but that they extend westwards down the terrace to at least the edge of the flood plain, where evidence of Roman activity is present (Trench 6; Appendix 2; Wilkinson and Marter 2006). Overlying the alluvial deposits discussed above, a layer of iron slag material was noted (BH 1, 2 and 3). This material was associated with Roman artefacts and can be dated to the Roman period. The slag layer may be used as a temporal marker, indicating that at this time the ground sloped steeply to the west, from 14.50m AOD (BH 2), in the centre of the site to 11.70m AOD (BH 1) in the west. The presence of organic-rich deposits, characteristic of the margins of slow-flowing streams suggests the presence of an active watercourse in the southern extent of the site in the Roman period (BH 8).

7.3 Post-Roman fields

There was little evidence for post-Roman or early medieval activity on the site. The thick deposits containing Roman artefacts, overlying Roman deposits, probably originated as 'dark earth' deposits in the later Roman period, as described above. Detailed study of dark earth deposits at the Deansway excavation indicated that following severe contraction of the settlement area in the 4th century, the area became grazed pasture, and remained so until the 10th century (Macphail 2004). This inference is that much of the area of the former Roman settlement became farmland in the post-Roman period, and that there was no regeneration of scrub and woodland over the town (Dalwood 2004, 52-5). It is possible that the land-use of this site was pasture land for a considerable period. The circumstances at The Butts are, however, different and at Farrier Street (Macphail 1994) the potential for soil micromorpholical analysis for yield interesting results is limited.

It is of interest that artefacts were recovered from the dark earth and though the current evaluation was too small a sample an argument can be made that later Roman and post-Roman activity may only be visible through the artefacts contained in the dark earth.

7.4 Medieval

Although not closely dated, the layers of plough soil (noted in all but Trench 4 and heavily truncated in Trench 1) can be interpreted as remains of post-Roman and medieval agriculture. In part these soils probably originated as Roman 'dark earth' as discussed above. Although the artefacts within the two soil horizons at this site dated solely to the Roman period, the presence of later material within similar horizons at 14-20 The Butts indicated that these soils had been continuously re-worked over considerable periods of time. The absence of medieval pottery and low-level of earlier post-medieval pottery from the site indicates that these soils did not receive large quantities of domestic refuse mixed with organic refuse to fertilise the soil during the medieval and early post medieval periods.

The lack of a substantial agricultural soil deposits in Trench 1 may be as a result of landscaping during the construction of formal gardens of the Netherton estate between 1796 and 1826, it is likely that some form of grading of the higher slopes of the edge of the gravel terrace took place, this would have caused truncation and re-deposition of some of the soil.

The agricultural soil horizons appear to be located to the upper reaches of the terrace, the eastern margin of the site. The borehole data shows that the ground sloped fairly steeply to the west from the terrace (Appendix 2; Wilkinson and Marter 2006, figs 6 and 7). There was no evidence for dumping substantial quantities of material off the edge of the terrace during the medieval period.

7.5 Post-medieval

A number of brick structures were uncovered within Trenches 3 and 5. From the fabric and stratigraphical locations within the trenches these structures could be assigned a date of between the mid-18th to late 19th century. None of these structures appear on any of the contemporary maps, which suggests that they are either not substantial, or were only in use temporarily.

Cartographic evidence indicates that the eastern part of the site area was occupied by market gardens in 1784, while the western part of the site was pasture (see fig 4 of the desk-based assessment). By 1826, the eastern part of the site was partly laid out as formal gardens, while the western part of the site was pasture, separated by a lane, the later Croft Walk (see fig 5 of the desk-based assessment).

The western part of the site saw considerable deposition of material in the 19th and 20th century. A large volume of material was deposited on what had been pasture in the early 19th century. The dumped deposits vary between 2m and 5m thick at the western part of the site (Appendix 2; Wilkinson and Marter 2006, 11-13, figs 3-5). The area west of Croft Walk was laid out for use as a cattle market in the early 19th century, as indicated on the Netherton Estate Map of 1846 (see fig 6 of the desk-based assessment) and on the Ordnance Survey plan of 1887 (see fig 7 of the desk-based assessment). This cartographic evidence would suggest that the 'made ground' in the western part of the site took place after 1826 and before 1846, and can be identified as a deliberate episode of land reclamation for use as the cattle market.

7.6 Modern

A number of deposits could be associated with the demolition of some of the timber yards buildings and the conversion of the site into a corporation yard in the middle of the 20th century. All of these deposits consisted of demolition layers of brick, mortar and other rubble. It appears that the material from the demolished 19th and 20th century buildings has been spread and compacted across the site rather than removed, this has helped to seal and protect the earlier underlying deposits.

The concrete floor in Trench 4 is likely to relate to one of the timber yard buildings, as seen on the 1887 Ordnance Survey map. Though this concrete surface was not removed it is likely to seal deposits relating to the semi-circular building that probably housed the horse powered gin, shown on the 1846 plan.

8. Significance

In considering significance, the Secretary of State's criteria for the scheduling of ancient monuments (DoE 1990, annex 4), have been used as a guide.

These nationally accepted criteria are used to assess the importance of an ancient monument and considering whether scheduling is appropriate. Though scheduling is not being considered in this case they form an appropriate and consistent framework for the assessment of any archaeological site. The criteria should not, however, be regarded as definitive; rather they are indicators which contribute to a wider judgement based on the individual circumstances of a case.

Natural deposits

Substantial depths of alluvium have been identified beneath the site through the borehole survey. Deposits contain organic material (BH 8; Appendix 2; Wilkinson and Marter 2006) which have a high potential for providing further evidence for natural and humanly-altered environments, and as well as dating evidence, providing a time scale for the alluvial deposition. The deposits are deeply buried; between 2.5m – 4.2m (BH 1) and 5.0m – 6.5m (BH 8) below current ground surface (11.30m AOD - 12.40m AOD and 10.10m AOD – 8.30m AOD respectively).

Although the exact nature of the development remains undecided, the effects of piling and/or large-scale excavation on organic remains are still relatively uncertain. Nevertheless it may destabilise the deposits and result in the drying out of any organic remains ultimately leading to their degradation, especially if the development requires ground reduction below the levels mentioned above.

Roman deposits

A number of features, including a probable road/track surface, ditches and a possible human cremation, all of which can be provisionally dated to the Roman period were observed across the evaluated area. The deposits generally overlay the alluvium or were cut into the underlying natural mudstone. The indication of an extension of the Roman activity from 14-20 The Butts, westwards across the site, indicated by the deposits and the aretfactual evidence is significant within the importance of Roman Worcester, and providing the basis of intra-site analysis.

The presence of a considerable dumps of iron slag within the vicinity of the site is already well testified (Jackson 2001) and indicates that ironworking and its associated waste was prevalent within the Roman 'small town' and its periphery from the early 2nd century to the 4th century AD. The iron slag deposits within Trench 3, and those noted within the borehole surveys provide another chance to further analyse and investigate this material, and to establish if they represent a single episode. Extensive *in situ* dumps of slag might provide greater understanding of the character and development of the ironworking industry in Worcester.

The likely continuation across the site of the road/track identified at 14-20 The Butts, and located within Trench 2 would also have a considerable importance on research into the Roman road network at Worcester and any potential Roman bridge of fording point.

All these deposits may be affected by the proposed development, especially if the new building is to be cellared or terraced into the west-facing slope of the site.

Post-Roman and medieval

Two soil horizons that extend across most the site may represent post-Roman agricultural activity, including the 'dark earth' deposits noted at 14 – 20 The Butts. These deposits are in a notably good state of preservation, largely thanks to the minimal/moderate levels of later cellarage and building, and indicate that the potential for widespread survival is very high. The remains are quite shallow (*c* 1m) below the present ground level and as such are extremely vulnerable to any future developments that would include ground reduction. However, The current sample was not large enough to establish the potential for the dark earth to contain indicators of late and post-Roman activity, which may only survive as artefacts within the dark earths. The long period over which the dark earths were accumulated suggests that there is little potential that soil micromorphological analysis would be productive.

18th - 19th century deposits

The 18th - 19th century remains are a useful indicator of the now demolished building relating to the Joseph Wood and Sons building yard. As with earlier remains their foundations are in a good state of preservation and have been subject to only minor levels of modern truncation. The remains are very shallow to the present ground level so are also extremely vulnerable.

Modern deposits

Demolition and removal of the modern buildings and buried deposits will not result in the loss of significantly important archaeology.

Vulnerability

As the future development of the site is still in the provisional stage and detailed plans have yet to be produced, the impact any works will have on the underlying archaeological remains can only be generally assessed. However the preservation of deposits (less than 1m below the present surface in most areas) would be greatly susceptible to any major building work.

9. Publication summary

The Service has a professional obligation to publish the results of archaeological projects within a reasonable period of time. To this end, the Service intends to use this summary as the basis for publication through local or regional journals. The client is requested to consider the content of this section as being acceptable for such publication.

An archaeological evaluation was undertaken at The Butts, Worcester (NGR ref SO 8467 5509; SMR ref WCM 101277). It was undertaken on behalf of Property Services, Worcestershire County Council, who intend to construct a new library and heritage centre. The project aimed to determine if a significant archaeological site was present and if so to indicate what its location, date and nature were.

The evaluation consisted of six trenches across the site and eight boreholes, located to investigate three topographical zones, the terrace, terrace slope and the River Severn flood plain. A number of significant Roman features were observed.

A small, partially exposed pit on far eastern edge of the excavation contained four small fragments of Roman pottery along with a small assemblage of cremated human (?) bone. The possible cremation is likely to date from the 2nd to 4th century based on the artefactual evidence, though a very small fragment of medieval pottery was also found within the deposit, it is assumed that this is intrusive. This pit truncated a probable ditch that was only visible in the southern section of the trench. Though there was no direct dating evidence form the fills of the ditch, the form and stratigraphic evidence indicates an early Roman date.

To the north-east corner of the site the remains of a cobbled surface were found below a thick layer of post-Roman 'dark earth' soils. The cobbled surface, 1.4m below the present ground level, is likely to be a continuation of a Roman road/trackway observed during earlier excavations to the east, at 14-20 The Butts. The dark earth soil directly above the cobbles contained Roman pottery, iron slag and tile dating to the 2nd century AD. Unfortunately there was no direct dating evidence from the cobbled surface itself.

To the north of the site, 1.40m below the surface the western end of a flat-based, square ended ditch terminus was located. The ditch was aligned east to west. The primary fill of the ditch terminus contained Roman pottery dating to the 2nd century AD and the overlying slag layer dated to the mid 1st to 4th centuries. Although large quantities of slag were present no sign of any 'hammer scale' was detected. This ditch cut two earlier deposits, a layer of re-deposited alluvial clay and an earlier slag layer. Although this earlier slag layer could not be

dated it is inferred an early Roman date. The overlying clay layer produced a single fragment of Severn Valley ware that could be broadly dated to the mid 1^{s} –4th centuries AD.

A single trench was excavated on the site of the present public car park to investigate the flood plain deposits. This trench revealed a partially exposed ditch linear containing mid 1st – 2nd century pottery. Also observed were a sequence of plough soil and alluvial layers, all of which contained pottery of a similar date.

Most of the Roman features were sealed by a post-Roman 'dark earth' plough soil formed by the introduction of organic material as a soil fertiliser after the Roman period.

These later overlying post-Roman plough soil deposits produced a large number of interesting and unusual residual Roman pottery sherds. The artefactal assemblage from these contexts contained fragments of mortaria, a trumpet broach and a tankard base along with many other pottery sherds, dating from the 1st – 3rd centuries AD.

A small number of post-medieval brick structures were located towards the centre of the site, mainly consisting of cellars. A continuous layer of made ground lay across the entire site, relating to recent demolition of brick buildings, the material having been spread across site rather than being removed elsewhere.

In addition to the deposits revealed in the evaluation trenching, borehole analysis across the site located organic deposits of a Roman date to the far west of the site. The presence of a former watercourse was also detected in the same area. In addition, layers of iron slag were noted across the site. These relate to iron production within Roman Worcester, the study of which would provide another chance to further analyse and investigate this material, and might provide greater understanding of the character and development of the ironworking industry in Worcester.

In summary, the evaluation concluded that extensive areas of well preserved Roman and post-medieval structural remains were present within the evaluated area, representing sequences of usage from at least the mid 1st – 2nd century AD. The Roman activity previously located at 14–20 The Butts extends westwards, down to the flood plain. At some point after the Roman occupation the area reverted back to an agricultural land usage, allowing for the formation of the post-Roman 'dark earth' deposits with absent or at the least, very limited occupational activity up until the construction of the timber yard in the nineteenth century.

10. The archive

The archive consists of:

6	Trench records AS41
18	Fieldwork progress records AS2
1	Photographic register AS3
98	Digital photographs
1	Sample register AS18
18	Scale drawings
1	Box of finds
1	Computer disk

The project archive is intended to be placed at:

Worcestershire County Museum

Hartlebury Castle

Hartlebury

Near Kidderminster

Worcestershire DY11 7XZ

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11. Acknowledgements

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12. Personnel

The fieldwork and report preparation was led by Simon Sworn. The project manager responsible for the quality of the project was Simon Woodiwiss. Fieldwork was undertaken by Simon Sworn, Katie Head and Alvaro Mora-Ottomano, finds analysis by Angus Crawford, environmental analysis by Elizabeth Pearson and illustration by Carolyn Hunt. Keith Wilkinson and Phil Marter contributed the geoarchaeological assessment. Hal Dalwood contributed to setting the results in an archaeological context for Worcester.

13. Bibliography

Beijerinck, W, 1947 *Zadenatlas der Nederlandsche Flora*, Wagoningen CAS 1995 *Manual of Service practice: fieldwork recording manual* County Archaeological Service, Hereford and Worcester County Council, internal report, **399**

Burrows, B, and Cutler, R, 2004 *14-20 The Butts, Worcester. Post-Excavation Assessment and Research Design*, Birmingham Archaeology, Project number 1097, November 2004

CAS, 1995 (as amended) *Manual of Service practice: fieldwork recording manual*, County Archaeological Service, Hereford and Worcester County Council, report, **399**

Clapham, A R, Tutin, T G and Moore D M, 1989 *Flora of the British Isles*, (3rd edition), Cambridge University Press

Dalwood, H, 2004a Archaeological and historical context, in Dalwood and Edwards, 9-25

Dalwood, H, 2004b, Chronological synthesis, in Dalwood and Edwards, 36-76

Dalwood, H, and Edwards, R, 2004 *Excavations at Deansway, Worcester, 1988-89. Romano-British small town to late medieval city. CBA Research Rep **139***

HEAS, 2006 *Proposal for an archaeological evaluation at new library and heritage centre, The Butts, Worcester*, Historic Environment and Archaeology Service, Worcestershire County Council, unpublished document dated 20th January 2006, **P2862**

Hurst, J D, 1994 (as amended) *Pottery fabrics. A multi-period series for the County of Hereford and Worcester*, County Archaeological Service, Hereford and Worcester County Council, report, **445**

Hurst, J D, and Rees, H, 1992 Pottery fabrics; a multi-period series for the County of Hereford and Worcester, in Woodiwiss, S G (ed), *Iron Age and Roman salt production and the medieval town of Droitwich*, CBA Res Rep, **81**

IFA, 1999 *Standard and guidance for archaeological field evaluation,* Institute of Field Archaeologists

Jackson, R 2004 Production: Roman ironworking, in Dalwood and Edwards, 100-105

Macphail, R, 1994 Soil micromorphology, in Dalwood, C H, Buteux, V A, and Darlington, J 1994 Excavations at Farrier Street and other sites north of the City Wall, Worcester 1988-1992, *Trans Worcestershire Archaeol Soc,* 3 ser, **14**, 75-114

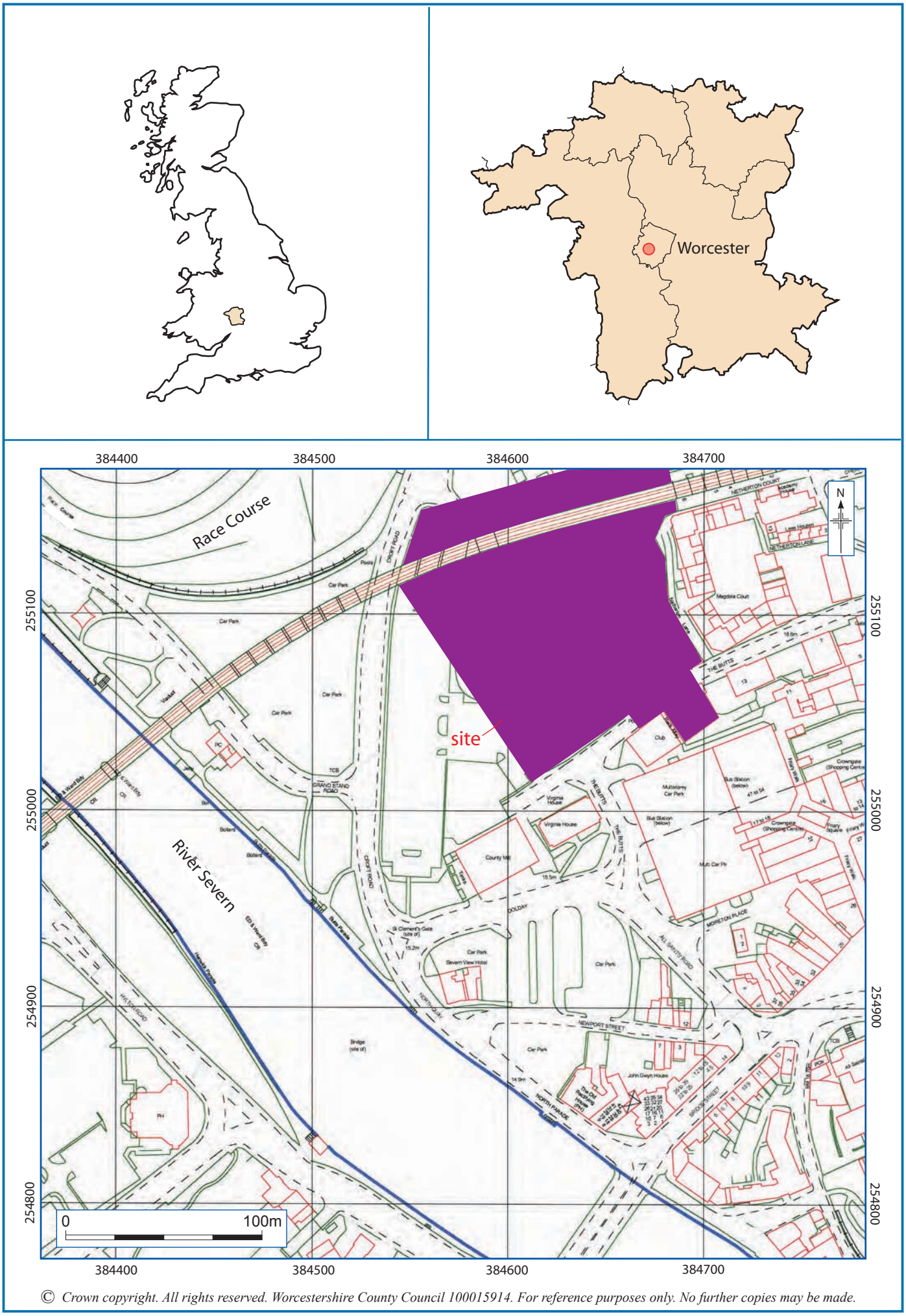
Macphail, R, 2004 Soils and land-use history: results and potential of soil micromorphology, in Dalwood and Edwards, 77-9

