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**THE BARBICAN SITE,
GLOUCESTER:
GEOARCHAEOLOGICAL
BOREHOLE SURVEY**

Prepared for Cotswold
Archaeology Ltd





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SUMMARY

In March 2019, at the request of Cotswold Archaeology Ltd, ARCA carried out a borehole survey at the Barbican site in Gloucester. Four boreholes were drilled and the following stratigraphic units were identified from youngest to oldest:

- *Archaeological strata composing cultural diamicts dated to the Victorian period,*
- *Fluvially reworked Cheltenham Sand and Gravel,*
- *Power House Member gravels and*
- *Undifferentiated Blue Lias and Charmouth Mudstone Formations (Lias Group) bedrock.*

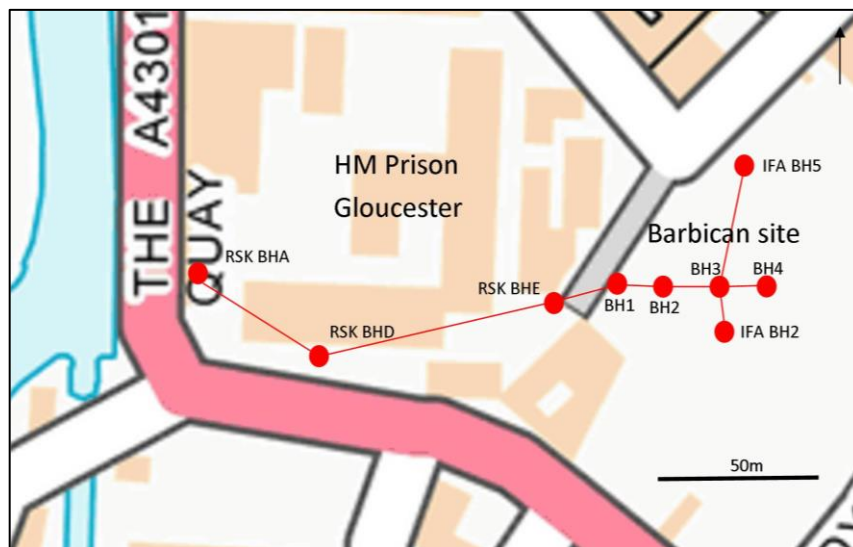
The Lias Group bedrock sub-crops between 5.91m OD in BH4 and 7.60m OD in BH2. A thin deposit of quartzitic gravels pertaining to the Power House Member unconformably overly the bedrock in BH1. This deposit is succeeded by fluvially reworked Cheltenham Sand and Gravel, which also overlies the bedrock in BH2 and BH3. Dark coloured cultural diamicts containing Victorian ceramic building material (cbm) are found in all the boreholes and truncate the gravels and sands. They attain a thickness of between 5.75m and 3.50m in BH4 and BH1, respectively. A humic deposit containing both Roman sherds and Victorian cbm was found in BH3 overlying sand and may represent the base of the Castle Outer Ditch.

1. INTRODUCTION

- 1.1 This report discusses the results of a geoarchaeological investigation of four boreholes drilled at the Barbican site, Gloucester (henceforth 'the site'). The work was carried out by ARCA on behalf of Cotswold Archaeology Ltd from 25th to 27th March 2019.
- 1.2 The proposed development will be student accommodation for the University of Gloucester.
- 1.3 The Barbican site lies in west Gloucester, to the immediate east of the River Severn (east channel) and is centred on NGR SO 82883 18508 (Figure 1). The site is approximately rectangular in shape and occupies c. 7.8ha. It is bounded on the west by Barbican Road, and on the east by Ladybellegate Street; in the north lie properties of the Old Fire Station, Bearland House and Bearland Lodge; and in the south lie a substation and Barbican House facing Commercial Road. The site is at an elevation of 12.5m OD and has a relatively flat aspect; it was formally occupied by a car park. To the west is the former HMP Gloucester, and to the northwest is Gloucester Quayside, both sites subject to major programmes of geoarchaeological evaluation (Wilkinson 2017 and Watson in prep).
- 1.4 The British Geological Survey (BGS1975, sheet 235) map the site as lying on limestone and mudstones of the undifferentiated Blue Lias and Charmouth Mudstone Formations, strata that formed between 210 – 183 Ma in the Late Triassic to Early Jurassic Epochs (BGS 2019a; 2019b). A small outcrop of Cheltenham Sand and Gravel lies 160m to the east. The lithology of this unit is fine to medium sands with ooidal limestone stringers, and it is believed to have been deposited in the middle of the Devensian cold stage (76-26,000 BP) by aeolian and solifluction processes and derived from the Middle Jurassic Great Oolite and Inferior Oolite Groups on the Cotswold Escarpment. A further distinct gravel unit is also known from the area: the Power House Member and is characterised by well-rounded quartzites and fine to medium sands which are ultimately derived from Triassic strata (Maddy 1997). It aggraded on the ancient Severn braid plain during the Late Devensian Glacial (29,000-11,500 BP).
- 1.5 The BGS do not map Tidal Flat Deposits on the site, however, they are known to be present to the east on the former HMP Gloucester where they contain charcoal and ceramic building

material throughout, indicative of periods of subaerial weathering and human action on the floodplain (from the Roman period onwards) (Wilkinson 2016). All Holocene (11.7ka to the present) alluvial and tidal flat deposits in the Severn Valley are cumulatively known as the Elmore Member (Maddy 1999).

