

# LAND ON THE EASTERN SIDE OF MERCIA ROAD, GLOUCESTER

## Geoarchaeological Fieldwork Report

**NGR:** SO 83174 19360

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## 1. NON-TECHNICAL SUMMARY

A programme of geoarchaeological investigation was undertaken at the Mercia Road site in order (1) to clarify the nature of the sub-surface stratigraphy, and (2) to clarify the nature, depth, extent and possible date of any alluvium and organic/peat deposits.

The results of the geoarchaeological investigations indicate that the sediments recorded at the site are similar to those recorded elsewhere in the valley of the estuarine River Severn, where the alluvial deposits of the Wentlooge Formation can be identified. In two of the five boreholes the basal unit was a sandy gravel, considered to represent the Pleistocene gravel that underlies the Holocene alluvial sequence, recorded at 3.31 and 3.71m OD in QBH1 and QBH2 respectively. Overlying the gravel is a predominantly silty or sandy unit, interpreted here as the Lower Wentlooge Formation and most likely comprised of estuarine deposits dated to the Early to Middle Holocene. This unit was recorded at elevations of between ca. 3 and 5m OD. No organic horizons, or indeed organic material, was recorded within this unit.

Sample retention was extremely poor in the new geoarchaeological boreholes at levels between ca. 5 and 6.8m OD. The composition of the alluvial sequence at these levels is therefore uncertain, and it is indeed possible that organic units survive here. However, no organic or peaty residue was identified in the sample gouges put down to these depths, and it seems more likely that the sequence here was comprised of extremely soft, waterlogged minerogenic deposits similar to the underlying sandy/silty, or overlying clay-rich, deposits. The uppermost unit in the alluvial sequence was a clay-rich, silty unit interpreted as the Upper Wentlooge Formation, recorded at levels between ca. 6.5 and 8m OD and most likely deposited on the floodplain at a distance from any active channels during the Middle to Late Holocene. Again, no organic horizons or inclusions were recorded within this unit.

## 2. INTRODUCTION

### 2.1 Site context

This report summarises the findings arising out of the geoarchaeological fieldwork undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of Land on the Eastern Side of Mercia Road, Gloucester (National Grid Reference: SO 83174 19360; Figures 1 & 2). Quaternary Scientific were commissioned by Avon Archaeology Limited to undertake the geoarchaeological investigations. The area of investigation is located on the eastern edge of the floodplain of the estuarine River Severn, at a point where the River flows broadly north-south and occupies two channels, ca. 750m and 1.5km to the west of the site respectively. The British Geological Survey (BGS) show the underlying geology here as the Blue Lias Formation and Charmouth Mudstone Formation (undifferentiated), overlain by Alluvium, described as Clay, Silt, Sand and Gravel. (<http://mapapps.bgs.ac.uk/geologyofbritain>). The boundary between the floodplain and the higher, drier ground of the bedrock outcrop is mapped just to the east of the site. The site occupies a total area of about 1.3ha, bounded to the east by a common boundary to the rear gardens of properties fronting onto Dean's Way, to the west by a part of the city's modern arterial road system, to the north by a large, triangular, undeveloped urban 'green', and to the south by a continuation of the commercial retail and light industrial park of which the site itself is a part (Avon Archaeology, 2017).

A previous geotechnical investigation at the site, comprising a total of 17 window sample boreholes put down to depths of between 0.6 and 6m below ground level (bgl) recorded a sequence of generally silty, in places sandy, clayey alluvium, at levels of between ca. 2 and 6m bgl (Ruddlesdon Geotechnical, 2017). Only in one sequence was organic-rich material recorded, at between 3.1 and 3.9m bgl in WSO9 towards the northeast of the site. The alluvium was capped by between 2 and 2.9m of Made Ground.

### 2.2 Palaeoenvironmental and archaeological significance

The alluvial sequence thought to underlie the Mercia Road site has good potential to provide evidence of prehistoric and historic human activity on both the wetland and dryland surfaces adjacent to the site. Important variations in the height of the gravel surface, and the type, thickness and age of the subsequent Holocene deposits may be present within the vicinity of the site. Such variations are significant as they represent different environmental conditions that would have existed in a given location. For example: (1) the varying surface of the Gravel may represent the location of pre-Holocene river terraces, former channels and bars; (2) the presence of peat represents former terrestrial or semi-terrestrial land-surfaces, and (3) the various alluvial units represent periods of changing hydrological conditions. Thus by studying the sub-surface stratigraphy across the site in greater detail, it will be possible to build an understanding of the former landscapes and environmental changes that took place across space and time.