Miller, D, Robson-Glyde, S, and Woodiwiss, S, 2005 *Desk-based assessment for a proposed new library and heritage centre, Worcester,* Historic Environment and Archaeology Service, Worcestershire County Council, report **1338**

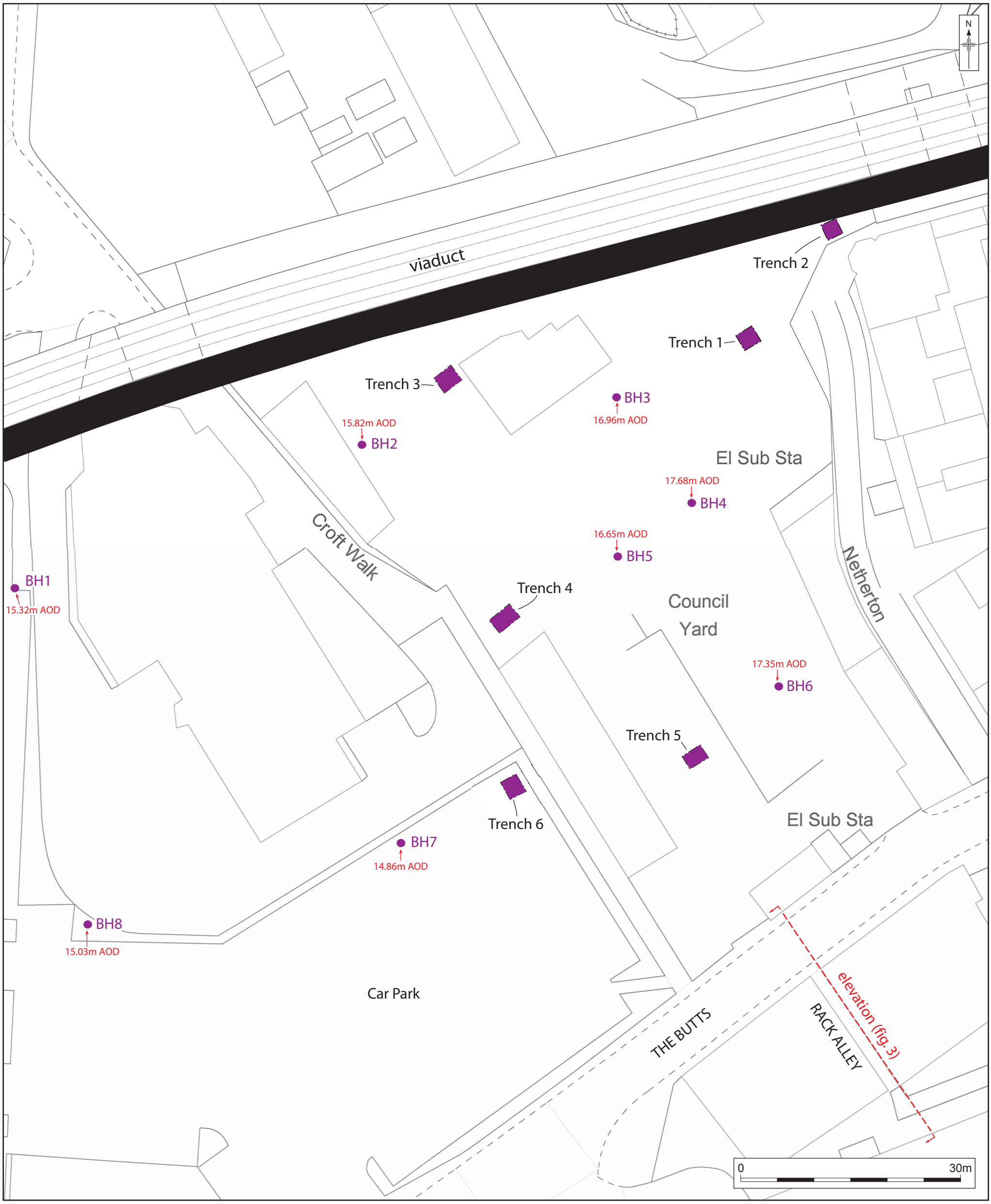
Wilkinson, K, and Marter, P, 2006 *The Butts, Worcester: a geoarchaeological assessment.* ARCA Report 0506-5 [incorporated as Appendix 2 of this report]

Worcester City Council 2004 *An outline research framework for the archaeology of Worcester. Worcester Urban Archaeology Strategy.* Worcester City Council (draft document)

Worcester City Council, 2005 *Brief for an archaeological desk-based assessment and building assessment, Butts Depot and Croft Walk, Worcester,* Worcester City Museum, Archaeology Section, unpublished document dated 10th February 2005

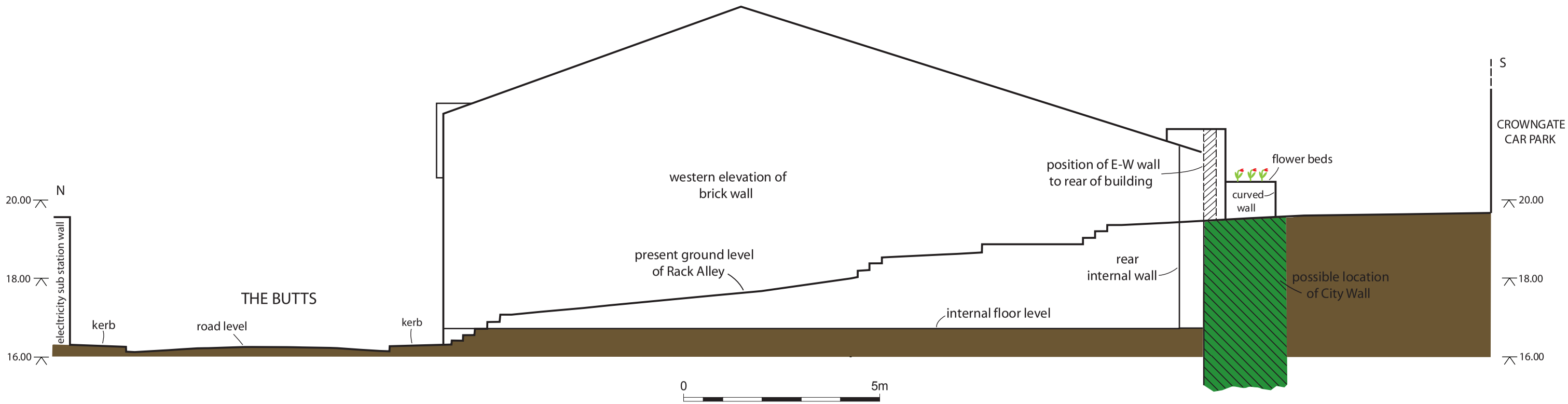


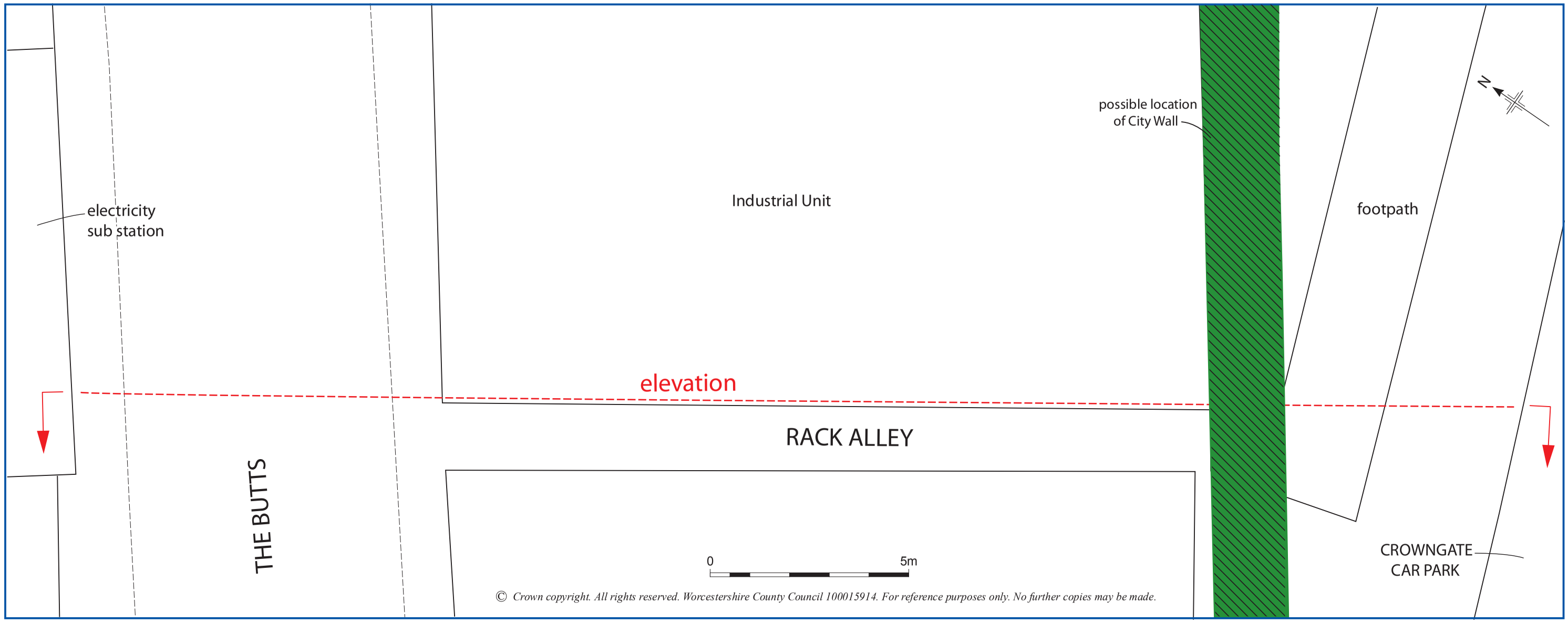
Location of the site. *Figure 1*



Location of trenches and boreholes

Figure 2

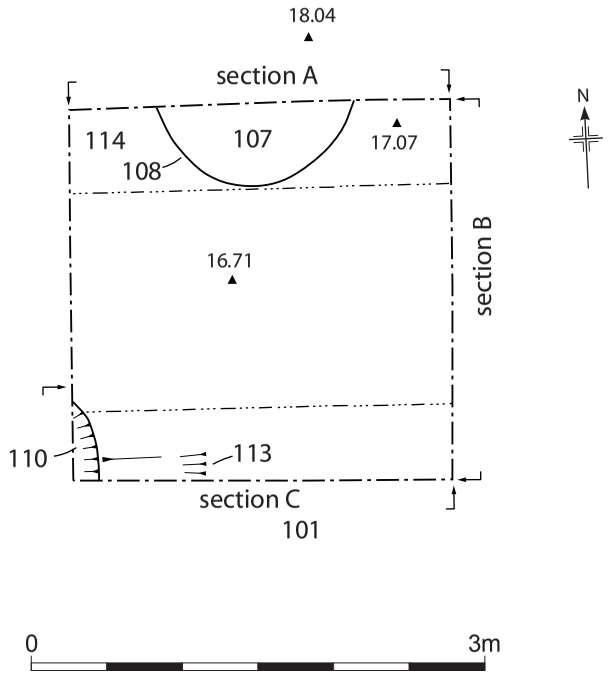




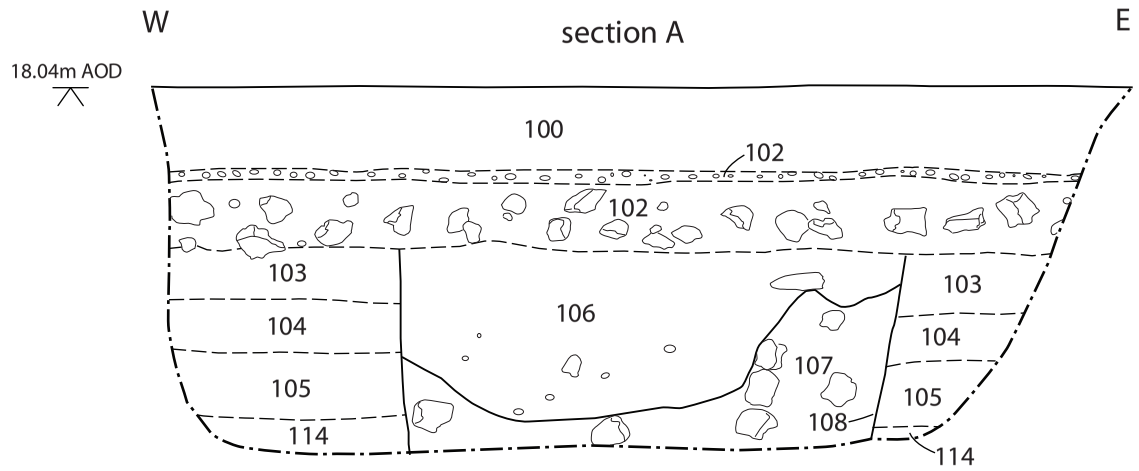
Plan and elevation of eastern side of Rack Alley