- 1.6 Previous archaeological fieldwork suggests that the Barbican site has evidence for the Roman and medieval castle ditches, and the Norman motte (Barbican Hill) and bailey ditch. The proposed areas that these features occupy is shown in Figure 2. The river Severn is thought to have been located further east in the Roman period, and the altitude of the Lias Group bedrock derived from borehole investigations does imply this (Watson in prep). The Roman waterfront may have occupied a roughly NNE - SSW line from Upper Quay street south towards the former HMP Gloucester (the site of the medieval castle), some 70m west of the Barbican site. The only evidence though, of low bedrock at the former HMP Gloucester site, is in the northwest and this may relate to the castle ditch as much as to a Roman quay. Land reclamation and probably natural silting caused the line of the waterfront to move westwards.



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Figure 1. The Barbican site. Location of ARCA boreholes (BH1 – BH4) drilled in 2019 and previous geotechnical boreholes (prefixed with RSK and IFA). Lithostratigraphic cross-sections in red.

- 1.7 The aims of the work at the site were to:

- 1.7.1 Determine the lithostratigraphic sequence of the site and the depositional environments in which the strata formed;
- 1.7.2 Provide a chronology for the Holocene sediment sequence;
- 1.7.3 Determine the palaeoenvironmental potential of key biological proxies;
- 1.7.4 Determine the geoarchaeological potential of strata on the site.



Figure 2. Location of the boreholes and archaeological features on the site (modified plan courtesy of Cotswold Archaeology Ltd).

2. METHODOLOGY

2.1 Borehole drilling

- 2.1.1 Four borehole locations were laid out by Cotswold Archaeology Ltd to target specific archaeological features:

- BH1: Deposits associated with Barbican Hill
- BH2: The Roman town wall and ditch
- BH3: The castle outer ditch
- BH4: The motte and bailey ditch

2.1.2 The four boreholes (BH1 – BH4) were drilled by Geotechnical Engineering Ltd using a Pioneer 2 drilling rig with dynamic sampler (for technical and engineering details see Geotechnical Engineering Ltd 2019). First, each location was CAT scanned for buried services and then drilling proceeded from the base of 1.2m deep inspection pits, dug to confirm the absence of buried services. Continuous cores were retrieved encased in 100mm diameter plastic liners. The entire Quaternary sequence was penetrated (c. 7m in depth) in each borehole. The cores were sealed, labelled and boxed for transport to Geotechnical Engineering's facility at Centurion House, Olympus Park, Quedgeley, Gloucester, GL2 4NF.

2.1.3 The cores were logged and photographed according to standard criteria at Centurion House (Jones *et al.* 1999; Munsell Color 2000; Tucker 2011). Data from three geotechnical boreholes (RSK BHA, RSK BHD and RSK BHE) that had been drilled on the former HMP Gloucester and two drilled on the Barbican site (IFA BH2 and IFA BH5) have been included in the present work. Lithological and positional data were entered in a RockWorks 15 database (RockWare 2012). The software was then used to plot the three lithostratigraphic cross-sections (Figure 3, Figure 4 and Figure 5). Lithological data from the boreholes and their locations and elevations are recorded Appendices 1 and 2.

2.2 Archive

2.2.1 The material archive comprises ten samples of ceramic building material (cbm) – some of which are multiple sherds – and a single core from BH3. This material will remain in storage at the University of Winchester pending decisions on further work until 12th April 2020 whereupon it will be discarded with no further notification. The cores stored at Centurion House will be disposed of 12th May 2019 with no further notification.

2.2.2 The digital archive consists of the RockWorks database (in Microsoft Access format); lithostratigraphic cross-sections in JPG format; photographs of cores in JPG format and this report in PDF format. These digital archives are stored both on the

University of Winchester server and on an external hard drive stored outside the University of Winchester. Copies of these data can be supplied on request.

2.2.3 OASIS records will be completed on approval of this report.

3. RESULTS: BOREHOLE STRATIGRAPHY

3.0.1 The sedimentary sequence found in the boreholes (including the geotechnical boreholes) is divided into five stratigraphic units. The units identified from youngest to oldest are:

1. Modern Made Ground
2. Archaeological units (predominantly Roman to Victorian dark diamicts)
3. Elmore Member (Holocene alluvium)
4. River channel deposits (Quaternary gravel and sand)
5. Blue Lias and Charmouth Mudstone Formations (Late Triassic to Early Jurassic Lias Group mudstone)

3.0.2 These units are described in stratigraphic order below. Three lithostratigraphic cross-sections are illustrated in Figure 3, Figure 4 and Figure 5.

3.1 Lias Group bedrock

3.1.1 The mudstone bedrock sub-crops below the superficial deposits in all four ARCA bores (BH1 – BH4) and in three of the geotechnical boreholes (IFA BH2, IFA BH5 and RSK BHD) (Figure 3). It lies between 6.18m OD in RSK BHD to the east and 9.48m OD in IFA BH2 in the south. In the ARCA boreholes it lies between 6.43m OD in BH1 and 7.60m OD in BH2. The eroded surface is irregular and dips gently northwest. It rises rapidly by c. 2.5m over a distance of only c.10m from BH3 southwards to IFA BH2 (Figure 4 and Figure 5). This local high in the bedrock in the southeast of the site may represent an early, high strath¹ terrace of the River Severn (see Wilkinson 2017, 23).

