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LAND EAST OF HOAD WAY, THEALE, READING: GEOARCHAEOLOGICAL BOREHOLE STUDY

WRITTEN SCHEME OF INVESTIGATION

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1. Introduction

1.1 This Written Scheme of Investigation (WSI) outlines the methodology to be used in conducting a geoarchaeological borehole study of land to the east of Hoad Way, Theale, Reading (henceforth 'the site' or 'study area'). The WSI accords with Historic England's (2015) guidelines for geoarchaeology.

1.2 The site lies east of Theale and is bounded by Hoad Way to the west, the A4 Bath Road to the south, the M4 motorway to the east and Theale High Street to the north (Figure 1). It is centred on NGR SU 64757 71468, lies ground between +44.5 and +46.0m OD and comprises an area of 5.43 ha (Figure 1). The proposed development is for two warehouses, loading areas, an access road and associated infrastructure in the western and central parts of the site and landscaping in the eastern and extreme north and west areas.

1.3. The British Geological Survey (BGS) map the bedrock geology of the study area as rocks of the Seaford Chalk Formation (of Coniacian–Santonian [Late Cretaceous] Age) and dating between 100.5 and 86.3 million years ago (British Geological Survey 2023a, 2023b). Geotechnical records (see Section 1.4) indicate that the Seaford Chalk Formation subcrops at between 4.0 and 6.5m below ground level (bgl). The BGS further map superficial Alluvium overlying the Seaford Chalk over the entirety of the study area (but see Section 1.4 below) (British Geological Survey 2023a). Alluvium is a catch-all term used by the BGA to describe deposits forming in running water during the Holocene epoch (11,700 years before present [BP] to the present day) (British Geological Survey 2023b). In the present instance, the Alluvium is likely to have been deposited by the River Kennett, which lies 550m to the south of the site, and/or a tributary stream shown passing through the south-west corner of the site in Ordnance Survey maps dating from the 1870–1960s.

1.4 Two phases of geotechnical works have been carried out on the site, these comprising 6 cable percussive ('Dando' rig) ('HWT BWB BH01–06' on Figure 1) and 4 windowless ('HWT BWB DS01–DS04') boreholes, and 16 test pits ('HWT BWB TP01–TP15') in 2018, and 3 further windowless boreholes ('HWT EXP BH06', 'HWT EXP BH101–BH102') in 2020 (BWB Consulting and Exploration and Testing unpublished logs supplied to RPS Group). Alluvium is

recorded as a <2.3m subcrop overlying fluvial gravel[1] across most of site (Figure 1). However, in the north-east and central zones (HWT BWB BH05, HWT BWB DS02–DS04, HWT BWB TP10–TP11), gravel is found at the ground surface. Organic strata are recorded as inclusions in the otherwise mineral Alluvium in HWT BWB TP02, HWT BWB TP03, HWT BWB TP05 and HWT BWB TP09, and as more substantial beds in HWT BWB BH06, HWT BWB TP16 and HWT EXP BH06. These locations cluster towards the south, and particularly in the south-west of the site around the pre-1970 stream where alluvial deposits are greater than 2m thick. Elsewhere the Alluvium is thinner (averaging c 1m), while organic strata are either not present or recorded as a <0.6m subcrop (e.g. HWT BWB TP12) (Figure 1).

1.5 The stream in the south-western part of the site, together with a north-south orientated linear feature corresponding with a drainage channel on Ordnance Survey maps of the 1870–1970s were both identified in a magnetometer survey carried out in 2020 (Sumo 2020). However, the same survey detected no archaeological features.

1.6 The aims of the project are as follows:

1.6.1 Characterise the Quaternary lithostratigraphy of the study area;

1.6.2 Determine the mode of formation of Quaternary strata within the study area;

1.6.3 Provide a chronology for the organic strata and thereby understand their relationship with the Mesolithic peat 'marker bed' identified elsewhere in the Kennett valley (Barnett et al. 2020)

1.6.4 Assess the preservation of biological palaeoenvironmental proxies in the Alluvium;

And by resolving the Aims 1.6.1–1.6.4 to:

1.6.6 Assess the archaeological potential of the site.

2. Methodology

2.1 Field

2.1.1 Eighteen boreholes will be drilled in locations where (a) the development will have a sub-surface impact below the present topsoil (i.e. the position of the warehouses, loading areas and access roads), and (b) where the prior geotechnical works demonstrate the presence of organic strata and/or >1.2m of alluvium.

2.1.2 Boreholes will be drilled using a man-portable Cobra TT petrol-powered hammer, driving gouge augers and core samplers. The gouge augers will be utilised to map the Holocene strata of the site, and the core samplers to sample the strata for palaeoenvironmental assessment and AMS ^{14}C dating.

[1] Deposits of the Beenham Grange Gravel Member are recorded by the British Geological Survey (2023a) immediately west of the site and it is likely that the gravel strata recorded in the geotechnical boreholes and test pits are of this unit. The Beenham Grange Gravel Member is an Upper Pleistocene unit that equates with the River Terrace Deposits 2 of the Blackwater–Loddon catchment (Worsley and Collins 1995). The latter unit has recently been dated to 57,000±7200 BP by optically-stimulated luminescence (OSL) (Wilkinson et al. 2022).