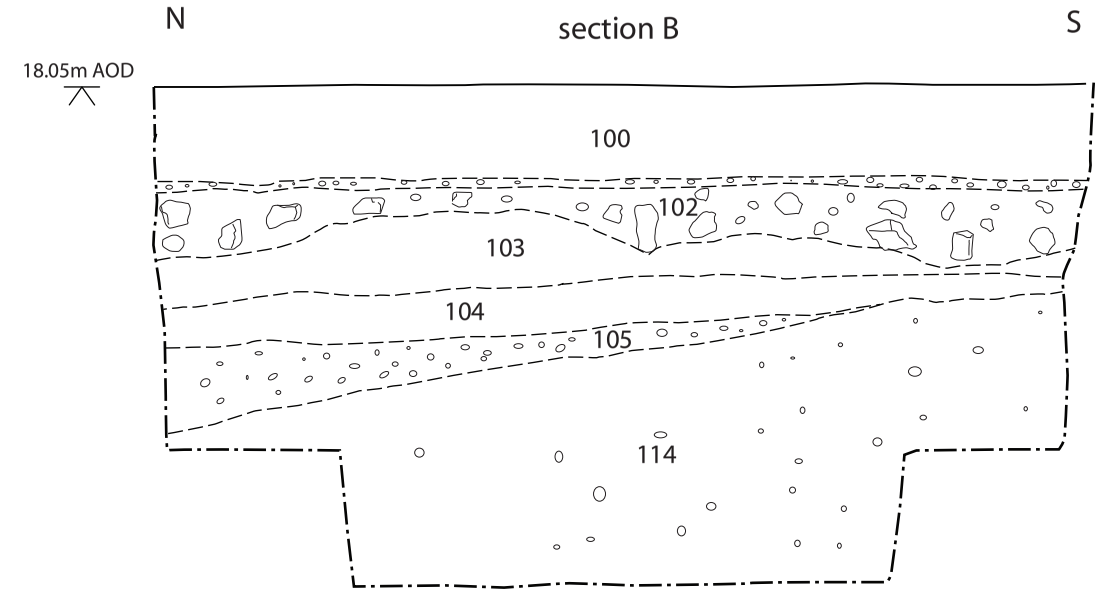
Figure 3

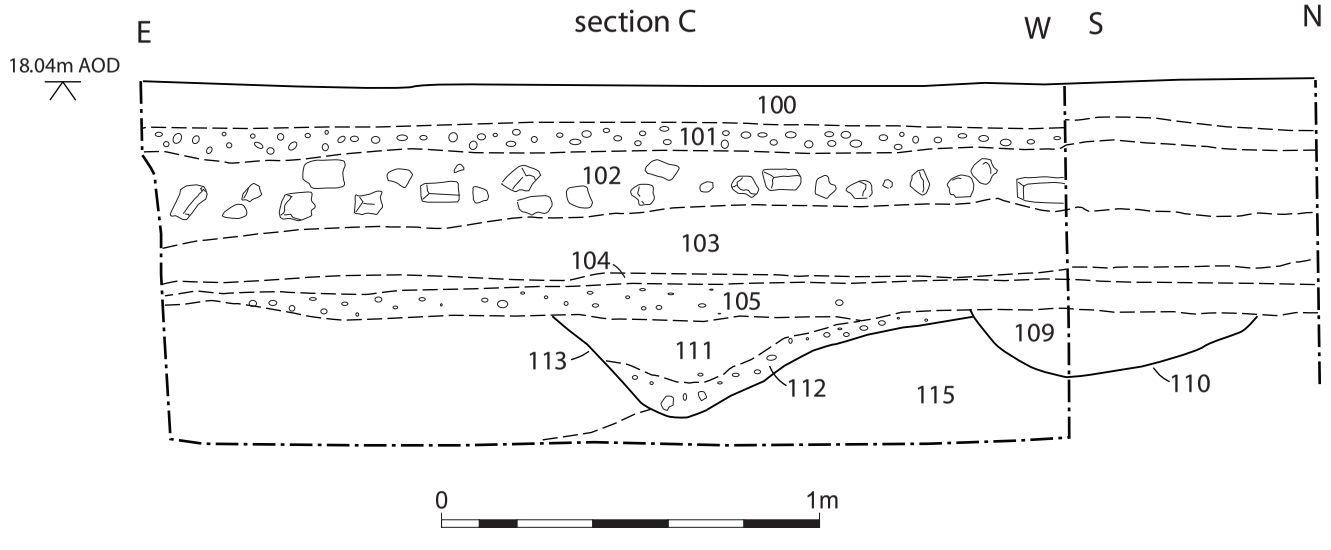
TRENCH 1 : PLAN



TRENCH 1 : SECTIONS



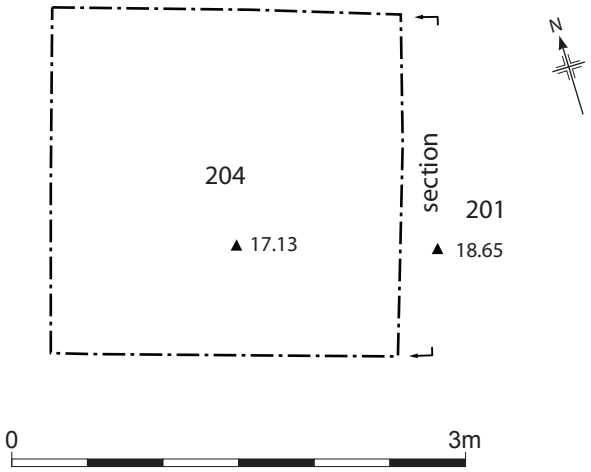




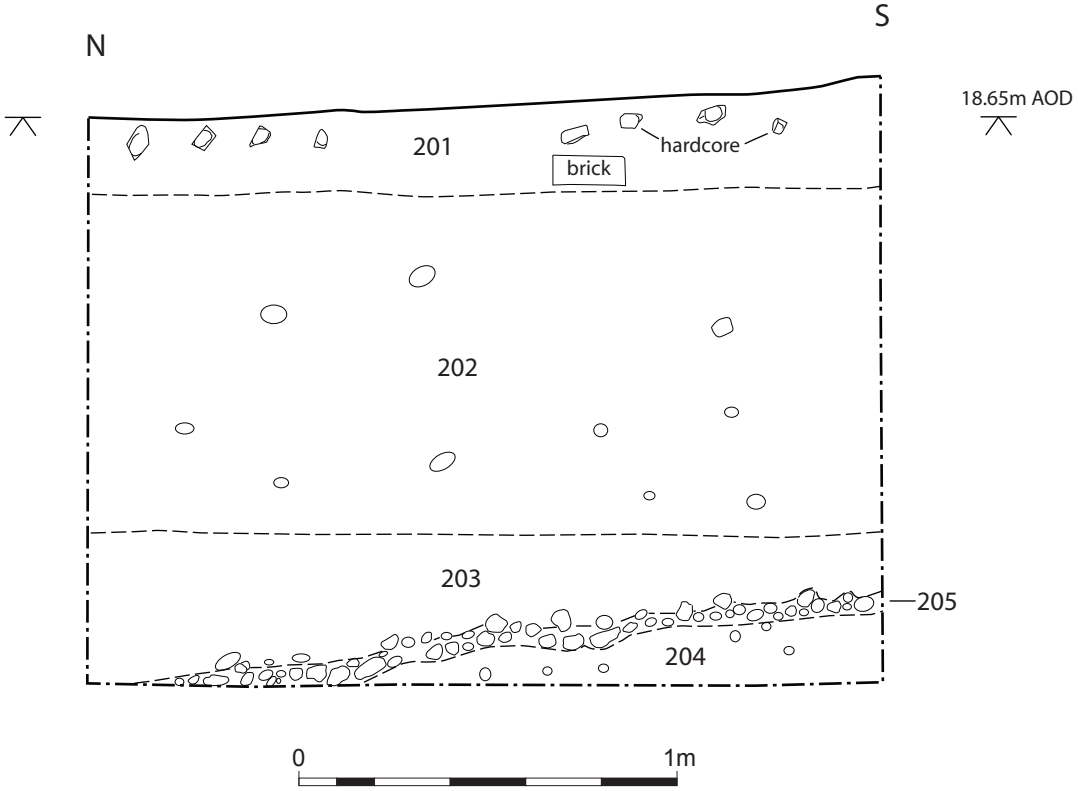
Trench 1: plan and sections

Figure 4

TRENCH 2: PLAN



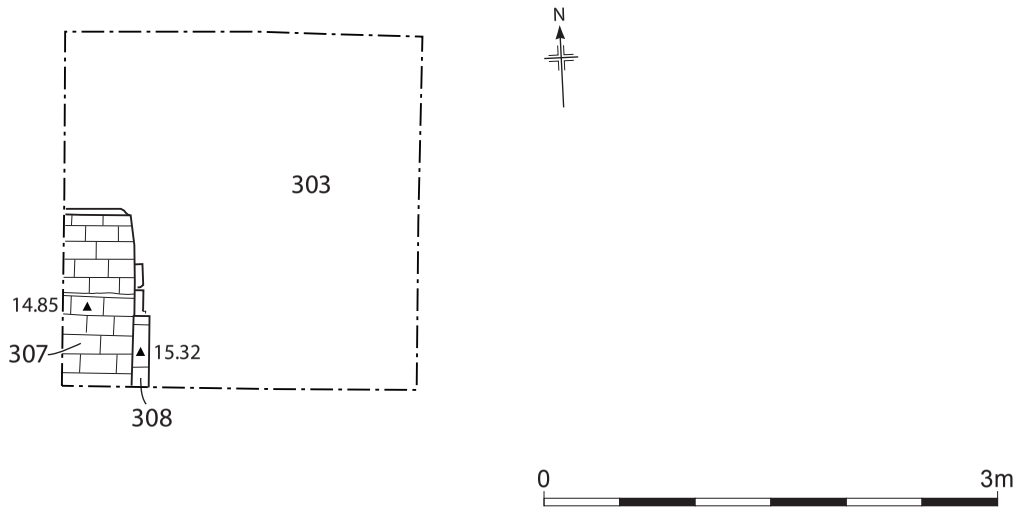
TRENCH 2: WEST-FACING SECTION



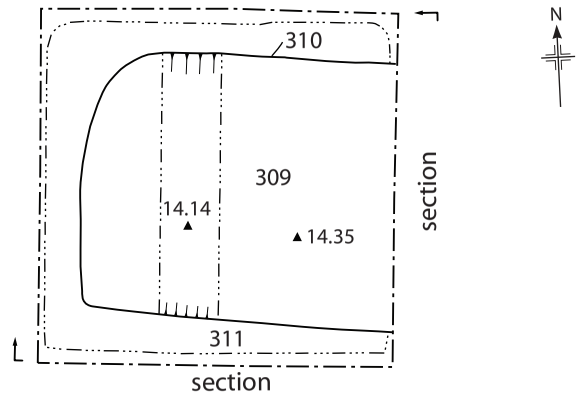
Trench 2: plan and section

Figure 5

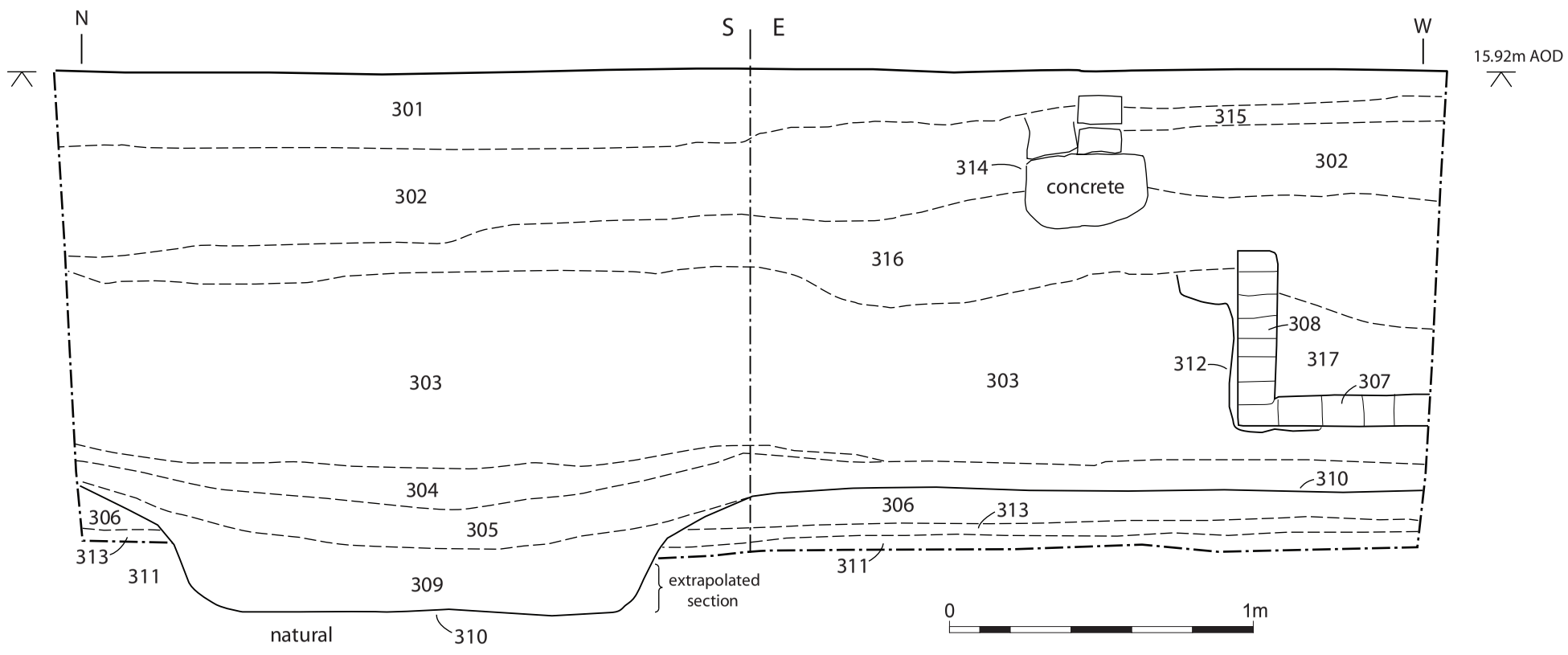
TRENCH 3 : PLAN OF BRICK STRUCTURE



TRENCH 3 : PLAN OF DITCH TERMINUS



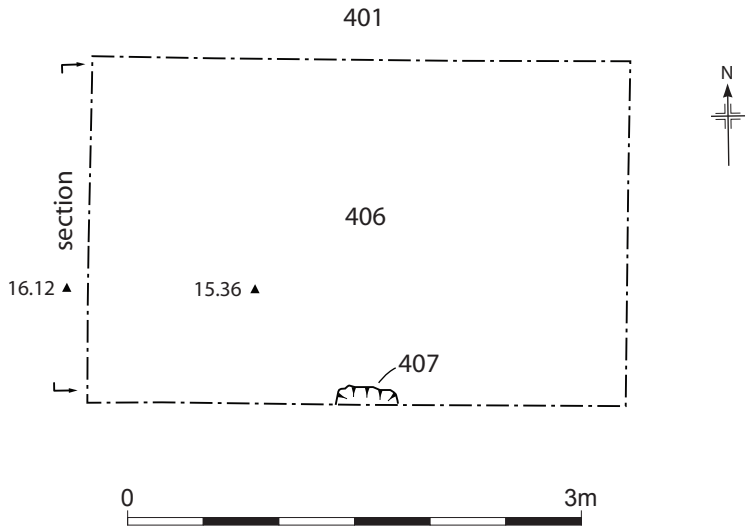
TRENCH 3 : WEST AND NORTH-FACING SECTION