3.1.2 The lithology of the bedrock is very dark grey to black (2.5Y 3/1 to 2.5Y 2.5/1), stiff to very stiff laminated mudstone. Fossils of granular to coarse pebble-size are present. The top 0.5m is frequently softer and capped by an oxidised yellowish brown

¹ A strath terrace is one cut by lateral erosion of the bedrock by the river (Lowe and Walker 2015, 75).

(10YR 5/4) surface up to 30mm thick. This represents either subaerial weathering prior to the unconformable aggradation of gravels and sands, or post-depositional diagenesis after aggradation, or both.

3.1.3 The bedrock is unconformably overlain by Quaternary superficial deposits.

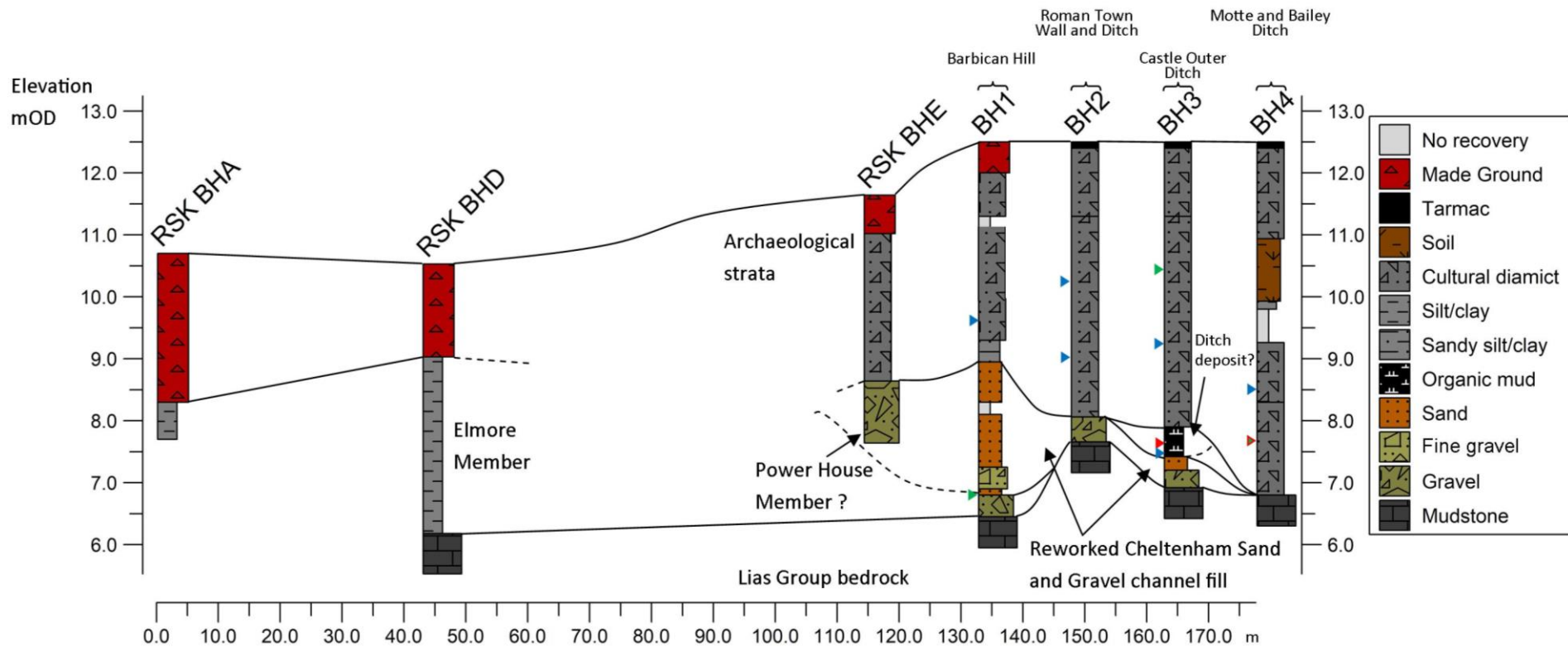


Figure 3. Lithostratigraphic cross-section from west to east. Vertical exaggeration x10. Cbm samples marked by triangles: blue, Victorian; green, medieval; red, Roman; and red and green, Roman/medieval.