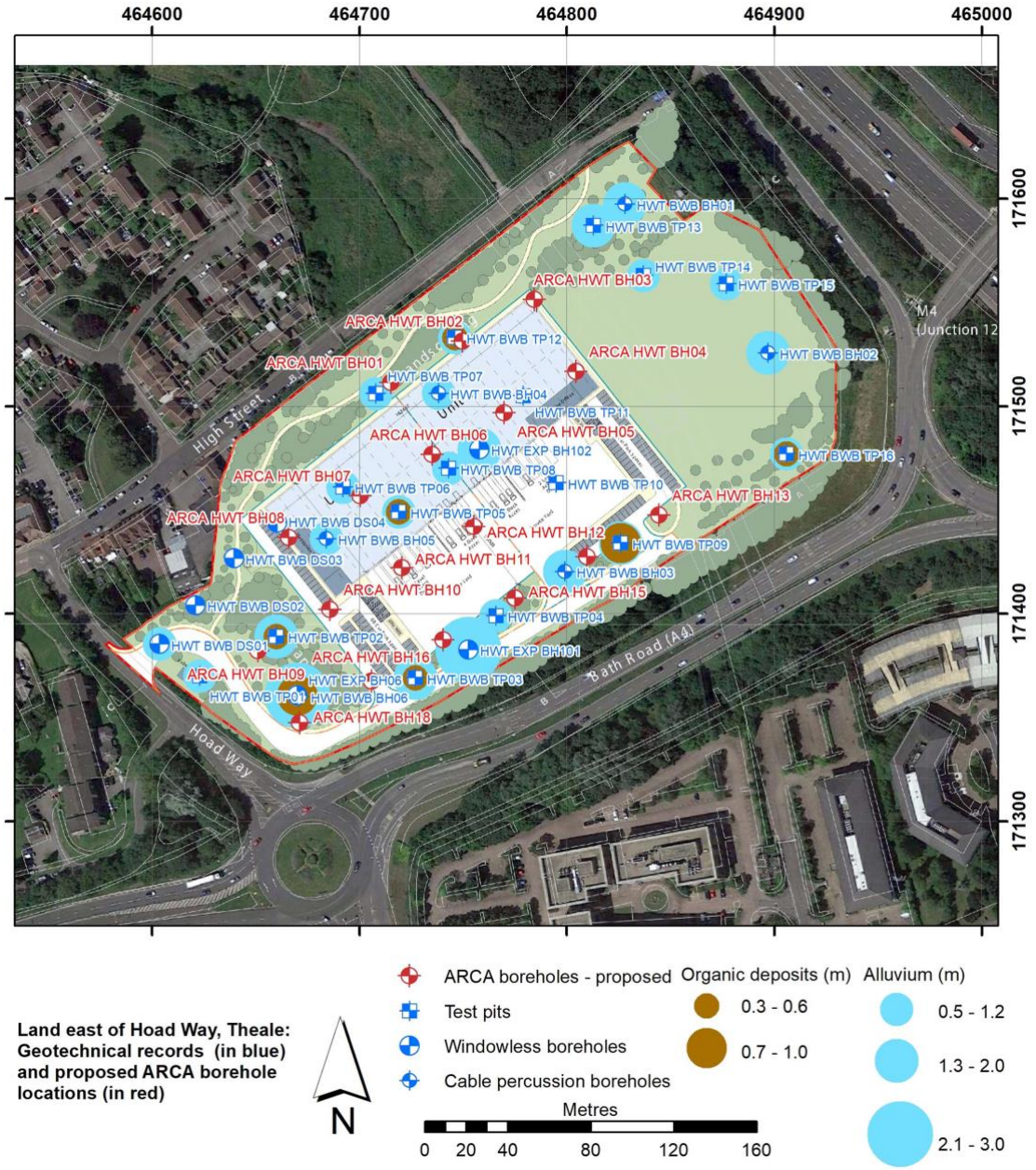

Figure 1. The Hoad Way study area, showing the planned development, locations of previous geotechnical boreholes and test pits, thickness of Alluvium and organic strata as recorded in the geotechnical records, and the proposed positions of ARCA's geoarchaeological boreholes

2.1.3 Borehole locations will be planned in an ArcGIS project (indicative locations for are shown in Figure 1), those data uploaded to a Leica GS16 RTK GPS and the latter device used to both locate positions in the field and then record the relevant elevations with respect to Ordnance Datum (OD) (when using SmartNet GSM correction the GS16 has a vertical accuracy of c 20mm). A CAT scanner/genny will then be used at each surveyed position to check for the presence of buried services. Should any such service be found, the relevant borehole will be moved the minimum possible distance so as to safely avoid the obstruction and a new GPS point taken [National Grid Reference (NGR) and OD].