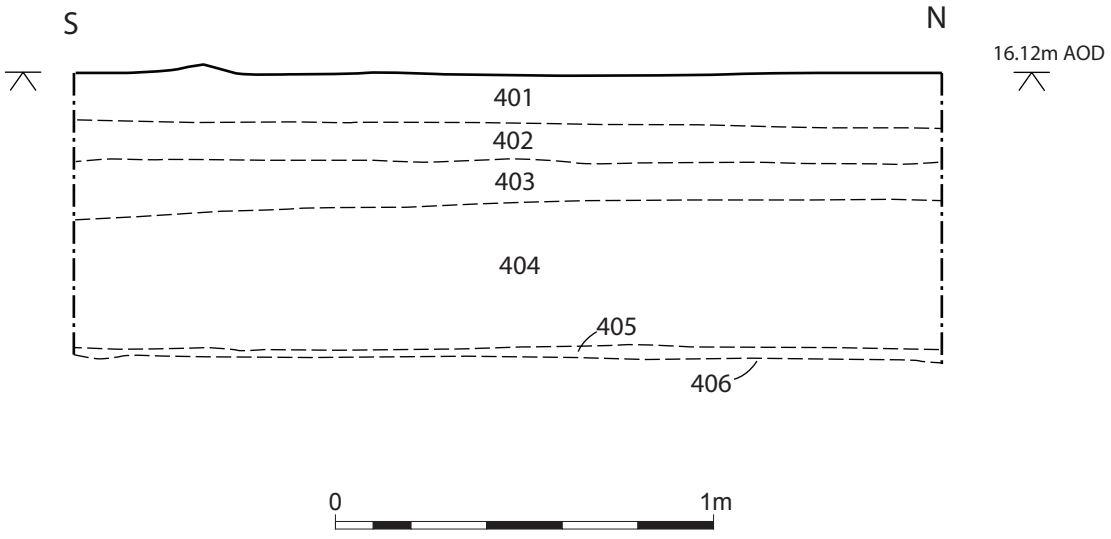
Trench 3: plan and section

Figure 6

TRENCH 4: PLAN



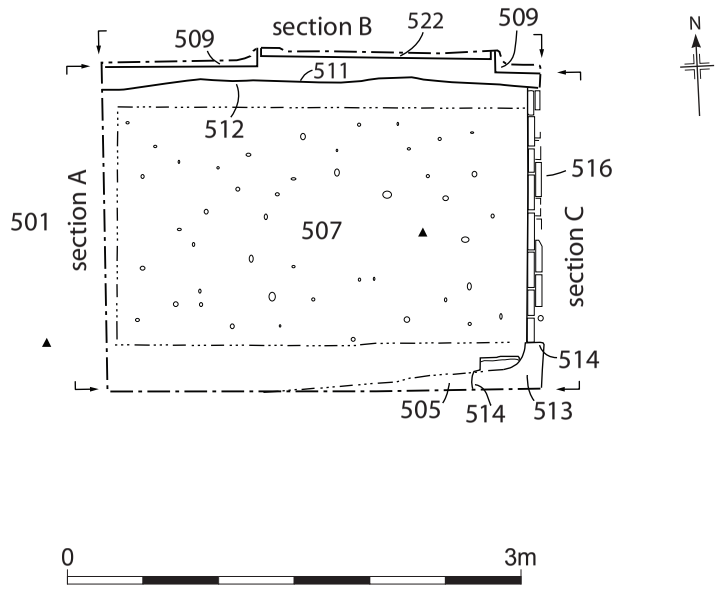
TRENCH 4: EAST-FACING SECTION



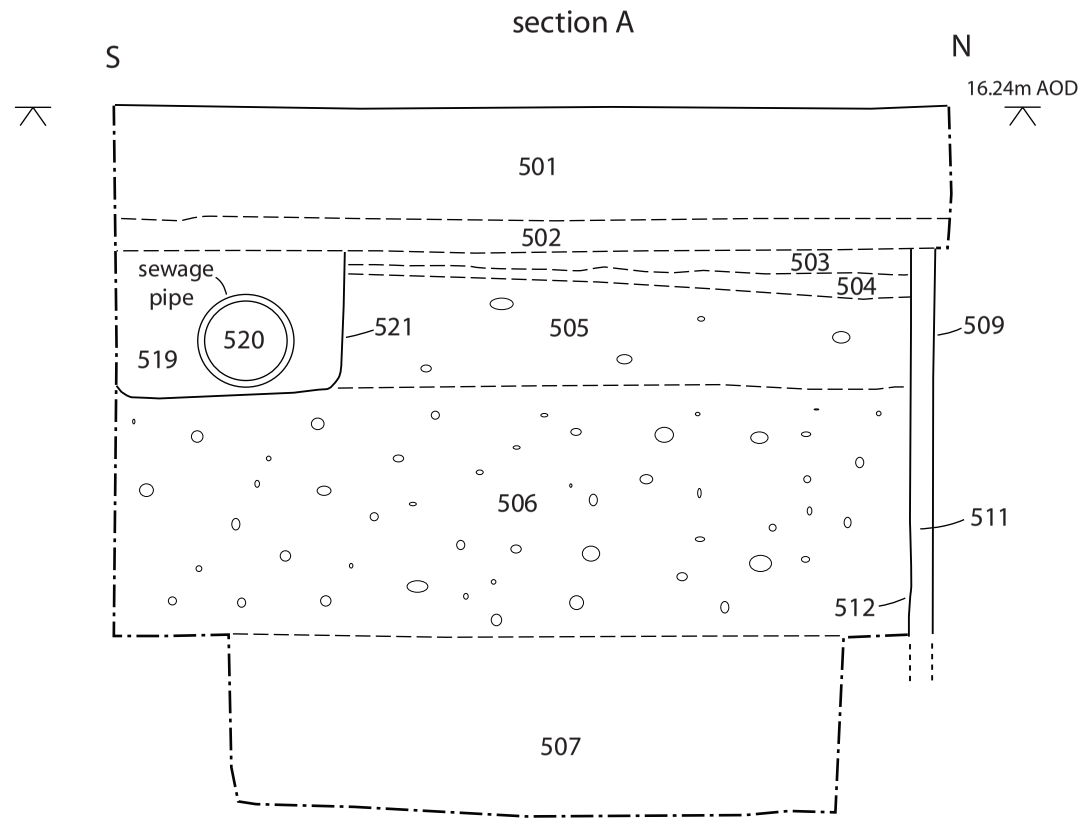
Trench 4: plan and section

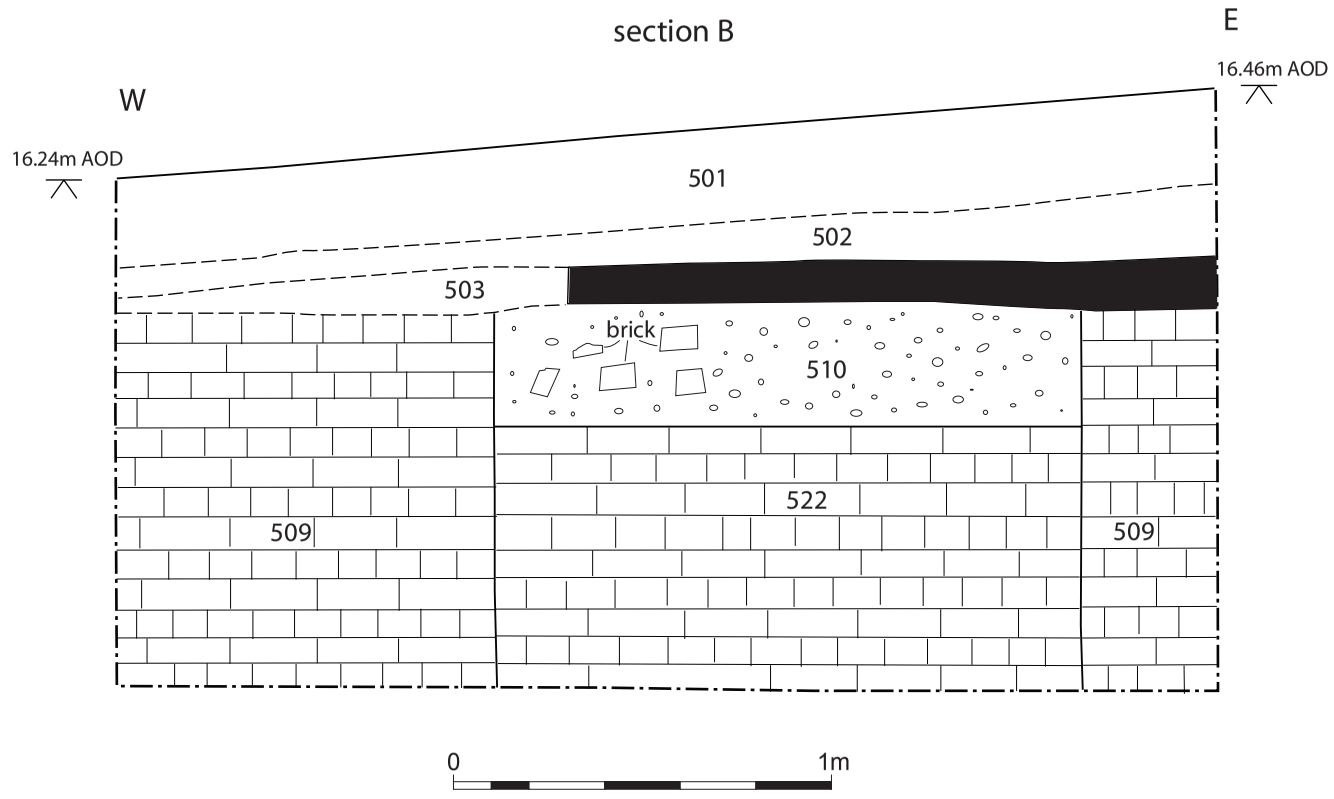
Figure 7

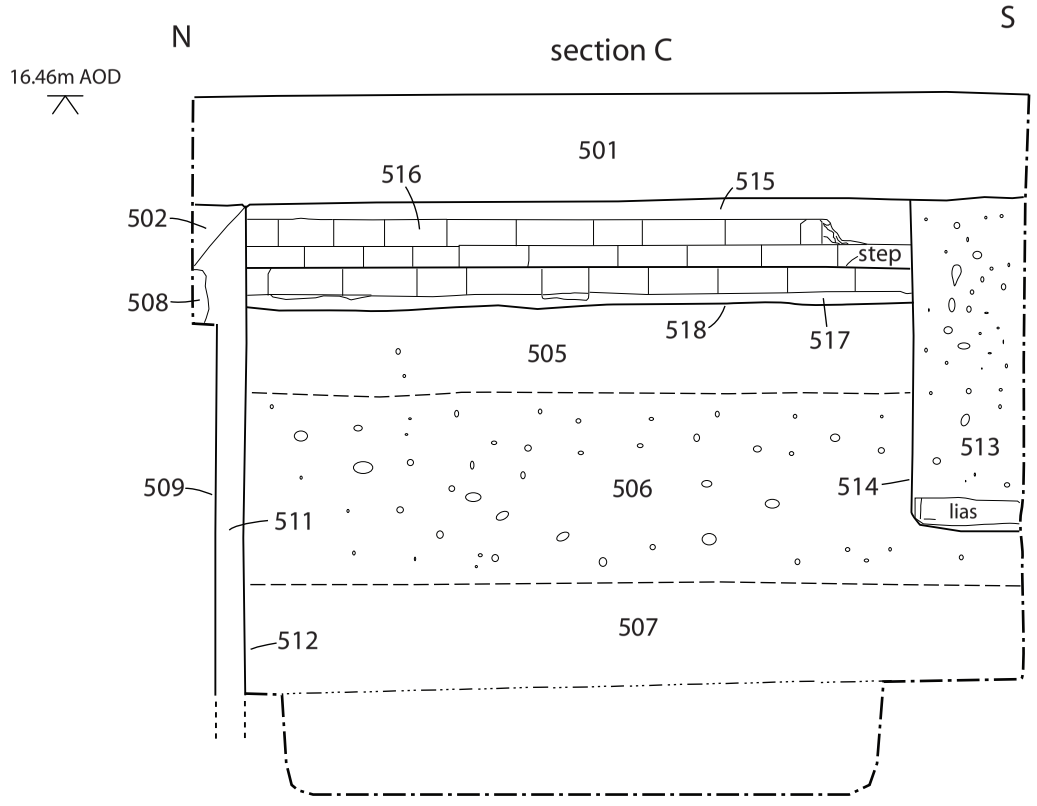
TRENCH 5 : PLAN



TRENCH 5: SECTIONS



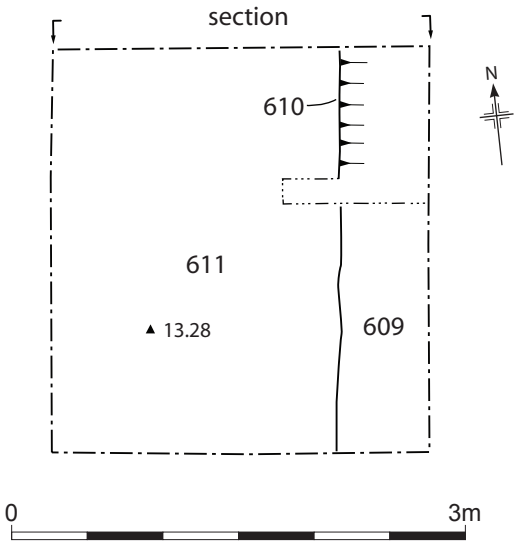




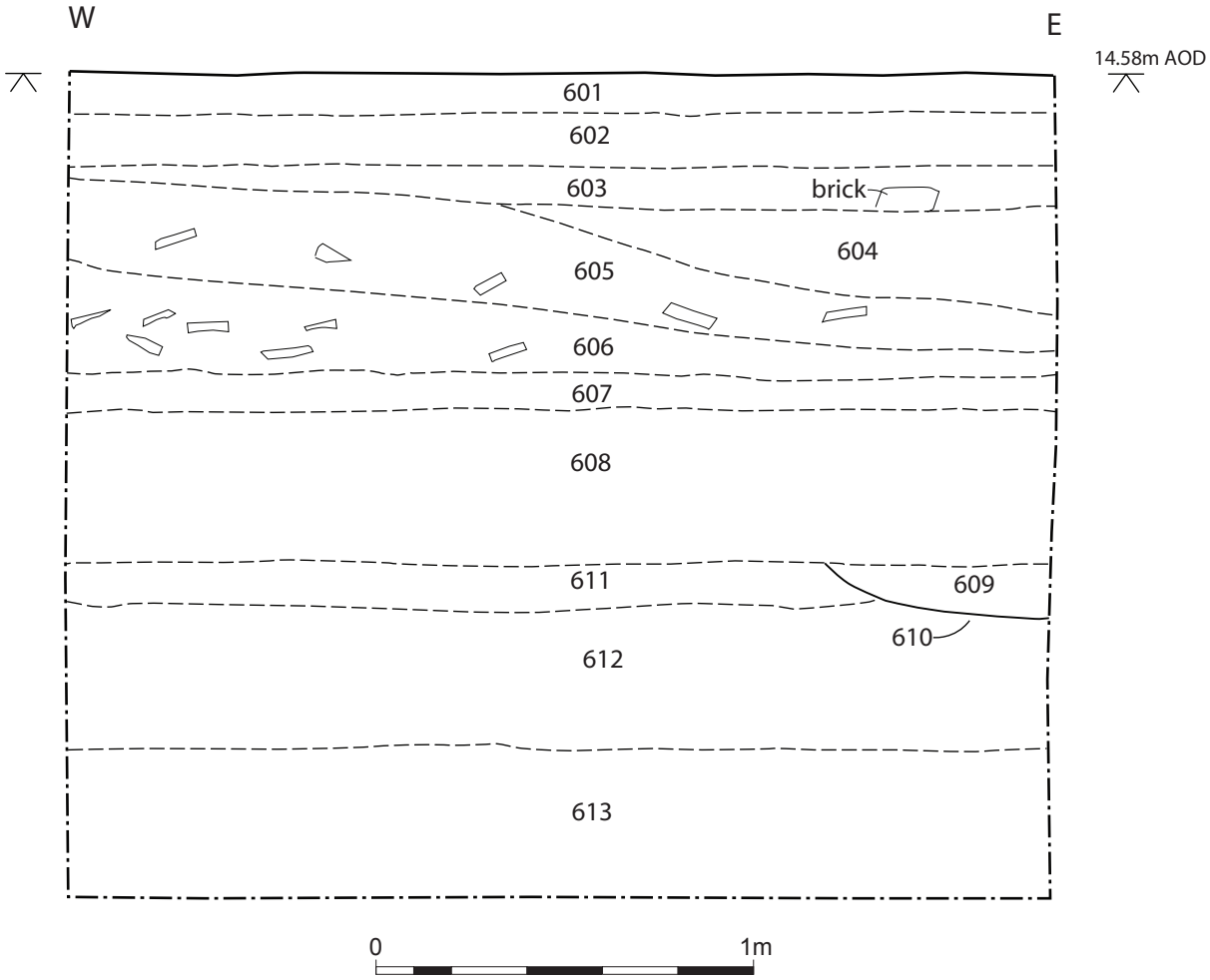
Trench 5; plan and sections

Figure 8

TRENCH 6: PLAN OF LINEAR, 610



TRENCH 6: SOUTH-FACING SECTION



Trench 6: plan and section of linear 610

Figure 9

The Plates

Plate 1: Trench 1, deposit 109, dark deposit in centre of photo. Facing south

Plate 2: Trench 1, pit 108. Facing north

Plate 3: Trench 2, 'dark earth' deposits overlying cobble layer. Facing east

Plate 4: Trench 3, brick floor surface 307 and wall 308. Facing west

Plate 5: Trench 3. Ditch terminus 310, prior to excavation. Facing west

Plate 6: Trench 3,north facing section. Facing south

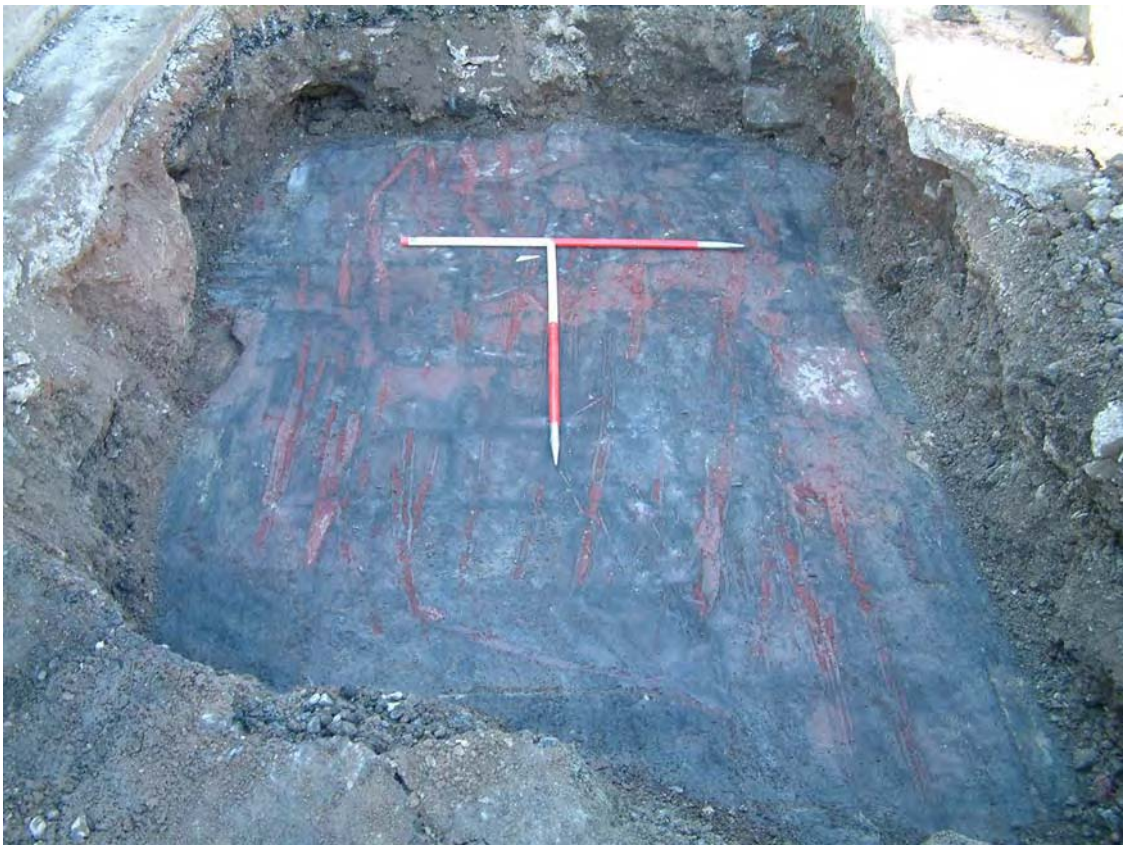


Plate 7: Trench 4, concrete floor surface 406. Facing west

Plate 8: Trench 5, wall 516. Facing east

Plate 9: Trench 5, wall 509 and 522. Facing north

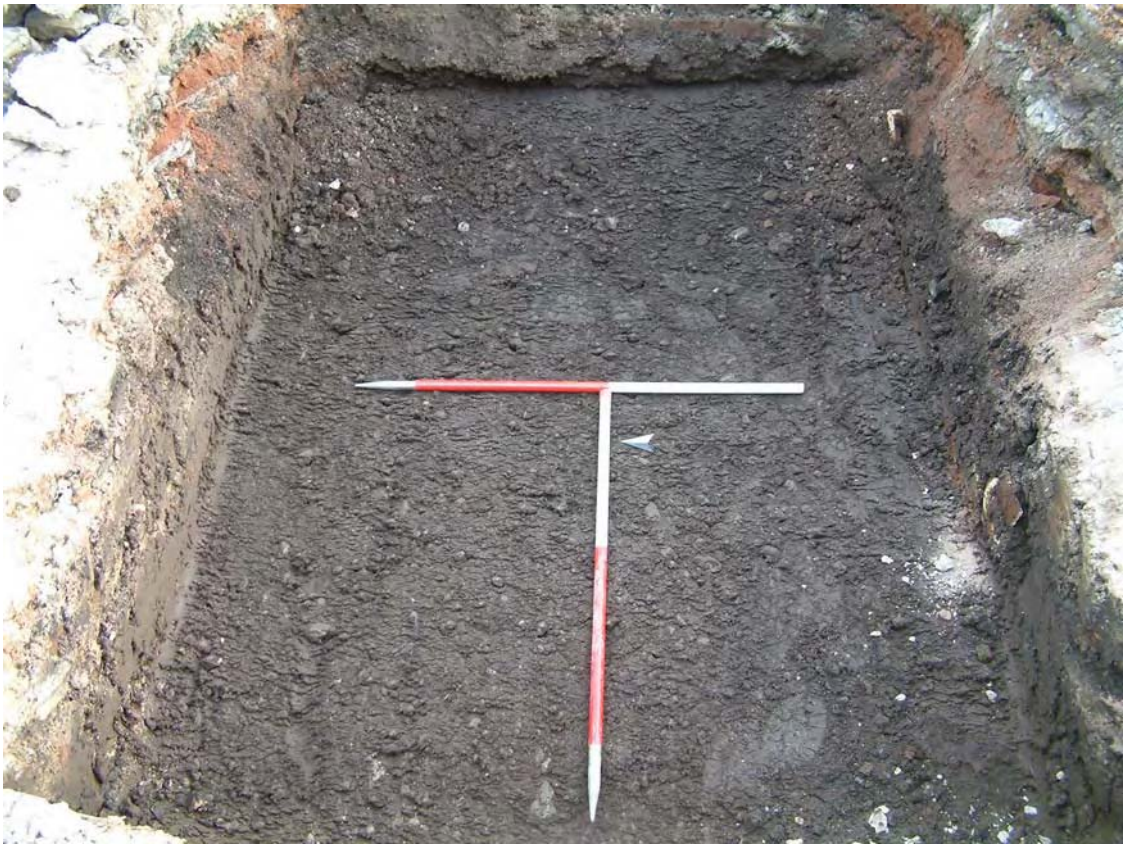


Plate 10: Trench 5, 'dark earth' deposit 506. Facing east

Plate 11: Trench 6, section through north-south linear 610, showing overlying 'dark earth' deposit 608 above. Facing north

Plate 12: Deposit sequence in trench 6. Facing south

Appendix 1 Trench descriptions

Trench 1

Maximum dimensions: Length: 2.60m Width: 2.50m Depth: 1.33m

Orientation: N/A

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
100	Present yard surface	Reinforced concrete slab	0-0.25m
101	Make-up layer	Loose grey sand and gravel	0.24-0.28m
102	Made ground	Loose yellow/brown sand, frequent brick and mortar	0.17-0.46m
103	Made ground	Friable dark brown sandy clay, frequent charcoal flecks, occasional small sub-rounded pebbles	0.34-0.59m
104	Buried plough soil (?)	Firm mid greyish brown sandy clay, occasional charcoal flecks and small sub-rounded pebbles	0.50-0.69m
105	Buried plough soil	Firm mid-dark brown clayey silt, occasional charcoal flecks, frequent small sub-rounded pebbles	0.60-0.91m
106	Secondary pit fill	Loose yellow sand, frequent brick rubble, mortar and sub-rounded pebbles. Fill of 108	0.40-0.88m
107	Pit fill	Friable dark brown sandy silt, frequent brick fragments, charcoal and small sub-rounded pebbles. Fill of 108	0.54-0.95m+
108	Pit Cut	Partially exposed circular (?) cut. Vertical clear sides. Filled by 106 and 107	0.40-0.95m+
109	Pit fill	Compact black silty clay, frequent charcoal and burnt bone, occasional small sub-rounded pebbles. Fill of 110	0.60-0.78m
110	Pit cut	Partially exposed cut, gentle concave sides, concave base. Filled by 109	0.60-0.78m
111	Secondary ditch fill	Loose mid brown sandy silt, occasional small sub-rounded pebbles. Fill of 113	0.61-0.80m
112	Primary ditch fill	Loose mid brown sandy silt, frequent small sub-rounded pebbles and occasional patches of yellow sand. Fill of 113	0.61-0.98m
113	North – south linear (?) ditch cut	Partially exposed linear (?) cut. Moderate, slightly convex sides, 'V' shaped base. Filled by 111 and 112	0.61-0.98m
114	Natural	Loose yellow/brown sandy gravels occasional manganese	0.58m+
115	Natural	Light brown clay	0.64m+