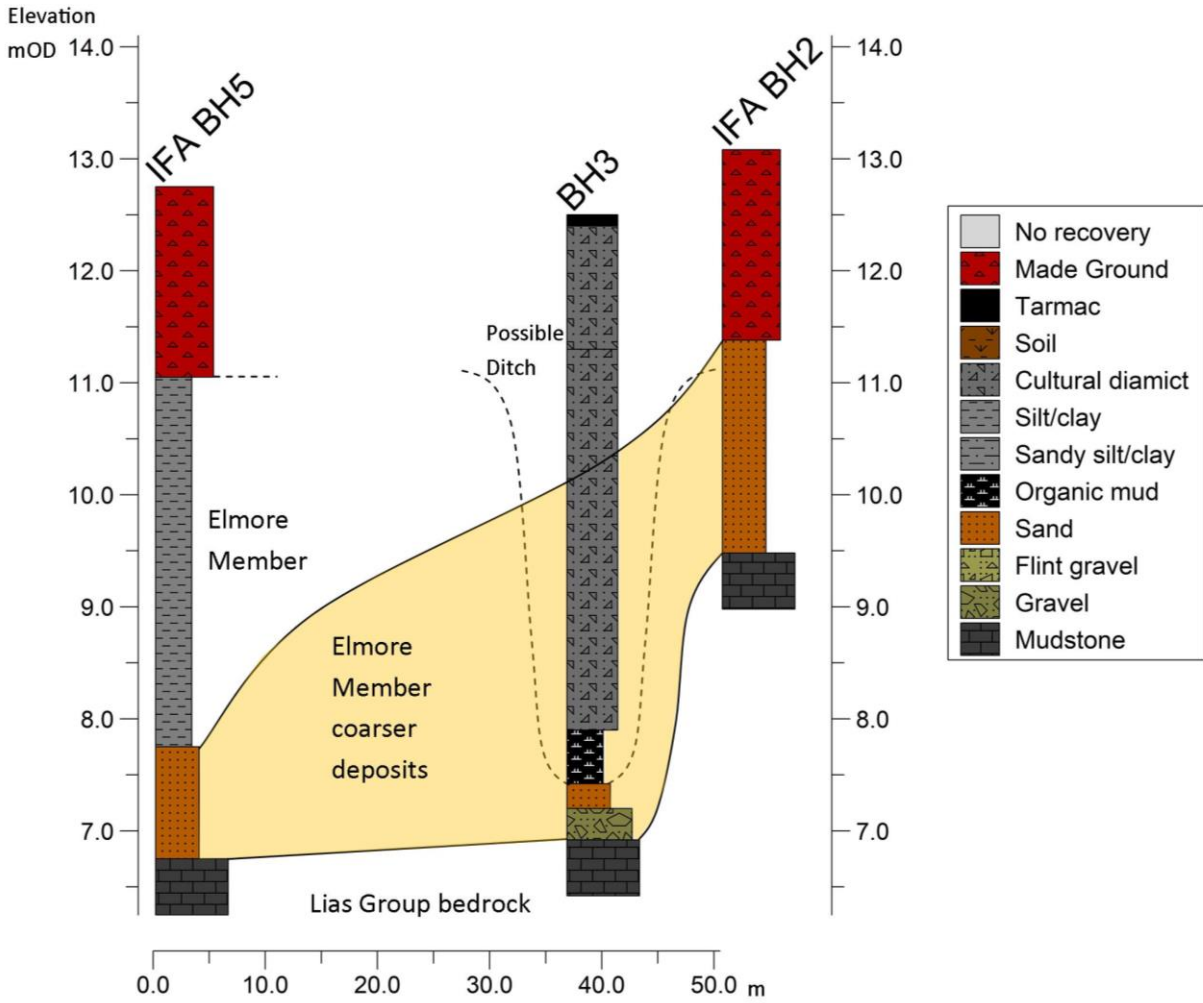


Figure 4. Lithostratigraphic cross-section from north to south. Vertical exaggeration x10.

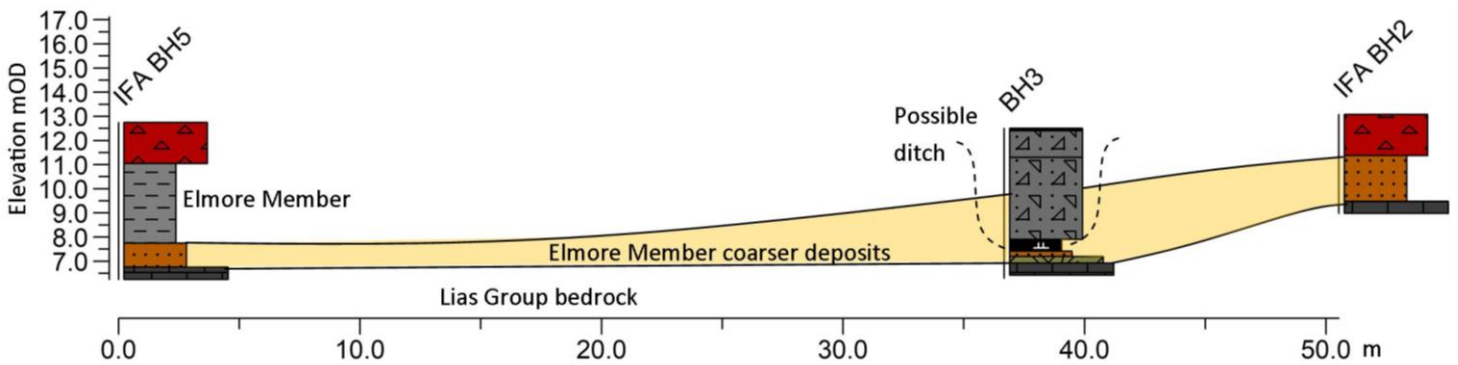


Figure 5. A copy of Figure 4 above but with no vertical exaggeration.

3.2 River channel deposits

3.2.1 Power House Member

3.2.1.1 Quartzitic gravels and sands that pertain to the Power House Member are found to lie at 6.81m OD over the mudstone in BH1 only. They are 0.38m thick, loose, unsorted and clast supported. Well-rounded granular to coarse pebble-sized quartzites and orthoquartzites predominate with rare sub-rounded vein quartz. Sand is medium-size class quartz.

3.2.1.2 Three sub-angular to sub-rounded fine pebble-sized clasts of cbm were recovered from the top of the unit. They appear to be medieval in date, however, they are intrusive (see Section 3.4.3).

3.2.1.3 In RSK BHE, c. 18m west, deposits classified as Power House Member lie considerably higher at 8.64m OD. Their lithology had been transcribed from geotechnical records as 'Mid orangey brown clayey sand and gravel, graduating into light brownish orange clayey sand with dark brown mottles' (Wilkinson 2017). No definitive clast lithology – be it quartzite or ooidal limestone – is recorded, however, the colour and mottling of the sand fraction suggests a reworking of Cheltenham Sand and Gravel particularly as similar deposits are found overlying the Power House unit in BH1.