Organic-rich sediments (in particular peat) also have high potential to provide a detailed reconstruction of past environments on both the wetland and dryland. In particular, they provide the potential to increase knowledge and understanding of the interactions between hydrology,

human activity, vegetation succession and climate. Significant vegetation changes include the Mesolithic/Neolithic decline of elm woodland, the Neolithic colonisation and decline of yew woodland; the Late Neolithic/Early Bronze Age growth of elm on Peat, and the general decline of wetland and dryland woodland during the Bronze Age. Such investigations are carried out through the assessment/analysis of palaeoecological remains (e.g. pollen, plant macrofossils & insects) and radiocarbon dating.

Finally, areas of high gravel topography, soils and peat represent potential areas that might have been utilised or even occupied by prehistoric people, evidence of which may be preserved in the archaeological (e.g. features and structures) and palaeoenvironmental record (e.g. changes in vegetation composition).

### **2.3 Aims and objectives**

Further borehole records are required in order to enhance our understanding of the sub-surface stratigraphy of the Mercia Road site, and to assess its palaeoenvironmental potential. Five significant research aims relevant to the geoarchaeological investigations at the site are outlined here:

1. To clarify the nature of the sub-surface stratigraphy across the site;
2. To clarify the nature, depth, extent and date of any alluvium and organic/peat deposits;
3. To investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity;
4. To investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland), including those related to sea level change;
5. To integrate the new geoarchaeological record with other recent work in the local area for publication in an academic journal.

In order to address the first two of these aims, a total of five boreholes were put down at the site and a programme of lithostratigraphic description and basic deposit modelling undertaken.

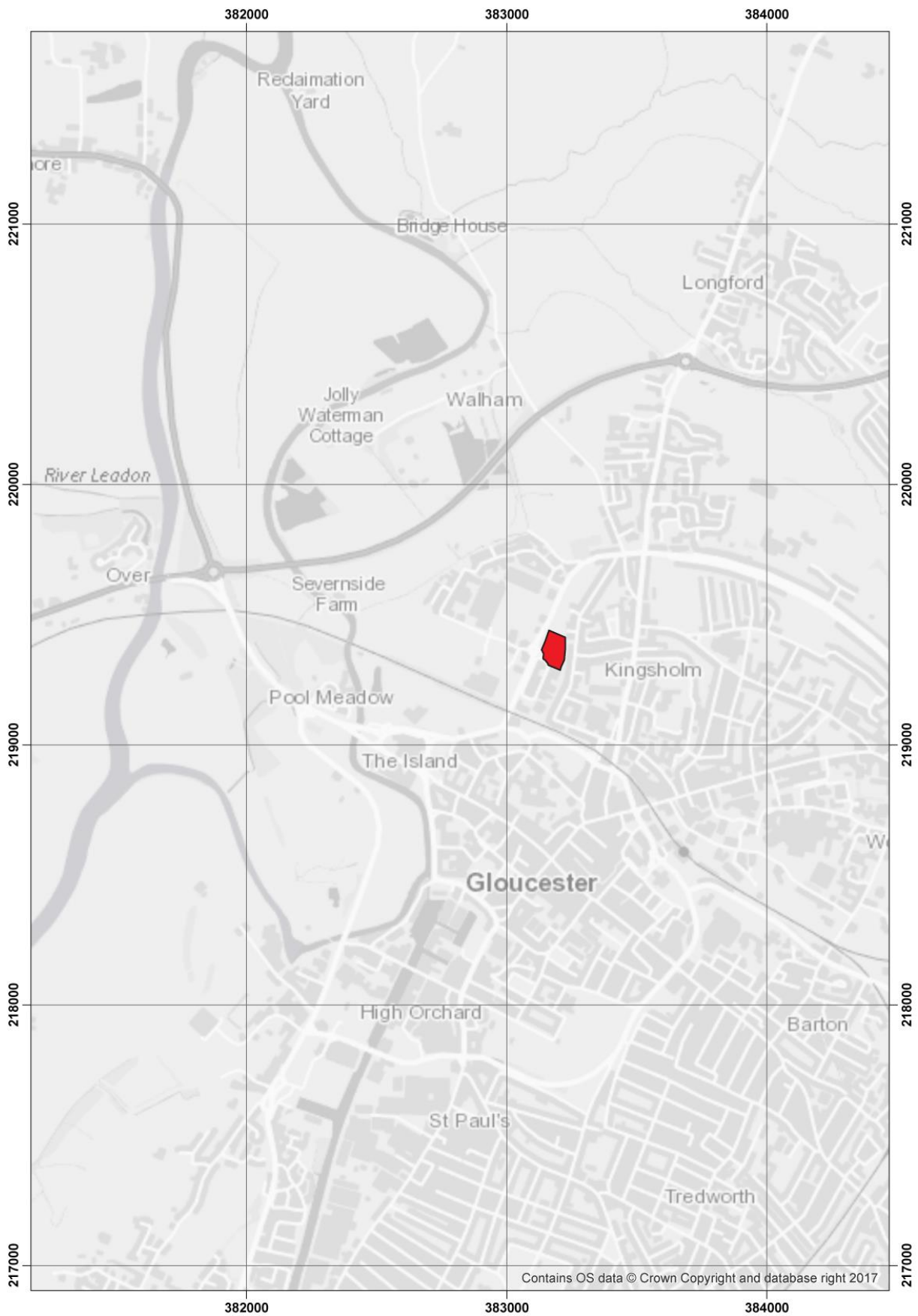


Figure 1: Location of the site at Mercia Road, Gloucester.