Trench 2

Maximum dimensions: Length: 2.30m Width: 2.30m Depth: 1.5m

Orientation: N/A

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
201	Modern made- ground	Mixed light brown loose clayey sand/gravel, frequent brick fragments, rubble and modern material	0-0.24m
202	Buried plough soil	Firm mid greyish brown silty clay, occasional large sub-rounded pebbles	0.24-1.16m
203	Buried 'dark earth' plough soil	Dark greyish brown clayey silt, frequent small sub-rounded pebbles	1.16-1.50m+
204	Natural	Friable light brownish orange sandy silt, frequent small round pebbles and patches of light brownish grey silt	1.40m+
205	Cobble surface (?)	Thin band of medium sub-rounded pebbles between interface of 203 and 204, silty dark brown soil matrix	1.30-1.50m+

Trench 3

Maximum dimensions: Length: 2.20m Width: 2.40m Depth: 1.80m

Orientation: N/A

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
300	Finds reference number	Un-stratified finds from trench 3	N/A
301	Present tarmac and make-up layer	Tarmac overlain by gravel and crushed brick	0.0.24m
302	Make-up layer	Friable mid brown silt, frequent mortar and rubble	0.16-0.56m
303	Buried plough soil	Firm dark greyish brown silty clay, occasional charcoal flecks and small sub-rounded pebbles	0.64-1.31m
304	Clay layer	Firm light yellowish brown clay, possible fill of 310	1.26-1.44m
305	Slag layer	Friable mid brownish grey clay, frequent Fe slag and charcoal, possible fill of 310	1.36-1.57m
306	Clay layer	Firm light yellowish brown clay	1.38-1.51m
307	Brick floor	Brick cellar floor surface, single course, east – west stretcher, bonded with soft mid brownish grey clayey silt. Brick size 245 x 110 x 65mm	1.08-1.19m
308	Brick wall	Brick wall laid over floor 307, 7 courses, bonded with light orange/brown mortar. Brick size 245 x 110 x 65mm	0.60-1.08m
309	Ditch fill	Friable mid greyish brown silty clay, frequent charcoal flecks, fill of 310	1.36-1.80m
310	Ditch cut	Sharp edged ditch terminus cut. Steep, convex sides, gentle/flat base. Extends eastwards	1.36-1.80m
311	Natural/alluvial	Friable mid reddish brown sandy silt with patches of firm brownish red clay, occasional small sub-rounded pebbles	1.51m+
312	Construction cut	Cut for cellar. Vertical sides, flat base, filled by 307, 308, 317	0.65-1.19m
313	Slag layer	Thin band of firm dark brown/black clay, frequent iron slag and charcoal	1.49-1.54m
314	Construction cut	Modern cut for brick and concrete wall foundation, vertical sides and flat base	0.14-0.54m

Trench 3 (cont.)

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
315	Compacted floor surface	Firm light orange/brown clay, frequent small brick fragments	0.08-0.19m
316	Rubble/demolition layer	Firm mortar and brick rubble layer	0.36-0.78m
317	Cellar backfill	Loose mid brown silty sand, frequent mortar/brick fragments, glass and charcoal	0.74-1.08m

Trench 4

Maximum dimensions: Length: 3.50m Width: 2.35m Depth: 0.76m

Orientation: East - West

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
401	Present yard surface	Reinforced concrete slab	0-0.14m
402	Make-up layer	Loose grey sand and gravel	0.14-0.25m
403	Tarmac	Thin tarmac layer	0.24-0.34m
404	Made ground	Mixed layer of concrete blocks, bricks, pebbles and sand	0.34-0.72m
405	Floor surface	Very degraded carpet tiles	0.72-0.73m
406	Floor surface	Thin layer of over fired dark red clay tiles	0.73-0.76m
407	Floor surface	Concrete surface, un-excavated	0.76m+

Trench 5

Maximum dimensions: Length: 2.65m Width: 2.05m Depth: 1.90m

Orientation: East - West

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
500	Finds reference number	Un-stratified finds from trench 5	N/A
501	Present yard surface	Reinforced concrete slab	0-0.25m
502	Make-up layer	Loose grey sand and gravel	0.25-0.44m
503	Made ground	Friable dark brownish grey sandy silt, occasional sub-rounded pebbles	0.37-0.44m
504	Compacted floor surface	Firm light orange/brown clay, frequent small brick fragments, occasional charcoal flecks and small sub-rounded pebbles	0.41-0.50m
505	Buried plough soil	Firm mid greyish brown clay, occasional large sub-rounded pebbles and charcoal flecks	0.43-0.73m
506	Buried plough soil	Firm dark brownish grey sandy clay, frequent well sorted large sub-rounded pebbles	0.73-1.40m
507	Mixed natural	Friable light brown silty sand, frequent medium sub-rounded pebbles	1.40-1.90m+
508	Modern surface	Concrete slab	0.42-0.53m
509	Brick structure	East – west brick wall. Not fully exposed. Twelve courses visible. Butted by later wall 522. Brick size 226x112x81mm. Fill of 512	0.44-1.50m+
510	Cellar backfill	Firm dark brownish grey sandy clay, frequent small sub-rounded pebbles, gravels and brick fragments	0.55-0.89m
511	Construction cut backfill	Friable mixed mid brownish grey silty sand, occasional medium sub-rounded pebbles. Fill of 512	0.19-1.60m+
512	Construction cut for cellar	Partially exposed east – west cut. Straight, vertical sides, base unexcavated. Filled by 509, 511 and 522	0.19-1.60m+
513	Modern manhole (?) backfill	Firm mixed mid greyish brown sandy clay, frequent small sub-rounded pebbles, CBM fragments and single large blue lias stone at base. Fill of 514	0.17-1.14m

Trench 5 (cont.)

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
514	Modern manhole (?) cut	Partially exposed cut. Straight, vertical sides, flat base. Filled by 513	0.17-1.14m
515	Modern levelling layer	Firm dark greyish brown clayey sand	0.18-0.23m
516	Brick foundation wall	North – south brick wall, three courses, lower course wider. Irregular bond though predominantly stretcher, all bricks laid flat. Light yellowish grey mortar. Brick size 226x112x81mm. Truncated by 512 and 514. Fill of 518. Partially exposed in section	0.23-0.52m
517	Wall bedding	Firm mid greyish brown silty clay, frequent charcoal flecks. Fill of 518	0.52-0.56m
518	Construction cut	Partially exposed north – south linear cut. Flat base, heavily truncated. Filled by 516 and 517	0.32-0.56m
519	Service trench backfill	Firm dark brown sandy clay, occasional sub-rounded pebbles. Fill of 521	0.38-0.76m
520	Modern service pipe	Redundant east- west ceramic sewage pipe, 240mm diameter. Fill of 521	0.48-0.72m
521	Service trench cut	East – west linear cut. Straight vertical sides, flat base. Filled by 519 and 520	0.38-0.76m
522	Later brick infill wall	East – west brick wall. Not fully exposed. Nine visible courses. Butts wall 509. Brick size 226x112x81mm.	0.90-1.60m+

Trench 6

Maximum dimensions: Length: 2.70m Width: 2.50m Depth: 2.20m

Orientation: N/A

Main deposit description

Context	Classification	Description	Depth below ground surface– top and bottom of deposits
601	Present car-park surface	Tarmac	0-0.10m
602	Make-up layer	Gravel hardcore	0.10-0.25m
603	Layer	Firm mid brownish grey silty sand, occasional brick and mortar fragments and charcoal flecks	0.25-0.35m
604	Layer	Friable mid brown sandy silt	0.35-0.64m
605	Dump layer	Loose mid grey clayey silt, frequent mortar and brick fragments	0.28-0.74m
606	Layer	Firm mid grey clayey silt, frequent brick and rubble fragments and occasional charcoal flecks	0.40-0.81m
607	Layer	Firm mid greenish brown clay	0.80-0.90m
608	Layer/buried plough soil	Firm mid brownish grey clayey silt, occasional large sub-rounded pebbles and charcoal flecks	0.90-1.31m
609	Ditch fill?	Firm mid greyish brown sandy clay, fill of 610	1.32-1.45m
610	Ditch cut?	North – south linear cut, moderate concave sides and gentle/flat base, only visible on western edge	1.32-1.45m
611	Layer	Friable mid greyish brown silty sand, occasional small sub-rounded pebbles	1.32-1.44m
612	Layer	Soft dark bluish black sandy silt, occasional small sub-rounded pebbles, heavily contaminated with oil/diesel	1.44-1.80m
613	Alluvial layer	Waterlogged friable greyish brown silty clay, occasional sandstones, not fully excavated	1.80m+

Appendix 2 The geoarchaeology of The Butts

Geoarchaeology

ARCA

March 2006

Report Number: 0506-5

THE BUTTS, WORCESTER: A GEOARCHAEOLOGICAL ASSESSMENT

Prepared for Worcestershire County Council

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SUMMARY

A geoarchaeological study was carried out as part of an initial stage of archaeological evaluation at The Butts, Worcester in February 2006. The study comprised two elements: examination of sections in two evaluation trenches and description of cores obtained from eight boreholes.

In the east of the site, Quaternary deposits rest on deposits of the Eldersfield Mudstone Formation – part of the Upper Triassic Mercia Mudstone Group. These deposits dip sharply to the west, and butted against the western slope so created are more than 6m of sediments from the Late Quaternary Elmore Member of the Severn Formation. The latter comprise channel sands and gravels, which trend upwards to silt and clay floodplain deposits. In the top of the silt-clays are Romano-British cultural layers, including distinct lenses of iron-working slag. The succession is sealed by 'made ground', which in the western part of the site is predominantly of 19-20th century date. However, in the east the base of the 'made ground' is comprised of Late Roman/?sub-Roman 'Dark earth' deposits and in the centre of the site by a Romano-British feature cut into floodplain sediments of the Elmore Member.

Documentary and cartographic evidence suggests that a stream channel once passed along the southern and western edge of the site. This was detected in two boreholes in which >5m of 'made ground' infill was recorded. The channel contains Romano-British deposits in at least one location and these appear to be both waterlogged and rich in organic material.

The data recovered during the geoarchaeological study demonstrate that the top of the Elmore Member has high archaeological and palaeoenvironmental potential. A mitigation strategy for the further investigation of these deposits is suggested which combines geophysics with further study of borehole stratigraphy.

CONTENTS

FIGURES

1. INTRODUCTION

1.1 This document reports on the geoarchaeology of The Butts, Worcester. The Butts site was subject to an archaeological evaluation, conducted by Worcestershire County Council, Historic Environment and Archaeology Service (WCCHEA) in early February 2006. This report has been written as the result of a day long visit made to the archaeological evaluation on 6 February 2006 and from studies made of borehole cores collected by a third party geotechnical contractor.

1.2 The Butts lies on the western side of Worcester and is c 100m from the easterly bank of the River Severn. The site is currently used as a depot by Worcester City Council (northern part) and as a public car park (south) (Figure 1). The present ground surface drops from east to west by about 2m. The assessment report suggests that this fall reflects a change in sub-surface geology from the Worcester Terrace (Late Pleistocene) of the River Severn in the east to 'alluvium' (presumably floodplain and channel deposits of Holocene age) in the west (Miller, Robson-Glyde and Woodiwiss 2005, 5). However, the most recent geological map of Worcester suggests that the eastern part of the site sits on Upper Triassic sandstone and mudstones of the Eldersfield Mudstone Formation (Mercia Mudstone Group) rather than the Worcester Terrace (Figure 2) (British Geological Survey 1993).

1.3 On the basis of historic maps, the archaeological assessment suggests that with one exception, the topography has remained largely unchanged since the medieval period. Cartographic evidence suggests that a stream once ran down the southern side of the site, before cutting north-westwards along the western side of the study area (Miller *et al.* 2005, 5, figure 2). This stream was canalised to form the town wall ditch in the Middle Ages and culverted in the 17th or 18th centuries.

1.4 The aims of the geoarchaeological assessment reported here are as follows:

1.4.1 To characterise Late Quaternary deposits and soils present on the site.

1.4.2 To determine the archaeological and palaeoenvironmental potential of the soils and deposits on the site.

1.4.3 To map the spatial extent of deposits with high archaeological and palaeoenvironmental significance.

1.4.4 To make recommendations for further geoarchaeological investigation.

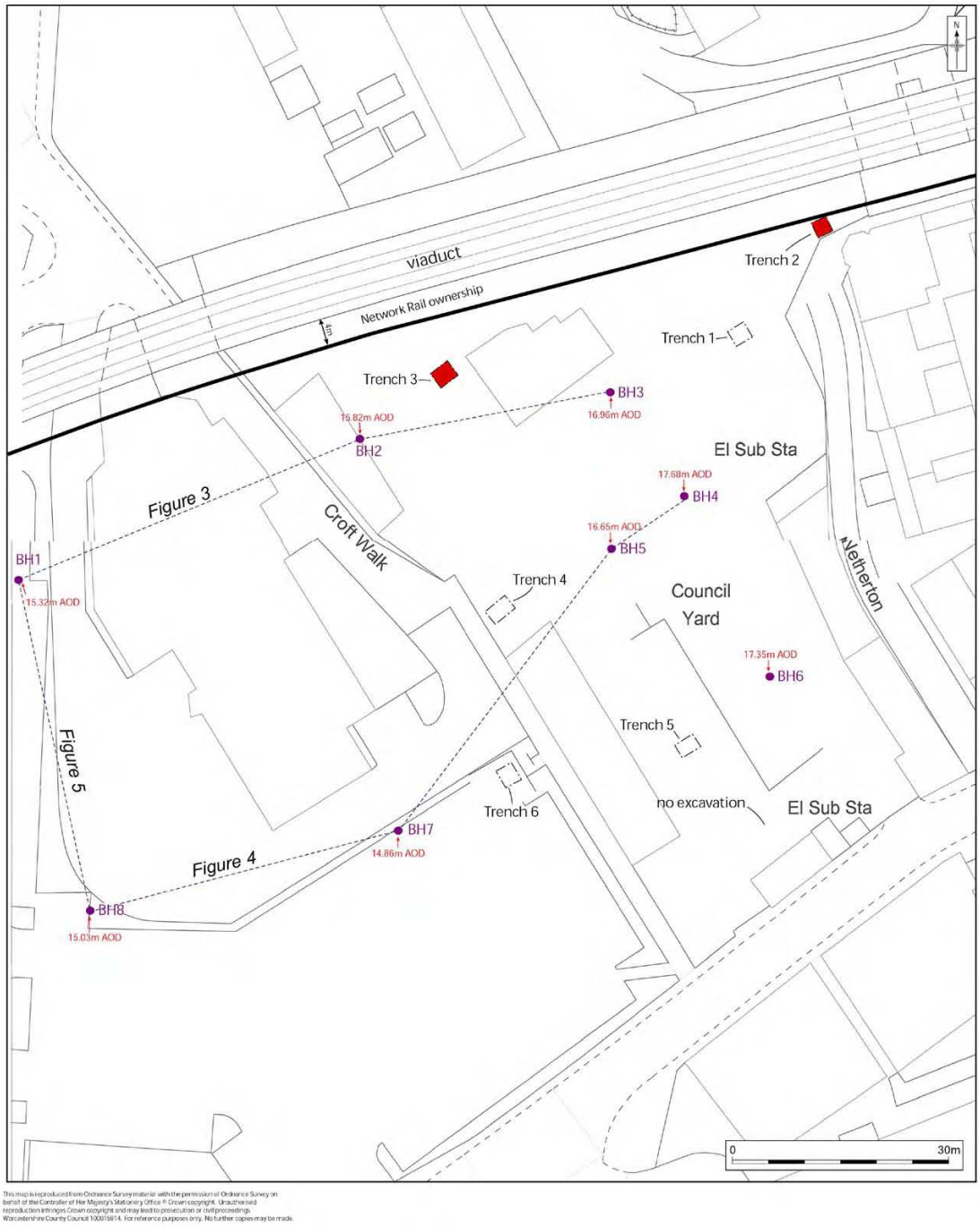

Figure 1. Location of archaeological evaluation trenches and boreholes at The Butts (figure by Worcestershire County Council, Historic Environment and Archaeology Service)

2. METHODOLOGY

2.1 The geoarchaeological work reported here was carried out in two stages. Firstly a visit was made to the site during the course of the archaeological evaluation in order to examine stratigraphy revealed in trenches (numbers 2 and 3) in the eastern part of the site (see red shaded locations in Figure 1). The eastern part of the site lies adjacent to 14-20 The Butts where previous archaeological fieldwork had revealed various features and deposits relating to Romano-British settlement and industrial activity (Burrows and Cutler 2004). The purpose of the visit was therefore to characterise and determine the genesis of any cultural deposits extending from 14-20 The Butts.

2.2 The second element of the geoarchaeological study was an investigation of deposits retained in cores obtained from eight boreholes (for locations see Figure 1). The boreholes were drilled by a geotechnical sub-contractor, Global Probing and Sampling (GPS) Ltd, under the supervision of Dr Katie Head (WCCHEA). WCCHEA officers labelled and sealed all the recovered cores and accurately surveyed in the location of the boreholes in relation to Ordnance Datum (OD) and Ordnance Survey National Grid Reference (NGR). GPS Ltd use a track-mounted percussion window sampling system that retrieves continuous cores to a maximum operating depth of 12m ("Competitor" Drilling System [Global Probing and Sampling Ltd. 2004]). On completion of the boreholes, all cores were removed to the WCCHEA offices for temporary storage.

2.3 The cores were subsequently transported to laboratories at the Department of Archaeology, University of Winchester for detailed study. The plastic tubes containing the cores were slit open; the sediments contained within were hand-cleaned and the freshly exposed sediments described. Sediment recovery in the cores was variable and there is an average loss of 0.2m from each 1.0m long core (see 'No Recover' in Figures 3-5). In respect of sediment 'loss' it should be noted that percussive auger systems of the type operated by GPS Ltd have a tendency to compress sediments retained in the recovered cores. Compression is a factor of sediment water content, which in turn is related to water table height, grain size and organic content. Lithological description, both of sections in the two evaluation trenches examined (Appendix 1) and of the borehole cores (Appendix 2), was according to standard geological criteria (Tucker 1982, Jones *et al.* 1999, Munsell Color 2000).