3.2.2 Reworked Cheltenham Sand and Gravel

3.2.2.1 Three boreholes (BH1 – BH3) record units of sand and gravel that lie between 7.57m OD in BH3 and 8.96m OD in BH1. They are thickest in BH1 where the units are interbedded with sharp boundaries, sand/gravel/sand over 2.15m. The sand is well sorted fine to medium grain quartz with occasional ooids. It is massive in the upper bed and coloured strong brown (7.5YR 4/6). Coal grains and granules are frequent. The gravels are dense and moderately well sorted, comprising granular to medium pebble-sized sub-angular to well-rounded, ooidal limestone clasts often with an oblate shape. Dark brown iron oxide mottles and stains are common and the frequent presence of coal grains gives the unit a speckled appearance.

3.2.2.2 These sand and gravel deposits appear to be fluviually reworked Cheltenham Sand and Gravel. They are truncated by Archaeological deposits.

3.3 Elmore member

3.3.1 In the geotechnical boreholes discussed in this report the transcriptions of the lithologies record sands and silt/clays with a subordinate fine gravel component that are classified as the Elmore Member, which have possibly been reworked (IFA BH2 and IFA BH5 (Wilkinson 2017)). The coarser fraction of these deposits (labelled 'sand' in the keys of (Figure 4 and Figure 5) have been designated here as 'Elmore Member coarser deposits' and possibly represent levee (i.e. channel proximal) deposits. The presence of coarse clasts is indicative of human activity on the floodplain. The Elmore Member unit does not sub-crop in the ARCA boreholes (BH1 – BH4) drilled on the Barbican site.

3.4 Archaeological deposits

3.4.1 Archaeological strata are found in all the ARCA boreholes and are between 5.75m and 3.50m thick (in BH4 and BH1, respectively). The lithology of the strata is a dark coloured, mineral diamict; the colour is, in general, a dark greyish brown (2.5Y 4/2) though with considerable variation (see Figure 6).² The matrix is a firm to stiff clay that contains predominantly coarse sand to granular-sized grains of ooidal limestone, with a subordinate fraction of charcoal, cbm and mortar grains. The texture is typically gritty. Clasts range in size from fine pebbles to cobbles (4 to >64mm) and are predominantly angular red brick and sub-angular ooidal limestone with lesser amounts of fine pebble-sized flint, vein quartz, quartzite and grey limestone. These clast types are typical of the superficial deposits in the area. It is notable that bone, shell, glass and pottery sherds are absent. The diamicts are very similar across the site and show evidence of oxidation at depth. They may on occasion contain coarse pebble-sized lenses of sand and/or clay generally with diffuse boundaries. At the base of the diamicts there is a tendency towards a sandier texture. There is, however, no obvious stratification visible across the 100mm of the core diameter throughout.

² A diamict is composed of a clayey matrix and clasts that range in size from granule to boulder (2 to >256mm); it has little or no internal structure. In an archaeological context its mode of deposition is primarily human though it can be reworked by fluvial processes or subject to pedogenesis.



Figure 6. BH1 1.2–4.2m bgl showing the dark diamict containing cbm overlying channel sands.

3.4.2 Angular, pebble-sized, red cbm characterises the diamicts and is believed to be Victorian in date (Figure 3). Four samples of cbm/pottery are believed to be earlier:

- three fragments of medieval cbm at 5.70m bgl in BH1
- three fragments of medieval/Roman cbm at 4.80m in BH4
- two sherds of Roman pottery at 4.83 in BH3, and
- a single possible medieval cbm at 2.04m in BH3.

Earlier cbm tends to be found deeper in the cores, however, Victorian cbm is also found at depth e.g. in BH3 *below* the Roman pottery.

3.4.3 The presence of three clasts of possible medieval cbm at 5.70m bgl in BH1 is believed to be anomalous and derived as a result of the insertion of casing during the drilling process. The cbm was recovered from the top of the Power House Member at the point of junction of two contiguous core runs: 4.20m to 5.70m and 5.70m to 7.20m.

3.4.4 In BH4 a possible soil is recorded to sub-crop at 11.05m OD (1.56m bgl). It is c. 1m thick and devoid of cultural material.

3.4.5 In BH3 a humic unit sub-crops against the underlying channel deposits at 8.05m OD (4.60m bgl) and is 0.48m thick. The deposit is irregularly mixed dark grey (5Y 4/) and black (2.5Y 2.5/1), fine sandy silt/clay with rare plant fibres. The lithology is inconsistent, with patches of more or less sand and clay, and is unstratified. Fine to coarse pebble-sized ooidal limestone clasts are present. Two sherds of Roman pottery were recovered at 4.83m bgl from the unit and an angular clast of Victorian cbm at 5.05m bgl. The deposit appears to have developed under reducing conditions in the base of a channel or ditch. Its poorly sorted texture, mixed aspect and contrasting cultural material is evidence of disturbance.