2.1.4 Drilling using the Cobra TT petrol-powered hammer and 75–55mm diameter Eijkelkamp gouge augers and 50mm diameter core sampler will commence at the ground surface and then advance in 1m increments until the Beenham Grange Gravel Member is reached. Strata exposed in each 1m-long gouge auger chamber will be photographed and described to standard geological criteria before being discarded (Jones *et al*. 1999, Munsell Color 2000, Tucker 2011). On completion, each of the Cobra TT/gouge auger boreholes will be backfilled with the arisings. The core sampler will be employed to drill ARCA HWT BH09, ARCA HWT BH14, ARCA HWT BH17 and ARCA HWT BH18, from continuous 1m long cores will be collected from the ground surface to the base of the Holocene sequence. Cores will be labelled and sealed on site and then transported to the laboratory for further study.

2.1.5 Fieldwork will be led by Prof Keith Wilkinson, who has >25 years experience of carrying out borehole surveys of alluvial strata in southern England (see https://geoarca.com/team for details).

2.2 Laboratory

2.2.1 The lithology of deposits in the core samples will be described in ARCA's Winchester laboratory using the same standard criteria (Jones *et al*. 1999, Munsell Color 2000, Tucker 2011) as employed for the gouge auger samples in the field. Sub-samples will be taken opportunistically from organic strata for palynological assessment (Dr Rob Batchelor or Dr Mike Simmonds, Quest, University of Reading), and AMS ^{14}C measurement (SUERC, East Kilbride, Scotland). Methods of biostratigraphic assessment will thereafter follow those outlined by Lowe and Walker (2014, 228–262), while all such works will accord with Historic England guidelines for environmental archaeology (Campbell et al. 2011).

2.2.3 Lithological and positional data obtained from the Cobra TT/gouge auger in the field and core samples in the laboratory will be combined with the previous stratigraphic data of the 2018 and 2020 geotechnical surveys in a RockWorks database (RockWare 2023). These data will then be used to plot composite cross sections through Quaternary deposits on the site, and where appropriate (i.e. where there are sufficient occurrences of a given stratum) to generate deposit models (e.g. for the surface of the Beenham Grange Gravel Member and thickness of the Alluvium). Where deposits are generated, they will corresponds to Historic England's (2020) guidance.

3. Reportage

3.1 A brief (1–2 sides A4) report on the stratigraphy of the Cobra TT/gouge auger boreholes will be produced within five working days of the completion of fieldwork.

3.2 An integrated geoarchaeological report incorporated lithological, biostratigraphic and chronological data will be produced within 15 weeks of the completion of fieldwork[2]. The report will directly address the aims outlined in Section 1.6.

[2] The constraints being the lead in and measurement times required for AMS ^{14}C dating at the Scottish Universities Environmental Research Centre (SUERC).

3.3 Reports will be issued in digital (PDF) format only.

4. Archive

4.1 The archive will be compiled in accordance with Archaeology Data Service (2011) guidelines. It will be both digital [dGPS locations for the boreholes, a RockWorks database (in SQL Lite format) and stratigraphic surface models (in ESRI Shape format), the report itself (Adobe PDF)] and material. The latter will comprise borehole cores, microscope slides with pollen residue. The cores will be held at the University of Winchester for 12 months following completion of the fieldwork and pending decisions on further analyses, but will thereafter be discarded without further notice. Microscope slides will be archived at the University of Reading until the project is deemed complete.

5. ARCA

5.1 ARCA is the geoarchaeological consultancy arm of the University of Winchester. It was founded in 2004 as a formalisation of previous ad-hoc arrangement. ARCA was formally launched at the Institute of Field Archaeologists conference in March 2005 and has been a Registered Organisation (RO) of the Chartered Institute for Archaeologists (CIfA) since 2010.

5.2 ARCA specialises in geoarchaeology, geophysics and geomatics. In respect of the former, ARCA has a particular expertise in the carrying out borehole surveys and using stratigraphic data to produce deposit models. ARCA possesses both manual and mechanical drilling equipment and has working relationships with a number of geotechnical companies who operate larger drilling equipment. Since its launch it has worked for most of the larger archaeological contractors in southern Britain as well as a number of utility and construction companies, charities and local authorities.

5.3 Further information on ARCA's services and mechanisms of quality assurance can be found at http://www.geoarca.com/.

6. Health and Safety

6.1 A risk assessment of the geoarchaeological borehole study of the Hoad Way, Theale site will be compiled following the approval of the present WSI and will be combined with the latter as a Risk Assessment Methods Statement (RAMS).

6.2 Health and safety protocols applied in the laboratory are outlined in the University of Winchester Health and Safety Policy (2013, but updated sub-annually since then).

7. Chartered Institute for Archaeologists

7.1 ARCA is a Registered Organisation (RO) of the Chartered Institute for Archaeologists (CIfA) and as such it adheres to all codes and guidance of the CIfA (CIfA 2023). The present project will be managed by Prof Keith Wilkinson, a Member of the Chartered Institute for Archaeologists (MCIfA).

8. Insurance

8.1 Through the University of Winchester, ARCA holds Public Liability Insurance to a maximum of £30 million and professional indemnity insurance to £5 million.

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