2.4 Lithological data from the borehole cores were entered into a database within the RockWorks geological utilities software (RockWare 2005), and that software was then used to generate the composite cross sections presented in Figures 3-5. The cross sections and the lithological data (Appendices 1 and 2) form the basis of the discussion in Section 3.

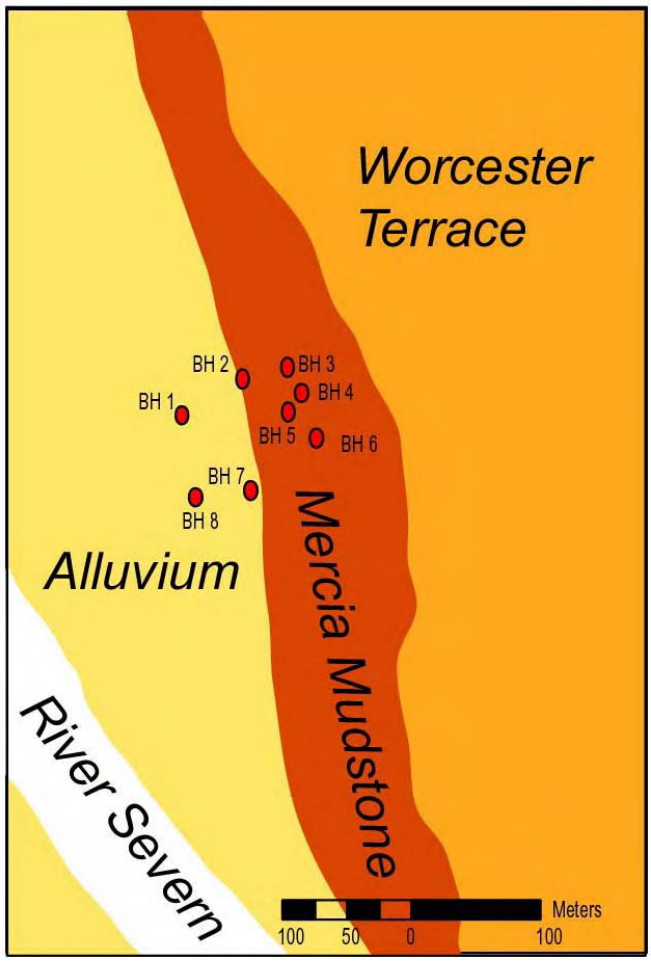

Figure 2. Location of boreholes in relation to solid and drift geology mapped by the British Geological Survey (1993)

2.5 The archive resulting from geoarchaeological study of The Butts comprises a paper and digital record. Cores from the Elmore Member in BH 1 and BH 8 have been retained, but all other cores have been discarded. The retained cores will not be suitable for further study after June 2006.

3. STRATIGRAPHY

3.0.1 The stratigraphy of The Butts site can be conveniently divided into three for the purposes of discussion. The earliest deposits

on the site are sandstones and mudstones of the Triassic period Eldersfield Mudstone Formation. These are overlain by bedded sands, silts and cultural layers of the Late Quaternary Elmore Member (Severn Formation) (Maddy 1999). The whole succession is capped by 'Made Ground' deposited during the historic period.

3.1 Eldersfield Mudstone Formation

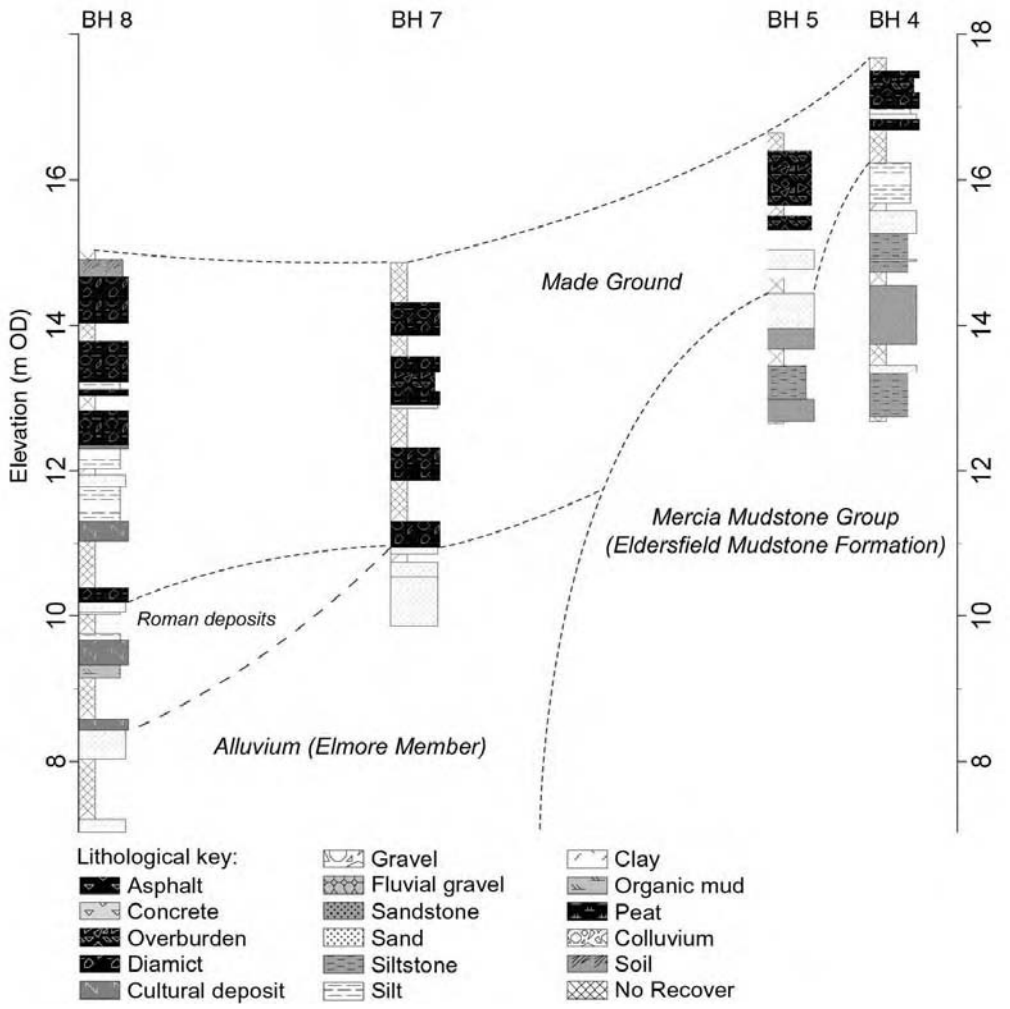

Figure 3. East-west borehole transect across the southern part of the site

3.1.1 The Eldersfield Mudstone Formation is part of the Mercia Mudstone Group of deposits (British Geological Survey 1993). It dates from the Carnian and Norian stage of the Upper Triassic and is therefore between 225 and 210 million years old. Deposits of the Eldersfield Mudstone Formation were separated

from those of the lowest part of the Elmore Member (see Section 3.2) on the basis of two characteristics:

a. Partial lithification or complete induration.

b. 5 YR or redder hue

On the basis of these criteria, four boreholes from the east of the site (BH 3-6) contain deposits of the Eldersfield Mudstone Formation (Figures 3-4, Appendix 2).

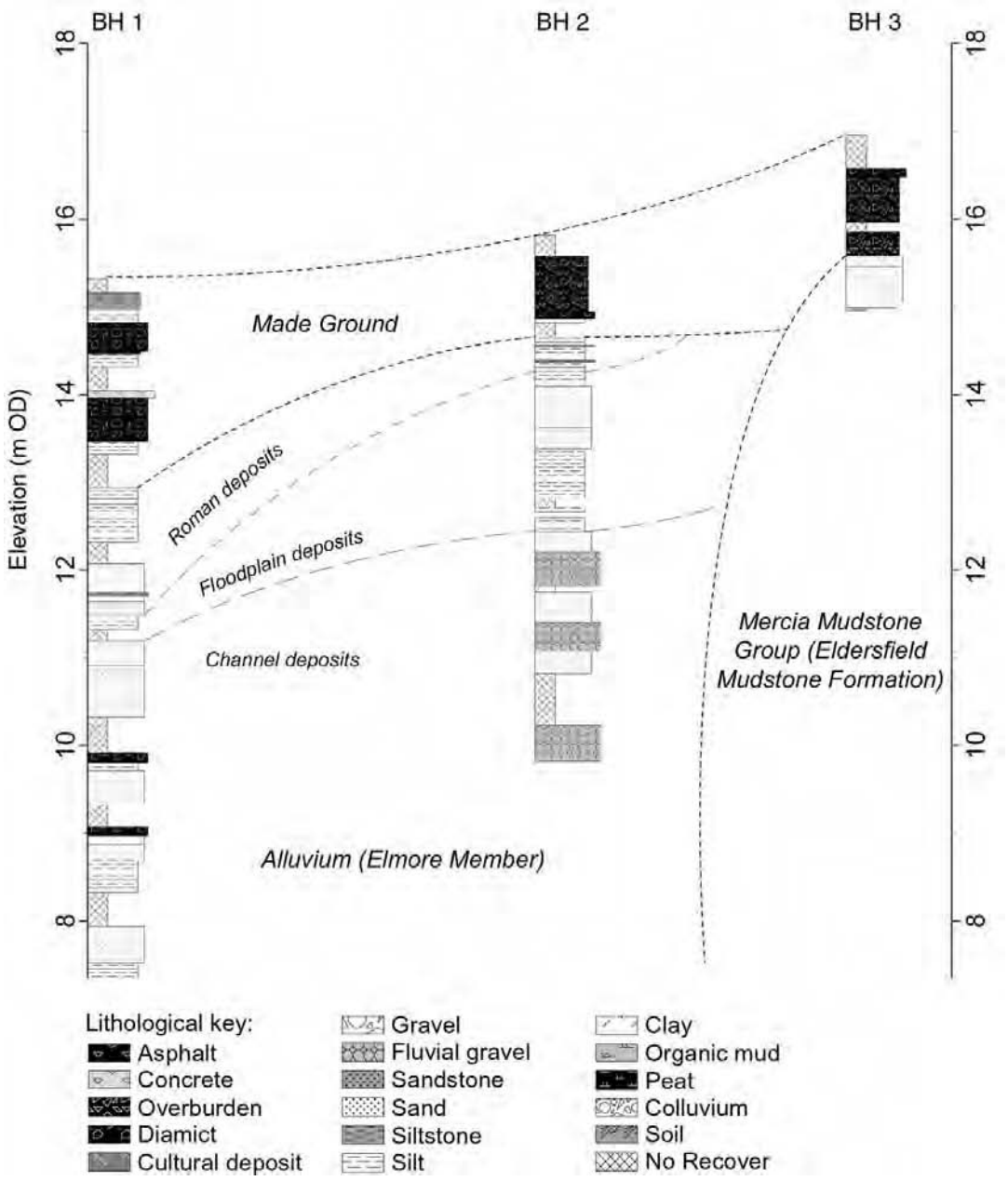

Figure 4. East-west borehole transect across the northern part of the site

3.1.2 Sediments of the Eldersfield Mudstone Member comprise compacted, deep red semi-lithified fine sand and silts, with occasional stringers of rounded quartzite granules and pebbles.

Rare thin beds of grey semi-lithified fine sand and unlithified medium sand also occur. The uppermost deposits of the Eldersfield Mudstone Formation are heavily weathered, for example in BH 3, and are therefore largely unlithified, but they have retained their deep red colour.

3.1.3 The fact that deposits of the Eldersfield Mudstone Formation were not found in the southern part of the site despite drilling to a depth of 7m OD (BH 8, cf. upper contact of 15-16m OD in BH 3-6), indicates that there is a considerable drop in bedrock height from east to west across the site (see Figure 3). This has almost certainly been caused by downcutting of the River Severn during the Quaternary period, as is also evidenced by the presence of the Worcester Terrace (a former bed of the Severn), at elevations greater than 16m OD (see Figure 2).

3.2 Elmore Member

3.2.1 The Elmore Member comprises all alluvial deposits forming in the Severn and tributary valleys that postdate the deposition of the Power House Member (Maddy 1999). Given that the Power House Member dates to the Late Pleistocene, deposits of the Elmore Member are overwhelmingly of Holocene and, to a lesser extent, Devensian Late Glacial age (0-15 ky BP).

3.2.2 The Elmore Member is draped against the Eldersfield Mudstone Formation, indicating its genesis as the infill of a major channel (Figures 3 and 4). Deposits of the Elmore Member therefore thicken from east to west, reaching at least 6m in thickness in BH 1. However, as Figure 5 demonstrates, there is a drop in height of almost 3m between the upper contact of the Elmore Member in BH 1 and the same contact in BH 8, both of which are located on the western margins of the site. There could be two reasons for this difference:

a. that during deposition of the Elmore Member or subsequently, the southern and/or western part of the site was subject to channelling, thus removing much of the upper alluvial stratigraphy in BH 8. As is explained in Section 3.2.4 below, this must have occurred prior to the Roman period. It is possible that the stream noted in the archaeological assessment as once passing down the south and west side of The Butts could have cut such a channel (Section 1.3, Miller *et al.* 2005).

b. that the relevant cores in BH 8 have been contaminated by deposits collapsing down the hole and have therefore been wrongly ascribed as 'made ground'. While it is true that there are many zones of non-recovery in BH 8 as a result of

compression and/or sediment escape from the auger chamber, this explanation is not favoured by the authors. It is notable that the lower contact of 'made ground' in BH 7 is at an almost identical elevation to that in BH 8, suggesting that 'made ground' is infilling a former channel.

3.2.3 Both channel and floodplain facies are found in the Elmore Member site. There is a general tendency for channel facies to underlie those of floodplain type (see Figure 4), suggesting that former channels of the River Severn once passed over the site, but that subsequently the river has migrated westwards. The channel facies show classic fining upwards sequences, suggesting that channels formed, were active and then became infilled, and that these processes occurred on a number of occasions. The alluvial deposits are derived from two sources: the Eldersfield Mudstone Formation and the various Pleistocene terraces of the River Severn. Sands and silts forming within channels therefore tend to be of a reddish hue (7.5 YR), while the gravels are mostly of rounded quartzites. Floodplain deposits, as for example found in BH 1-2 and 8, are of a greener hue (10 YR and occasionally 2.5 Y), reflecting their higher organic content and derivation from surface soils.

3.2.4 The upper part of the Elmore member, corresponding to floodplain facies, contains Romano-British artefacts. These comprise ceramics, burnt animal bone and iron-working slag. The latter was found as distinctive beds in BH 1 and BH 2, and as loose particles in BH 8, and is likely to correspond to a wide spread of Romano-British slag known from western Worcester (Miller *et al.* 2005, 6). As well as providing information about the nature of Romano-British industrial activity in Worcester, the slag layer also provides an excellent temporal marker. Assuming that the slag layer can be used in this way, it would appear that at the time of its deposition the ground surface sloped from 14.5m OD (BH 2) in the centre of the site to 11.7m OD in the south (BH1) (Figure 4). At present the slope is from 16m OD to15.3m OD. Although no slag layer was found in cores from BH 8, other Romano-British artefacts (including slag) were. These outcrop at between 10m and 8.3m OD, i.e. between 1.5m and 3.2m lower than in BH 1 (Figure 5). The data suggest that the Romano-British ground surface sloped downwards from north to south across the western part of the study area, a further argument for the presence of an active channel running along the southern part of the site at this time. Yet another argument for the channel thesis is the nature of the Romano-British deposits in BH 8, which include organic-rich deposits that are

characteristic of the margins of slow-flowing streams. The remaining Romano-British layers in BH 8 are suggestive of mixed alluvial and deliberate human deposition.

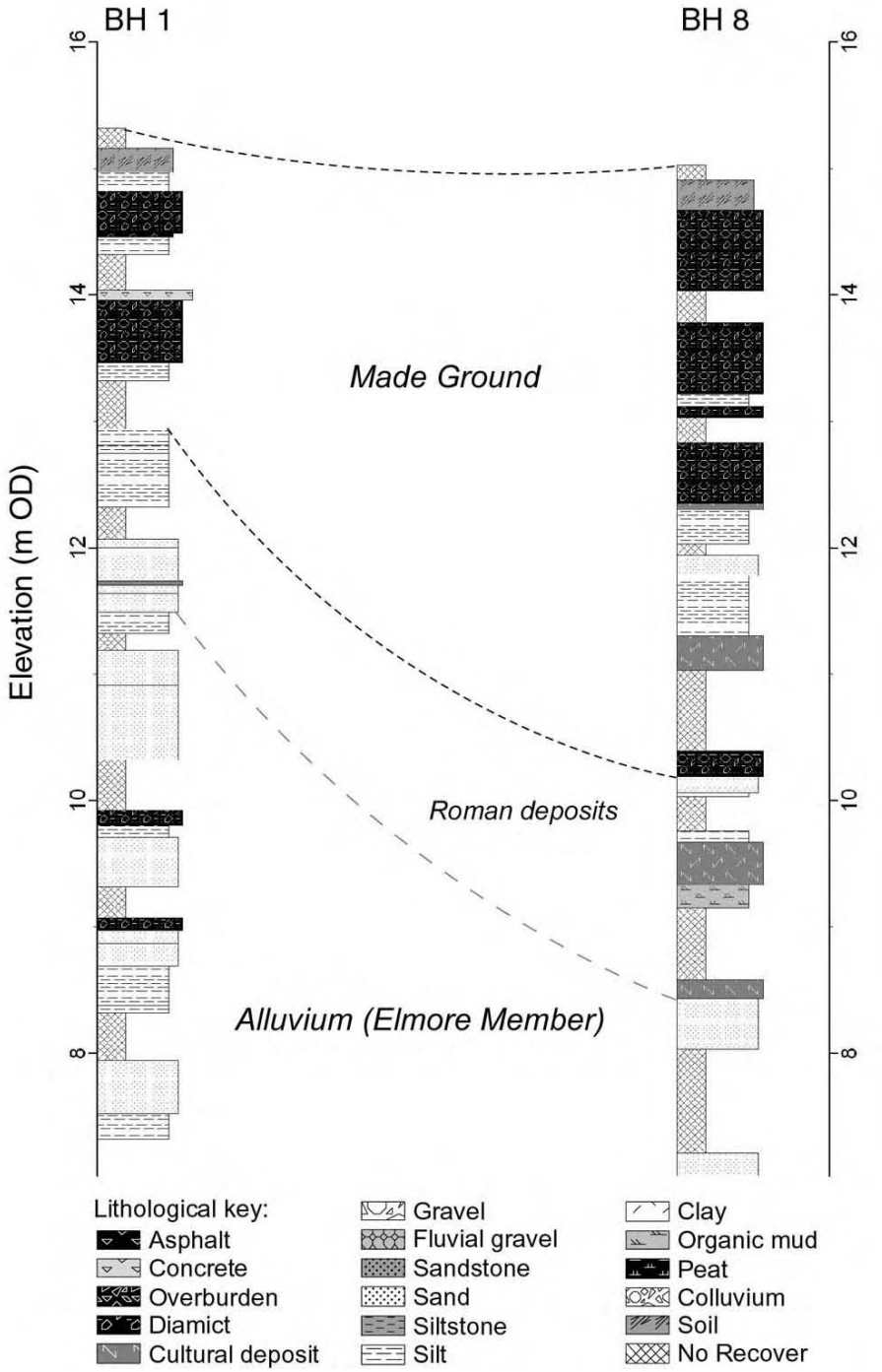

Figure 5. North-south borehole transect across the western part of the site

3.2.5 Despite the presence of Romano-British artefacts in the top of the Elmore Member, only an approximate chronology can be

advanced for its formation. During the Romano-British period, floodplain sedimentation occurred across the southern and central parts of the site, while the southern part is likely to have included a stream channel. Deposition of metalworking debris and other cultural debris occurred on to these surfaces. However, the underlying floodplain and channel deposits could date any time from the Romano-British period to as far back as 15 ky BP.