4. ASSESSMENT

4.0.1 The sub-sections below review the lithostratigraphic evidence against the relevant aims of Section 1.7.

4.1 Lithostratigraphic sequence

4.1.1 The Lias Group bedrock forms an irregular incised basement to the later Quaternary sediments laid down on the River Severn floodplain. There is evidence for a higher and earlier strath terrace immediately south of the east/west line of ARCA boreholes. A thin veneer of quartzitic gravel of the Pleistocene Power House Member is preserved in BH1. Other gravel and sand deposits have been laid down in a channel or channels identified in BH1, BH2 and BH3. These deposits are derived during a period of time (Late Pleistocene/Early Holocene) when the river reworked Cheltenham Sand and Gravel units found further upstream. The fluvial processes have sorted the deposits into a basal sandy gravel of ooidal limestone clasts and overlying sands.

4.1.2 Cultural diamicts appear to truncate the channel deposits in all the ARCA boreholes. In BH3 a basal organic unit is preserved over and within the interstices of coarser grained channel sands. That being said, the deposit may lie in the base of a ditch (the Castle Outer Ditch) cut down to the natural sands. Whatever the depositional aspect, the unit is severely compromised because it contains Victorian cbm lying below Roman pottery sherds at a depth of c. 5m bgl. Neither the cbm nor the pottery shows evidence of fluvial transport. If there is a ditch or channel present, there does not appear to have been a long term, haphazard disposal of waste with periods of fluvial reworking (and a fresh water molluscan fauna) that the fill might be expected to demonstrate; rather the cultural diamicts appear to embody the deliberate accumulation – perhaps a process of backfilling earlier features – of material during the Victorian period.

4.2 Archaeological and palaeoenvironmental potential of the deposits

4.2.1 As a result of the discussion in Section 4 above it is concluded that the ARCA borehole cores have no archaeological or palaeoenvironmental potential. No further work on them is recommended.

5. ACKNOWLEDGEMENTS

ARCA would like to thank the following for their help during the present project: Cliff Bateman of Cotswold Archaeology Ltd, Wayne Fitton of Geotechnical Engineering Ltd and his drilling crew, and Dr Eleanor Standley of the University of Oxford.

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APPENDIX 1: LOCATION OF BOREHOLES

| Borehole | Easting | Northing | Elevation m OD |
|-----------------|----------------|-----------------|---------------------------|
| BH1 | 382858.5062 | 218510.7495 | 12.51 |
| BH2 | 382872.6293 | 218510.4202 | 12.44 |
| BH3 | 382885.2919 | 218509.8999 | 12.65 |
| BH4 | 382898.7348 | 218509.9307 | 12.61 |
| IFA BH2 | 382887.932 | 218496.454 | 13.08 |
| IFA BH5 | 382932.302 | 218493.692 | 12.75 |
| RSK BHA | 382732.13 | 218513.09 | 10.70 |
| RSK BHD | 382767.72 | 218489.14 | 10.53 |
| RSK BHE | 382837.20 | 218505.04 | 11.64 |

APPENDIX 2: BOREHOLE LITHOLOGY

| Borehole | Top m | Base m | Lithology | Comments |
|-----------------|------------------|-------------------|------------------|--|
| BH1 | 0.00 | 1.20 | Cultural diamict | 10 YR 3/2 Very dark greyish brown sandy diamict with occasional granular to cobble-sized red brick, grey limestone, ooidal limestone, quartzites and rare fossils. (Modern Made Ground). |
| BH1 | 1.20 | 1.40 | No recovery | Void. |
| | 1.40 | 2.53 | Cultural diamict | 2.5Y 2.5/1 Black firm and moist, silt/clay, homogenous, with frequent very fine white grains (ooids). Occasional ooidal limestone granules and a fine pebble-sized, angular cbm. Grey limestone cobble and red brick cobble at base. Rare charcoal granules. Sharp boundary to: |
| BH1 | 2.53 | 3.20 | Cultural diamict | 2.5Y 4/2 Dark greyish brown, firm and moist, diamict with frequent sand and charcoal grains. Occasional ooidal limestone grains and granules and fine to medium pebble sized clasts. Rare coarse pebble-sized mortar and angular red brick clasts and angular grey limestone. (Cbm sample at 2.85m). Very gradual boundary to: |
| BH1 | 3.20 | 3.55 | Sandy silt/clay | 2.5Y 4/4 Olive brown moist and firm sandy silt/clay. Fine to medium sand grains and rare charcoal grains. Homogenous unit. Fine pebble and granules of sub-angular ochre flint, grey limestone and iron nodule at boundary. (Alluvial unit with leaching from above deposits?). Sharp boundary to: |
| BH1 | 3.55 | 4.20 | Sand | 7.5YR 4/6 Strong brown firm well sorted medium sand. Rare granules of well-rounded flint. Occasional granules of coal. Massive and homogeneous bed. (Reworked Cheltenham Sand and Gravel) |
| BH1 | 4.20 | 4.40 | No recovery | Void. |
| BH1 | 4.40 | 5.25 | Sand | Sand unit as above with a cobble-sized irregular lens of coal grains and granules. Diffuse boundary to: |

| | | | | |
|-----|------|-------|------------------|---|
| BH1 | 5.25 | 5.60 | Gravel | 10YR 4/3 Brown, firm, poorly sorted fine gravel of granules and fine pebbles of yellowish white, angular to sub-rounded ooidal limestone with occasional fossil. Frequent coal grains and granules throughout giving unit a coarsely speckled aspect. Occasional sandy clay matrix. (Reworked Cheltenham Sand and Gravel). Sharp boundary to: |
| BH1 | 5.60 | 5.70 | Sand | Sand unit as above. |
| BH1 | 5.70 | 6.08 | Gravel | Loose fine to coarse, unsorted gravel. Well-rounded clast of quartzite, and rare well rounded vein quartz. Three fine pebble -sized, angular red brick clasts at top (samples at 5.7m). (Power House Member). Sharp boundary to: |
| BH1 | 6.08 | 6.05 | Mudstone | 10Y 5/4 Yellowish brown silt/clay. (Weathered mudstone). Gradual boundary to: |
| BH1 | 6.05 | 6.55 | Mudstone | 2.5Y 2.5/1 Black, stiff to very stiff laminated mudstone. (Charmouth Mudstone Formation). End of BH. |
| BH2 | 0.00 | 0.10 | Tarmac | Tarmacadam |
| BH2 | 0.10 | 0.120 | Cultural diamict | 10YR 3/1 Very dark grey diamict with frequent grains and granules of angular to sub-angular ooidal limestone and charcoal. No cbm few clasts. |
| BH2 | 1.20 | 4.44 | Cultural diamict | 10YR 3/1 Very dark grey grading over 0.5m into 2.5Y 3/2 Very dark greyish brown to 2.5Y 3/1 Very dark grey at the base. Unstructured, stiff diamict with frequent grains and granules of angular to sub-angular ooidal limestone. Occasional grains and granules of charcoal and red cbm. Occasional fine to coarse pebble-sized sub-angular ooidal limestone. Rare sub-rounded fine pebble of vein quartz. Occasional fine to medium pebble-sized red brick. Clasts distributed throughout unit. Very gritty texture in general. Very rare organic fibres at base. Rare orange iron oxide mottles at base. Stiffer greater clay fraction at base. (Cbm sample at 2.25m). |
| BH2 | 4.44 | 4.84 | Gravel | 10 YR 4/4 Dark yellowish brown, very wet, unsorted clayey gravel. Granular to coarse pebble-sized, angular to sub-rounded ooidal limestone. Rare fine pebble of ochre quartz. Very sandy from decomposed ooidal arenaceous limestone (and distal sand banks?). (Reworked Cheltenham Sand and Gravel). Sharp boundary to: |

| | | | | |
|-----|------|------|------------------|--|
| BH2 | 4.84 | 5.34 | Mudstone | 2.5Y 2.5/1 Black, stiff to very stiff laminated mudstone. (Charmouth Mudstone Formation). End of BH. |
| BH3 | 0.00 | 0.10 | Tarmac | Tarmacadam |
| BH3 | 0.10 | 4.60 | Cultural diamict | Heterogeneous dark coloured diamict, damp and firm: 10YR 3/1 Very dark grey ranging to 2.5Y 4/2 Dark greyish brown. Heterogeneous clast content; predominantly occasional to frequent granular to coarse pebble-sized ooidal limestone. Rare angular unknown rock clast. Occasional charcoal grains and granules. Frequent fine to medium sand throughout. Iron oxide staining in patches. Occasional well defined cobble-sized orange sand lenses and well defined blueish grey clay lenses throughout. Occasional red cbm grains and granules and occasional fine to coarse pebble-sized, angular to sub-angular red brick (?post-medieval cbm sample at 2.04m and second sample at 3.30m). (Heterogeneous mineral cultural diamict). Sharp colour boundary but poorly defined lithological boundary to: |
| BH3 | 4.60 | 5.08 | Organic mud | Irregularly mixed 5Y 4/1 Dark grey and 2.5Y 2.5/1 Black fine sandy silt/clay with frequent granules to coarse pebble-sized sub-rounded ooidal limestone clasts. Clay component of (gritty) black organic mud with occasional granular sized plant fragments. Faint smell of hydrocarbons. Frequent grains and granules of charcoal and occasional red cbm. (two fine pebble-sized Roman pottery sherds at 4.83m and cbm sample at 5.08 post 18th century) (Reworked and contaminated organic deposit). Gradual boundary to: |
| BH3 | 5.08 | 5.30 | Sand | 2.5Y 3/2 Very dark greyish brown, damp poorly sorted fine sand with frequent granules of sub-rounded ooidal limestone. Dark muddy aspect. (Ooidal component to sand. (Cheltenham Sand and Gravel). Diffuse boundary to: |
| BH3 | 5.30 | 5.58 | Gravel | 10YR 4/4 Dark yellowish brown poorly sorted and clast supported sandy gravel of ooidal limestone clasts. Dark brown oxidation staining and mottling throughout. Sharp boundary to: |