3.3 Made Ground

3.3.1 'Made ground' is a term used by geologists to include all deposits formed as a product of human action. At The Butts the lowest part of the 'made ground' stratigraphy in the eastern part of the site includes Romano-British and ?sub-Roman layers (e.g. Trenches 2 and 3), but that to the west is predominantly comprised of 19th and 20th century material.

3.3.2 In general, 'made ground' thickens from c 1.5m in the east of the site to between 2.5m and 5m in the south. There is also a thickening of 'made ground' across the southern part of the site from 2.5m (BH 1) to 5m (BH 8). In other words: deposition of made ground has the effect of evening out topographic 'lows'. This infill has been most significant in the southern part of the site where the greatest thicknesses of 'made ground' are found. These deposits have infilled the putative channel previously discussed in Sections 1.3 and 3.2.4, effectively obliterating this feature from the modern topography. The lowest part of the 'made ground' in BH 7 is late post-medieval in date (i.e. 18th century or later) on the basis of artefacts in the cores, indicating that the southern channel was infilled within the last three centuries.

3.3.3 Romano-British layers at the base of the 'made ground' in Trenches 2 and 3 are described in the archaeological evaluation report (Sworn in prep.). However, it is worth commenting on their genesis here. It should be emphasised that although Romano-British layers in the evaluation trenches are not of the Elmore Member (i.e. they did not form in an alluvial environment), basal deposits in Trench 2 may be of an equivalent age to Romano-British layers in the Elmore Member. The Romano-British deposits in Trench 2 comprise poorly sorted fills - containing Mortaria and other coarse ware pottery and iron working slag - of a cut feature. The feature cuts through floodplain deposits of the Elmore Member and is buried by 'made ground' dating to the 19-20th century. Therefore, at

this particular location, no alluvial sedimentation has occurred since the cut feature was dug.

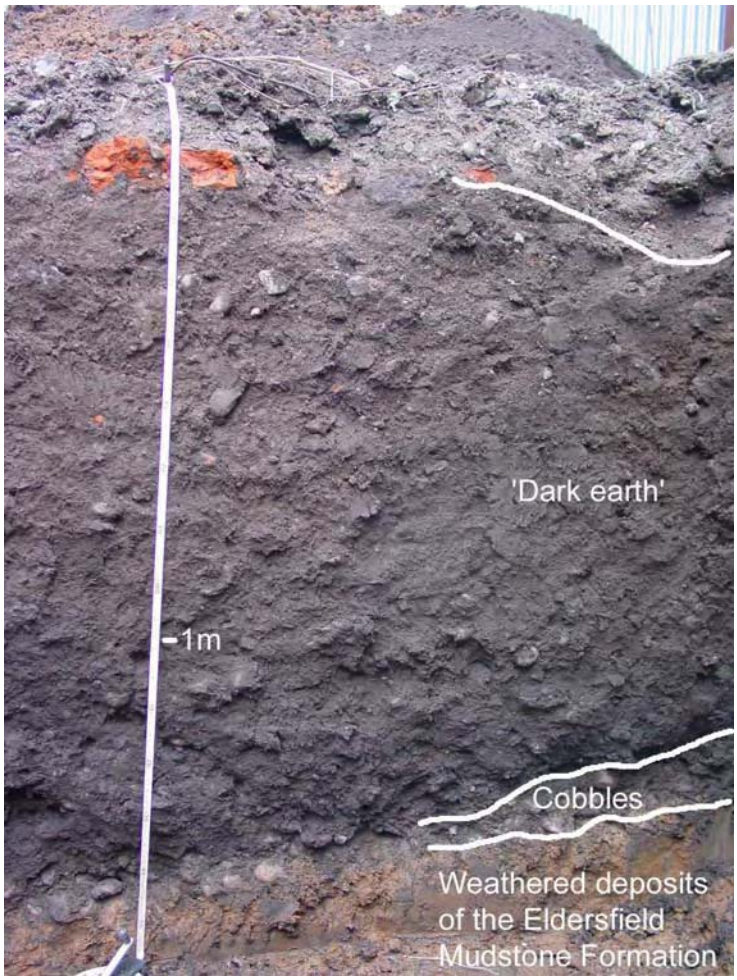

Figure 6. 'Dark earth' deposits in the eastern section of Trench 2

3.3.4 In Trench 2, 'Dark earth' deposits were found overlying a layer of rounded cobbles interpreted as being deliberately emplaced during the Roman period (Figure 6) (Sworn pers. comm.). 'Dark earths' are common Late Roman and sub-Roman deposits in urban situations in Britain and are thought to have formed when habitation and craft areas were converted to market gardens towards the end of the Roman period. The dark colour reflects the input of manure, cess and other organics to improve fertility. The 'Dark earth' in Trench 2 probably extends from similar deposits previously reported at 14-20 The Butts (Burrows and Cutler 2004). 'Dark earth' from Worcester has also been studied in detail by Dr Richard MacPhail (2004) at the Deansway site, and he suggests the deposits derive from animal manure and middens. 'Dark earth' in Trench 2 at The Butts is about 1.25m thick, contains frequent Romano-British ceramic fragments and charcoal pieces, but is not especially humic. It

lacks any stratifications (a common property of all 'Dark earths'), although it does lighten in colour upwards. It is interesting to note that 'Dark earth' was not found in any of the borehole cores, or in Trench 3, suggesting that it is restricted to the eastern margins of the site. In other words: 'Dark earth' does not coincide with the Elmore Member, suggesting that market gardening did not take place on the floodplain during the Late Roman/?sub-Roman period.

3.3.5 The non-Romano-British 'made ground' is comprised of diamicts of brick, concrete and asphalt in a sand matrix. The sands are of a reddish colour and are therefore likely to have been derived from the Eldersfield Mudstone Formation, while the larger clasts are reworked building materials. 'Made ground' in BH 7 and 8 contained large quantities of crushed brick, suggesting that this material was compressed during deposition – perhaps another indication that 'made ground' infills a channel at this location.

4. ASSESSMENT

4.1 The Eldersfield Mudstone Formation has NO archaeological or palaeoenvironmental potential. These deposits formed many millions of years before the hominid family had evolved.

4.2 The basal parts of the Elmore Member, i.e. the channel facies (BH 1 and 2, Figure 4), have a LOW archaeological and palaeoenvironmental potential. Although it is not known when these deposits accreted – except that this occurred before the Romano-British period – the high-energy environment needed to emplace such sands and gravels will have mitigated against a. human use of the area, and b. subsequent survival of archaeological material.

4.3 In contrast, the upper part of the Elmore Member, i.e. the floodplain facies, has both a HIGH archaeological and palaeoenvironmental potential. Reasonably large quantities of archaeological material were found from floodplain facies in BH 1 and BH 2, and from equivalent deposits in BH 8. These suggest activity across much of the western and northern part of the site in the Romano-British period. Indeed it is likely that this activity correlates with Romano-British deposits in evaluation Trench 3 and the 14-20 The Butts site investigated by Birmingham Archaeology. Accompanying the cultural deposits in BH 8 and to a lesser extent BH 1, are organic layers containing, in the case of BH 8, well-preserved plant macro

remains. The potential therefore exists to recover well-preserved proxies from these waterlogged deposits, which would enable Romano-British economies and environments to be reconstructed.

4.4 The archaeological potential of the 'made ground' is considered in detail by the archaeological evaluation report (Sworn in prep.). It is worth noting that the 'Dark earth' sequence in the eastern part of the site appears to survive in a relatively untruncated condition (at least in Trench 2), and therefore has MODERATE archaeological (but LOW palaeoenvironmental) potential. Analysis of the 'Dark earth' would enable the genesis of these deposits to be more clearly understood and suggestions made as to whether the high ground at The Butts was subject to the same land use as Deansway in the Late Roman period.

5. RECOMMENDATIONS

5.1 The geoarchaeological project reported on here has enabled the past topography of The Butts site to be reconstructed in detail. Any future archaeological/geoarchaeological work carried out in advance of construction should attempt to refine the data presented here. A number of questions suggest themselves:

a. What is the exact route of the channel passing down the southern and western sides of the site? How wide an area did the channel occupy?

b. What is the chronological, stratigraphic and functional relationship of the Late Roman/?sub-Roman 'Dark earth' in the east of the site (Trench 2), Romano-British features cut into alluvial silts of the Elmore Member in the centre of the site (Trench 3) and Romano-British cultural layers observed within the Elmore Member in BH 1, 2 and 8?

c. Is the slag noted in BH 1, 2, 8 and Trench 3 all from the same phase of activity (i.e. is there a consistent slag layer covering the site)? Can the metalworking history of this part of Worcester be reconstructed from evidence preserved at The Butts?

5.2 Archaeological/geoarchaeological techniques to address all the above questions do exist, many of them relying on trenching. However, there are considerable logistical difficulties in the use of archaeological trenches to investigate the western parts of the site, given deep burial of archaeological deposits (e.g. 2.5-4.2m in BH 1, 5.0-6.5m in BH 8). Also, these deeply stratified areas coincide with a 'terrace' in Worcestershire County Council's outline development plan (Miller *et al.* 2005, figure 4). If

construction of this terrace were to remove less sediment than the depths quoted above then the development is likely to have limited impact on this buried Romano-British archaeological resource. Assuming that construction of the terrace involves ground reduction of less than 2.5m, the following strategy is suggested as part of an archaeological mitigation programme to address the questions given in Section 5.1.

5.2.1 Consideration should be given to a ground-penetrating radar (GPR) survey of areas of the present public car park to be impacted by the proposed development. This survey should be able to both locate and map the extent of the buried channel passing through this part of the site. The survey could either be undertaken as a series of transects, or a total spatial survey of the whole area.

5.2.2 A key constituent of the archaeological mitigation in the eastern and central part of the site is an east-west section though the Romano-British deposits, allowing their stratigraphic, chronological and functional relationship to be assessed. Consideration should be given to the use of micromorphological techniques comparable to those employed at Deansway to study the 'Dark earths' in the eastern part of the site.

5.3 Should terracing result in damage to deposits below 2.5m, or piles be driven into the deposits of the western part of the site, the following further mitigation is suggested:

5.3.1 Organic deposits associated with Romano-British cultural layers in BH 8 should be assessed using plant macro-fossil and palynological techniques. This will enable both the environment in which Romano-British activity took place, and Romano-British economies to be reconstructed. Following extraction of samples for these purposes, the relevant sediments can then be disaggregated and any further artefacts extracted. It should be noted, however, that sub-sampling for these assessments would have to take place before June 2006.

5.3.2 That a further borehole be drilled, using either a rotary or pneumatic drilling device, in the vicinity of BH 1. Cores would be extracted to the base of the floodplain deposits (c 4-5m) and then used for mineral magnetic and palynological studies. This would enable the metalworking history of western Worcester to be determined (mineral magnetics) and provide sub-regional vegetation data for the Romano-British period.

6. ACKNOWLEDGEMENTS

6.1 ARCA would like to thank Dr Katie Head, Simon Sworn and Simon Woodiwiss of Worcestershire County Council, Historic Environment and Archaeology Service for their help during the course of the project.

6.2. This text has been copy-edited by Fine Line Archaeological Language Services (http://www.finelinetext.com).

7. BIBLIOGRAPHY

British Geological Survey (1993) *Worcester, England and Wales Sheet 199. Solid and drift geology. 1/50,000*. British Geological Survey, Keyworth.

Burrows, B. and Cutler, R. (2004) 14-20 The Butts, Worcester. Post-excavation assessment and research design. Unpublished report, Birmingham Archaeology Project 1097, University of Birmingham, Birmingham.

Global Probing and Sampling Ltd (2004) Technology. http://www.globalsampling.co.uk/page1.htm (Accessed 7 February 2006).

Jones, A.P., Tucker, M.E. and Hart, J.K. (1999) Guidelines and recommendations. In Jones, A.P., Tucker, M.E. and Hart, J.K. (Eds.) *The description and analysis of Quaternary stratigraphic field sections*. Quaternary Research Association technical guide **7**, London, 27-76.

Maddy, D. (1999) English Midlands. In Bowen, D.Q. (Ed.) *A revised correlation of Quaternary deposits in the British Isles*. The Geological Society Special Report **23**, London, 28-44.

Miller, D., Robson-Glyde, S. and Woodiwiss, S. (2005) Desk-based assessment for a proposed new library and heritage centre, Worcester. Unpublished report, Historic Environment and Archaeology Service, Worcestershire County Council, Worcester.

Munsell Color (2000) *Munsell soil color charts*. Munsell Color, New Windsor (NY).

Rockware (2005) RockWorks v2004. http://www.rockware.com (Accessed 7 February 2006).

Shotton, F.W. and Coope, G.R. (1983) Exposures in the Power House Terrace of the River Stour, Wilden, Worcestershire, England. *Proceedings of the Geologists' Association* **94**, 33-44.

Tucker, M.E. (1982) *Sedimentary rocks in the field*. Wiley, Chichester.

APPENDIX 1. STRATIGRAPHIC DESCRIPTIONS (EVALUATION TRENCHES)

Trench 2

Unit	Top (m)	Base (m)	Lithology	Description
1	0.00	0.53	Diamict	10 YR 3/2 diamict of frequent slate and moderate brick sub-angular granular and fine pebble-sized clasts in a medium to coarse sand matrix. Discrete fine layers of 10 YR 3/1 silt clay ('made ground'). Sharp boundary to:
2	0.58	0.65	Overburden	Bricks (structural layer, 'made ground'). Sharp boundary to:
3	0.65	1.32	Silt	10 YR 3/2 poorly sorted silt/clay containing frequent granular-sized charcoal fragments and mortar pieces. Occasional sherds of porcelain ('made ground'). Sharp, irregular boundary to:
4	1.32	1.42	Silt	10 YR 4/4 well sorted silt/clay with frequent humus filled root traces emanating from Unit 3. Rare granular-sized charcoal pieces (reworked alluvium – 'made ground'). Diffuse boundary to:
5	1.42	1.52	Silt	10 YR 3/2 silt clay with frequent pebble and granular-sized charcoal fragments and moderate sub-rounded quartzite clasts. Moderate quantities of Romano-British pottery including Mortaria fragments (top fill of cut feature)
8	1.52	+	Sand	7.5 YR 4/4 silt-medium sand. Frequent root and worm holes visible in plan. Rare rounded granular clasts (Elmore Member). Moderately sorted.

Trench 3

Unit	Top (m)	Base (m)	Lithology	Description
1	0.00	0.18	Diamict	10 YR 3/2 diamict of slate, brick and limestone sub-angular to sub-rounded pebbles in a loose silt-medium sand matrix. Lower boundary marked by horizontally bedded, reworked bricks ('made ground'). Diffuse boundary to:
2	0.18	0.85	Diamict	7.5 YR 3/2 fine diamict of sub-rounded pebble-sized quartzite clasts and moderate sub-angular ceramic fragments. Very occasional granular sized charcoal pieces (upper 'Dark earth'). Grading into:
3	0.85	1.43	Diamict	10 YR 3/1 diamict of moderate to frequent rounded and sub-rounded quartzite pebbles in silt-fine sand humic matrix. Occasional sub-angular ceramic fragments (Romano-British) (lower 'Dark earth'). Sharp boundary to:
4	1.43	1.48	Gravel	Cobble and coarse pebble gravel of rounded and sub-rounded quartzite clasts (interpreted as deliberate cultural deposition). Sharp boundary to:
5	1.48	1.57	Silt	7.5 YR 4/6 fine sand-silt with frequent root holes filled by sediment from Unit 3 (weathered Eldersfield Mudstone Formation)

APPENDIX 2. STRATIGRAPHIC DESCRIPTIONS (BOREHOLES)

Borehole	Top (m)	Base (m)	Lithology	Description
Butts BH 1	0.00	0.16	No Recover	
	0.16	0.35	Soil	7.5 YR 3/2 silt clay with occasional fine sand. Rooted. Well sorted. Sharp boundary to:
	0.35	0.50	Silt	5 YR 4/4 silt clay with occasional coarse sand/granules. Moderately sorted. Sharp boundary to:
	0.50	0.83	Diamict	10 YR 4/3 diamict of cobble to pebble-sized clasts (sub-angular) in a coarse-medium sand matrix. Basal 2cm is silt-fine sand matrix. Includes brick, quartzite and concrete clasts. Sharp boundary to:
	0.83	0.86	Overburden	10 YR 2/1 granular-sized cinders. Sharp boundary to:
	0.86	1.00	Silt	5 YR 4/4 silt clay with occasional coarse sand. Moderately sorted..
	1.00	1.28	No Recover	
	1.28	1.36	Concrete	Reinforced concrete 'clast'.
	1.36	1.86	Diamict	5 YR 4/4 diamict of silt clay containing frequent sub-angular slate granular clasts and sub-rounded quartzite pebble clasts. Diffuse boundary to:
	1.86	2.00	Silt	10 YR 4/3 silt clay with occasional fine sand. Occasional granular-sized charcoal fragments.
	2.00	2.38	No Recover	
	2.38	2.51	Silt	10 YR 4/3 silt clay with occasional fine sand. Occasional granular-sized charcoal fragments. Sharp boundary to:
	2.51	2.57	Silt	2.5 Y 3/2 silt clay. Well sorted. Containing possible cess. Diffuse boundary to:
	2.57	3.00	Silt	10 YR 3/2 silt clay with moderate medium to coarse sand and granular charcoal, particularly near top. Vestiges of laminar structure. Moderately sorted.
	3.00	3.25	No Recover	
	3.25	3.32	Sand	5 YR 4/3 medium coarse sand containing moderate pebble and granular sized sub-rounded quartzite clasts. Sharp boundary to:
	3.32	3.58	Sand	10 YR 2/1 medium coarse sand with occasional sub-rounded pebble and granular quartzite clasts, increasing upwards. Moderate organics in discrete patches. Moderately sorted. Fining upwards. Sharp boundary to:
	3.58	3.62	Cultural deposit	Iron slag
	3.62	3.68	Sand	10 YR 2/1 medium coarse sand with occasional sub-rounded pebble and granular quartzite clasts, increasing upwards. Moderate organics in discrete patches. Moderately sorted. Fining upwards. Sharp boundary to:
	3.68	3.83	Sand	10 YR 4/4 fine sand, coarsening upwards. Frequent organics and roots. Well sorted. Diffuse boundary to:
	3.83	4.00	Silt	Gley 1 4/10 GY silt clay with occasional fine sand. Well sorted. Moderate roots and organic material.
	4.00	4.13	No Recover	
	4.13	4.41	Sand	10 YR 2/1 medium coarse sand with moderate granular and frequent pebble-sized sub-rounded clasts. Moderate organics present throughout. Fining upwards. Poorly sorted. Sharp boundary to:
	4.41	4.58	Silt	Gley 1 5/10 Y silt clay with occasional fine sand. Well sorted. Sharp boundary to:
	4.41	5.00	Sand	7.5 YR 3/4 medium sand with occasional bands of 10 YR 5/1 grey sand (10 YR 5/1) and occasional sub-rounded pebble-sized clasts near base. Top of bed stained grey (Gley 1 5/10 Y) from overlying bed.
	5.00	5.40	No Recover	

	5.40	5.52	Diamict	10 YR 3/2 coarse sand with occasional sub-rounded quartzite pebbles towards base. Diffuse noundary to:
	5.52	5.61	Silt	2.5 YR 4/1 silt clay with occasional fine sand. Occasional sub-rounded quartzite pebbles towards surface. Well sorted. Sharp boundary to:
	5.61	6.00	Sand	10 YR 3/6 medium sand with occasional sub-rounded quartztie pebbles below 5.80m. Fining upwards. Uppermost part of unit stained grey (10 YR 5/1) from upper unit.
	6.00	6.25	No Recover	
	6.25	6.35	Diamict	10 YR 3/1 silt clay with frequent coarse sand and moderate sub-rounded quartzite granules and pebbles. Diffuse boundary to:
	6.35	6.45	Sand	7.5 YR 3/4 coarse sand with moderate sub-rounded granular and pebble-sized clasts. Poorly sorted. Sharp boundary to:
	6.45	6.63	Sand	2.5 YR 3/3 fine sand with moderate sub-rounded granular quartzite clasts throughout, and occasional, increasing upwards to moderate, sub-rounded quartzite clasts towards top. Moderately sorted. Sharp boundary to:
	6.63	6.94	Silt	5 YR 3/4 silt clay with occasional fine sand. Well sorted. Diffuse boundary to:
	6.94	7.00	Silt	5 YR 3/3 silt clay. Well sorted.
	7.00	7.38	No Recover	
	7.38	7.80	Sand	5 YR 4/4 medium sand with occasional sub-rounded granular and pebble-sized quartzite clasts. Poorly sorted. Sharp boundary to:
	7.80	7.87	Silt	5 YR 3/4 silt clay. Well sorted. Sharp boundary to:
	7.87	8.00	Silt	Gley 1 5/10 Y silt clay with occasional fine sand. Well sorted.
Butts BH 2	0.00	0.24	No Recover	
	0.24	0.71	Overburden	10 YR 2/1 diamict of charcoal, cinders, brick, mortar and burnt slate in a coarse sand matrix. Sharp boundary to:
	0.71	0.87	Overburden	Brick and mortar - possible a floor. Sharp boundary to:
	0.87	0.96	Diamict	7.5 YR 3/2 fine to coarse sand with occasional quartzite and brick pebble clasts. Sharp boundary to:
	0.96	1.00	Silt	7.5 YR 4/3 silt clay with occasional sand and granular-sized mortar and brick clasts. Moderately sorted.
	1.00	1.17	No Recover	
	1.17	1.22	Silt	7.5 YR 4/3 silt clay with occasional sand and granular-sized mortar and brick clasts. Moderately sorted.. Sharp boundary to:
	1.22	1.26	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.26	1.28	Cultural deposit	Iron slag
	1.28	1.43	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.43	1.45	Cultural deposit	Iron slag
	1.45	1.51	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.51	1.73	Silt	10 YR 3/3 silt with moderate fine sand. Occasional laminae of 10 YR 2/1 burnt material, one at 1.66m containing pottery. Well sorted. Sharp boundary to:

	1.73	2.20	Sand	10 YR 4/3 lightening downwards to 10 YR 4/4 fine sand. Well sorted. Diffuse boundary to:
	2.20	2.44	Sand	7.5 YR 4/6 fine to medium sand. Well sorted.Sharp boundary to:
	2.44	3.00	Silt	7.5 YR 4/6 silt clay with occasional fine sand. Occasional granular size iron stone or charcoal at 2.88m. Well sorted.
	3.00	3.11	No Recover	
	3.11	3.16	Silt	7.5 YR 4/6 silt clay with occasional fine sand. Well sorted. Sharp boundary to:
	3.23	3.39	Silt	10 YR 4/4 silt clay. Well sorted. Sharp boundary to:
	3.39	3.60	Sand	7.5 YR 3/4 coarse sand with occasional rounded granular and pebble-size quartzite clasts. Well sorted. Sharp boundary to:
	3.60	4.00	Fluvial gravel	7.5 YR 3/2 matrix supported gravel of rounded and sub-rounded granular and pebble sized quartzite clasts in coarse sand matrix.
	4.00	4.07	No Recover	
	4.07	4.42	Sand	7.5 YR 4/3 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Occasional coarse sand-sized shell fragments. Sharp boundary to:
	4.42	4.75	Fluvial gravel	7.5 YR 3/4 matrix supported gravel of rounded and sub-rounded granular and pebble sized quartzite clasts in coarse sand matrix.
	4.75	5.00	Sand	7.5 YR 3/4 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Occasional coarse sand-sized shell fragments.
	5.00	5.59	No Recover	
	5.59	6.00	Fluvial gravel	7.5 YR 3/4 matrix supported gravel of sub-rounded granular, pebble and cobble sized clasts in a coarse sand matrix. Fining upwards.
Butts BH 3	0.00	0.38	No Recover	
	0.38	0.48	Diamict	7.5 YR 2.5/1 diamict of granular and pebble-sized angular and sub-angular brick clasts. Sharp boundary to:
	0.48	1.00	Overburden	2.5 YR 4/4 crushed brick.
	1.00	1.10	No Recover	
	1.10	1.38	Overburden	2.5 YR 4/4 crushed brick with modern floor tile at very base - possibly a floor level. Sharp boundary to:
	1.38	1.50	Sand	7.5 YR 3/1 fine medium sand with occasional granular and pebble sized quartzite clasts and moderate burnt material. Poorly sorted. Sharp boundary to:
	1.50	1.90	Sand	7.5 YR 3/3 medium sand with occasional granular and pebble-size quartzite clasts. Well sorted. Sharp boundary to:
	1.90	1.97	Silt	5 YR 4/4 silt clay with occasional fine sand and occasional pebble-sized sub-rounded quartzite clasts.
	1.97	2.00	No Recover	
Butts BH 4	0.00	0.18	No Recover	
	0.18	0.28	Diamict	10 YR 4/1 diamict of angular and sub-angular granular and pebble-sized concrete/tarmac clasts in fine sand matrix. Sharp boundary to:
	0.28	0.48	Overburden	10 YR 3/3 diamict of brick, plaster, mortar and slate granular and pebble clasts in a fine medium sand matrix. Sharp boundary to:
	0.48	0.70	Diamict	7.5 YR 3/2 diamict of brick, burnt material, mortar, plaster etc in a fine sand matrix. Sharp boundary to:
	0.70	0.77	Silt	5 YR 3/4 silt clay with occasional coarse sand and granular-sized, sub-rounded quartzite clasts. Well sorted. Sharp boundary to:

	0.77	0.85	Sand	5 YR 2.5/1 fine sand with occasional sub-rounded granular quartzite clasts. Sharp boundary to:
	0.85	1.00	Diamict	5 YR 3/4 silt clay with occasional fine sand containing pebble-size brick fragments at surface
	1.00	1.44	No Recover	
	1.44	2.00	Silt	5 YR 3/4 silt clay with occasional fine sand. Well sorted
	2.00	2.10	No Recover	
	2.10	2.42	Sand	5 YR 3/3 fine sand. Well sorted. Sharp boundary to
	2.42	2.77	Siltstone	5 YR 3/4 highly compact silt clay with moderate fine sand. Well sorted. Sharp boundary to:
	2.77	2.80	Sand	10 YR 5/3 medium sand. Well sorted. Sharp boundary to:
	2.80	2.95	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand. Well sorted.
	2.95	3.13	No Recover	
	3.13	3.94	Sandstone	5 YR 3/4 highly compact fine sand.
	3.94	4.23	No Recover	
	4.23	4.33	Sand	7.5 YR 4/4 coarse sand with occasional sub-rounded granular quartzite clasts. Well sorted. Sharp boundary to:
	4.33	4.94	Siltstone	5 YR 4/4 highly compact silt clay with occasional fine sand. Lightening in colour upwards.
	4.94	5.00	No Recover	
Butts BH 5	0.00	0.25	No Recover	
	0.25	0.45	Overburden	10 YR 2/1 diamict of angular and sub-angular tarmac and cinder clasts in medium sand matrix. Sharp boundary to:
	0.45	0.70	Overburden	10 YR 5/2 diamict of sub-angular pebble and cobble-sized brick and concrete clasts in medium sand matrix. Sharp boundary to:
	0.70	1.00	Overburden	7.5 YR 2.5/2 diamict of sub-angular brick, plaster and mortar granular and pebble clasts in fine sand matrix. Sharp boundary to:
	1.00	1.15	No Recover	
	1.15	1.34	Overburden	10 YR 3/1 diamict of sub-rounded burnt quartzite pebbles, sub-angular brick and concrete pebbles in a medium sand matrix. Diffuse boundary to:
	1.61	1.88	Sand	7.5 YR 2.5/2 fine sand with occasional sub-angular granular and pebble clasts. Occasional charcoal fragments. Sharp boundary to:
	1.88	2.00	Silt	5 YR 2.5/1 silt clay with occasional sub-rounded quartzite granules and fine pebbles. Occasional charcoal fragments. Moderately sorted.
	2.00	2.21	No Recover	
	2.21	2.51	Sand	5 YR 3/1 fine sand with occasional sub-rounded quartzite granular and pebble clasts. Occasional charcoal fragments. Sharp boundary to:
	2.51	2.69	Sand	7.5 YR 4/3 fine to medium sand with occasional sub-rounded quartzite granular and pebble clasts. Diffuse boundary to:
	2.69	2.98	Sandstone	10 YR 5/4 highly compact fine to medium sand.
	2.98	3.21	No Recover	
	3.21	3.67	Siltstone	5 YR 3/4 highly compact silt clay with occasional sub-rounded and rounded quartzite pebbles. Well sorted.

	3.67	3.97	Sandstone	7.5 YR 3/4 highly compact fine sand with occasional fine laters of Gley 1 5/10 Y fine sand towards base. Well sorted.
	3.97	4.00	No Recover	
Butts BH 6	0.00	0.13	No Recover	
	0.13	0.26	Overburden	10 YR 2/1 diamict of medium and coarse sand with frequent sub-angular and angular granular and pebble tarmac, brick and cinder clasts. Sharp boundary to:
	0.26	0.92	Sandstone	5 YR 3/4 highly compact fine sand with occasional sub-rounded granular quartzite clasts. Interbedded with thin layers of Gley 1 6/10 GY sand, particularly towards base. Sharp boundary to:
	0.92	1.21	No Recover	
	1.21	1.51	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand. Occasional fine layers of grey fine sand (Gley 1 5/10 Y) throughout. Sharp boundary to:
	1.51	1.61	Sandstone	5 YR 4/3 highly compact medium sand. Sharp boundary to:
	1.61	1.93	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand and sub--rounded quartzite granular clasts.
	1.93	2.55	No Recover	
	2.55	3.00	Siltstone	5 YR 3/4 highly compact silt/clay with occasional fine sand.
Butts BH 7	0.00	0.55	No Recover	
	0.55	1.00	Diamict	10 YR 4/1 diamict of angular and sub-angular granular to cobble-sized clasts in medium sand matrix.
	1.00	1.29	No Recover	
	1.29	1.50	Diamict	2.5 YR 5/2 diamict of angular pebble-sized brick fragments in a medium sand matrix. Sharp boundary to:
	1.50	1.77	Overburden	10 YR 4/6 diamcit of crushed brick. Sharp boundary to:
	1.77	1.88	Diamict	7.5 YR 2.5/1 diamict of granular-sized angular brick fragments in medium to coarse sand matrix. Sharp boundary to:
	1.88	1.96	Diamict	7.5 YR 2.5/1 diamict of pebble and cobble-sized sub-angular brick clasts in a coarse sand matrix. Sharp boundary to:
	1.96	2.00	Sand	10 YR 3/2 coarse sand with occasional sub-angular granular-sized brick clasts.
	2.00	2.54	No Recover	
	2.54	2.88	Diamict	10 YR 3/1 diamict of sub-angular granular-sized brick fragments in a medium sand- matrix. Sharp boundary to:
	2.88	3.00	Diamict	10 YR 3/1 diamict of decomposing plant material and cobble-sized sub-angular brick fragments in medium sand matrix.
	3.00	3.56	No Recover	
	3.56	3.91	Diamict	10 YR 3/1 diamict of pebble-sized sub-round quartzite clasts, pebble to cobble-sized sub-angular brick, mortar and plaster clasts, and decomposing organics in coarse sand matrix. Sharp boundary to:
	3.91	4.00	Sand	10 YR 3/6 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts.
	4.00	4.12	No Recover	
	4.12	4.32	Sand	10 YR 3/1 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts and occasional sub-angular pebble-sized brick fragments. Well sorted. Sharp boundary to:
	4.32	5.00	Sand	7.5 YR 3/3 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Well sorted.
Butts BH 8	0.00	0.12	No Recover	
	0.12	0.36	Soil	7.5 YR 3/3 silt clay with occasional fine sand. Frequent roots. Increasing sub-rounded quartzite pebbles and cobbles

			towards base. Moderately sorted. Sharp boundary to:
0.36	0.69	Diamict	7.5 YR 3/4 diamcit of pebble and cobble-size sub-rounded quartzite and sub-angular brick and concrete clasts in a medium and coarse sand matrix. Sharp boundary to:
0.69	1.00	Diamict	5 YR 3/3 diamict of granular and pebble-sized sub-rounded quartzite and pebble-sized sub-angular brick granules in a silt clay matrix.
1.00	1.25	No Recover	
1.25	1.81	Diamict	5 YR 3/3 diamict of sub-angular pebble and cobble-sized brick clasts in silt clay matrix. Sharp boundary to:
1.81	1.91	Silt	5 YR 3/4 silt clay with occasional medium to coarse sand. Well sorted. Sharp boundary to:
1.91	2.00	Diamict	10 YR 2/1 diamict of pebble and granular-sized sub-angular brick, and granular charcoal in medium sand matrix.
2.00	2.20	No Recover	
2.20	2.68	Diamict	10 YR 2/1 diamict of granular and pebble-sized sub-rounded quartzite clasts and sub-angular brick, concrete cobbles in medium and coarse sand matrix.
2.68	2.73	Cultural deposit	2.5 Y 2.5/1 silt clay with frequent mortar and charcoal. Sharp boundary to:
2.73	3.00	Silt	2.5 Y 4/1 silt clay with moderate granular-sized charcoal pieces, concentrated particularly towards base of unit. Possible cess content.
3.00	3.09	No Recover	
3.09	3.25	Sand	10 YR 2/1 medium to coarse sand with occasional sub-angular granular sized brick clasts. Sharp boundary to:
3.25	3.73	Silt	10 YR 4/1 silt clay, darkening downwards. Well sorted. Sharp boundary to:
3.73	4.00	Cultural deposit	10 YR 2/1 silt clay with some fine sand and occasional sub-rounded quartzite granules. Frequent charcoal and occasional burnt bone and other domestic debris.
4.00	4.64	No Recover	
4.64	4.84	Diamict	10 YR 5/2 diamict of charcoal fragments, sub-angular granular and pebble-sized brick fragments and post-medieval pottery in silt clay matrix. Sharp boundary to:
4.84	4.97	Sand	10 YR 2/1 fine to coarse sand with occasional organic contect. Sharp boundary to:
4.97	5.00	Silt	Gley 1 5/10 Y silt clay. Well sorted.
5.00	5.27	No Recover	
5.27	5.36	Silt	10 YR 5/2 silt clay with occasional sand and granular-sized sub-rounded quartzite inclusions. Well sorted. Sharp boundary to:
5.36	5.70	Cultural deposit	10 YR 2/1 diamict of charcoal and waterlogged organic matter, ceramics (pottery and tile/brick) in medium to coarse sand matrix. Sharp boundary to:
5.70	5.88	Organic mud	Gley 1 4/10 GY silt clay with occasional fine sand. Frequent roots and waterlogged wood. Moderately sorted.
5.88	6.45	No Recover	
6.45	6.60	Cultural deposit	Gley 1 10 GY medium sand containing charcoal and waterlogged organic matter. Sharp boundary to:
6.60	7.00	Sand	5 YR 3/3 medium to coarse sand with occasional sub-rounded quartzite granules and pebbles.
7.00	7.82	No Recover	
7.82	8.00	Sand	5 YR 3/3 medium to coarse sand with occasional sub-rounded quartzite granules and pebbles.