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|-----|------|------|------------------|--|
| BH3 | 5.58 | 6.08 | Mudstone | 2.5Y 2.5/1 Black, stiff to very stiff laminated mudstone. Top 30mm weathered yellowish grey. (Charmouth Mudstone Formation). End of BH. |
| BH4 | 0.00 | 0.10 | Tarmac | Tarmacadam |
| | 0.10 | 1.56 | Cultural diamict | 10YR 4/2 Dark greyish brown diamict with frequent angular red brick and occasional ooidal limestone clasts of granular to coarse pebble-size. Gritty texture with charcoal mortar and cbm grains. Oxidises to 5Y 4/4 Reddish brown. Sharp boundary to: |
| BH4 | 1.56 | 2.57 | Soil | 10YR 3/2 Very dark greyish brown, crumbly and moist silt/clay with a poorly developed granular crumb structure. Occasional to frequent fine sand-sized mineral grains. Occasional fine to coarse pebble-sized ooidal limestone; rare cobble. Rare charcoal granule; no cbm. (Soil). Diffuse boundary to: |
| BH4 | 2.57 | 2.70 | Silt/clay | 2.5Y 4/2 Dark greyish brown, stiff too very stiff silt/clay with occasional to frequent grains and granules of sub-rounded ooidal limestone; rare rounded flint; occasional charcoal and cbm grains. |
| BH4 | 2.70 | 3.24 | No recovery | Void and slump. |
| BH4 | 3.24 | 4.20 | Cultural diamict | 10YR 3/1 Very dark grey intimately mixed with 2.5Y 4/2 Dark greyish brown, firm to stiff diamict. Medium sand in irregular poorly defined pebble-sized lenses. Gritty texture with frequent ooidal limestone grains and granules and occasional red cbm grains and granules. Rare charcoal grains. Rare oyster shell fragments. Coarse pebble-sized, angular grey limestone. Medium pebble-sized red brick (cbm sample at 4.00m) Crushed mortar with brick attached towards base. Occasional fine pebble of sub-angular ochre flint. (Heterogeneous mineral cultural diamict). |
| BH4 | 4.20 | 5.70 | Cultural diamict | 2.5Y 3/2 Very dark greyish brown, very wet, muddy diamict. Appears to be a continuation of the above unit. Loose and gritty texture. (Cbm sample at 4.80m). |
| BH4 | 5.70 | 6.20 | Mudstone | 2.5Y 2.5/1 Black, stiff to very stiff laminated mudstone. (Charmouth Mudstone Formation). End of BH. |

| Geotechnical boreholes | | | | |
|------------------------|------|------|-------------|--|
| IFA BH2 | 0.00 | 0.50 | Made ground | |
| IFA BH2 | 0.50 | 1.00 | Made ground | |
| IFA BH2 | 1.00 | 1.70 | Made ground | Modern |
| IFA BH2 | 1.70 | 3.60 | Sand | Greyish brown, clayey, gravelly fine to medium sand. Gravel medium, sub-angular to sub-rounded mixed lithologies (alluvium-possibly reworked). (Elmore Member). |
| IFA BH2 | 3.60 | 4.10 | Mudstone | |
| IFA BH5 | 0.00 | 1.70 | Made ground | |
| IFA BH5 | 1.7 | 5 | Silt/clay | Soft, dark brownish grey, slightly gravelly, very sandy, slightly organic silt/clay. Gravel is fine, sub-angular to sub-rounded of mostly quartzite (possibly reworked alluvium). (Elmore Member). |
| IFA BH5 | 5 | 6 | Sand | Greyish brown, clayey, gravelly fine to medium sand. Gravel medium, sub-angular to sub-rounded mixed lithologies (alluvium). (Elmore Member). |
| IFA BH5 | 6 | 6.5 | Mudstone | |
| RSK BHA | 0.00 | 2.00 | Slump | Backfill of evaluation Trench 16. |
| RSK BHA | 2.00 | 2.40 | Void | Void |
| RSK BHA | 2.40 | 3.00 | Silt/clay | Dark brown silty clay. Soft, plastic. Contains frequent small mollusc shells, very occasional charcoal and ceramic building material. Context (2501) (Elmore Member) |
| RSK BHD | 0.00 | 1.00 | Slump | Backfill of evaluation Trench 13. |

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|------------|------|------|----------------------------|---|
| RSK BHD | 1.00 | 1.50 | Made ground | Dark brown clayey, sandy silt. Soft, plastic. Contains frequent gravel, mortar, charcoal and ceramic building material. Test pit and core context (2801) |
| RSK BHD | 1.50 | 3.40 | Silt/clay | Dark greyish brown silty clay. Soft, plastic. Contains limestone pebbles, frequent small mollusc shells, occasional charcoal. Core context (2802) (Elmore Member) |
| RSK BHD | 3.40 | 3.75 | Silt/clay | Mid brown silty clay. Contains occasional small mollusc shells. Core context (2803) (Elmore Member) |
| RSK BHD | 3.75 | 4.35 | Silt/clay | Dark brownish grey sandy, silty clay. Contains occasional charcoal and organic material. Core context (2804) (Elmore Member) |
| RSK BHD | 4.35 | 5.00 | Mudstone | Dark bluish grey Lias clay. Sterile. Firm. Core context (2805) |
| RSK BHE | 0.00 | 0.40 | Made ground | Hard core. Test pit contexts (2302) and (2301) |
| RSK BHE | 0.40 | 0.50 | Made ground | Drain. Test pit context (2303) and cut [2304] |
| RSK BHE | 0.50 | 0.62 | Made ground | Make up. Test pit context (2305) |
| RSK BHE | 0.62 | 0.95 | Cultural deposit (mineral) | Brownish grey silty clay, but which was greenish in places. It contained occasional brick, sandstone and charcoal. Test pit context (2306) |
| RSK BHE | 0.95 | 1.00 | Cultural deposit (organic) | Dark greyish brown humic silty clay with occasional charcoal inclusions. Test pit context (2307) |
| RSK BHE | 1.00 | 2.30 | Void | Void |
| RSK BHE | 2.30 | 3.00 | Cultural deposit (mineral) | Mid brown sandy, silty clay. Soft, plastic. Contains mortar, charcoal and ceramic building material. Core context (2900) |

| | | | | |
|------------|------|------|------|---|
| RSK BHE | 3.00 | 4.00 | Sand | Mid orangey brown clayey sand and gravel, graduating into light brownish orange clayey sand with dark brown mottles. Core context (2901) (Power House Member) |
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