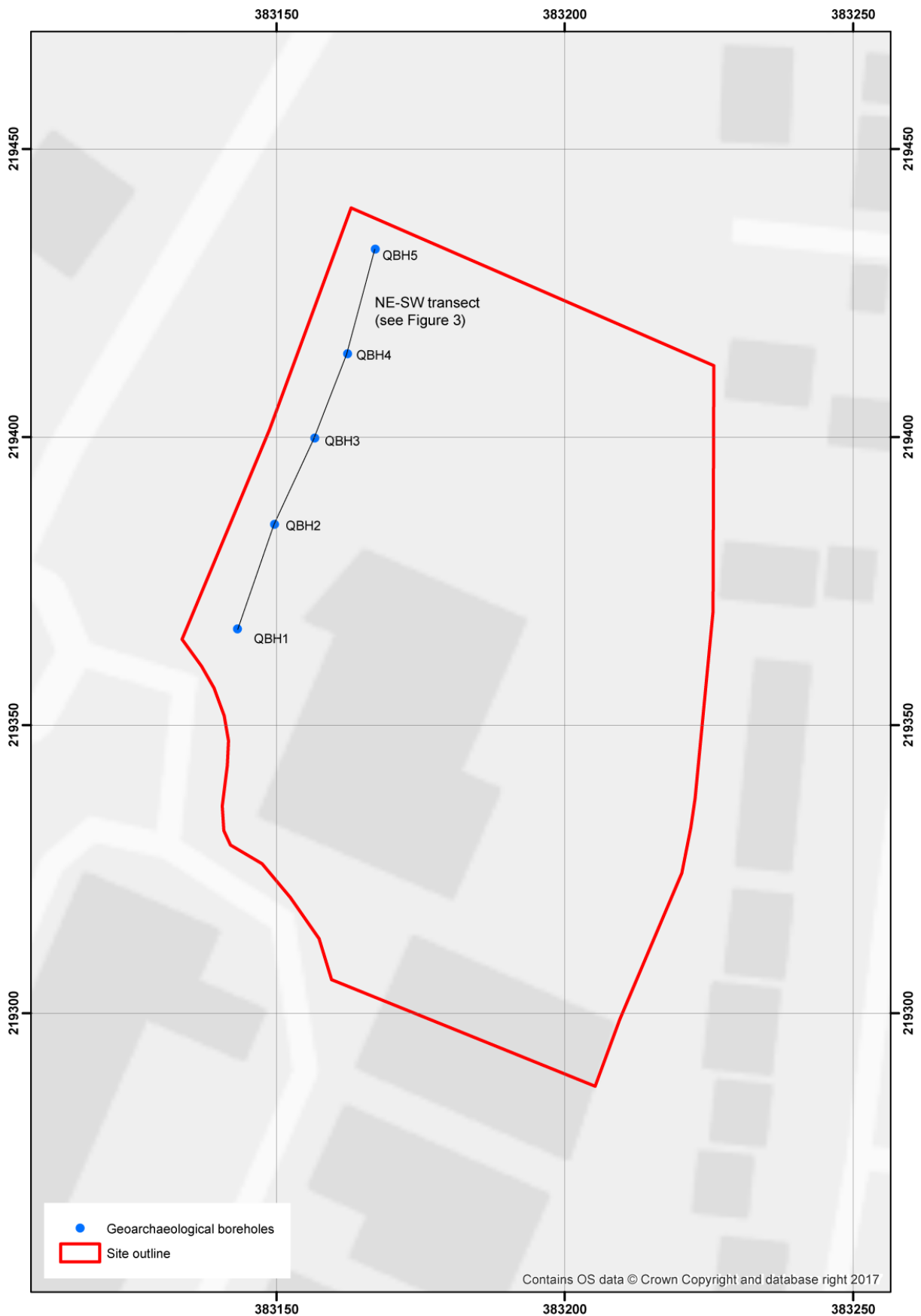


Figure 2: Location of the new geoarchaeological boreholes (QBH1 to QBH5) at Mercia Road, Gloucester. Alignment of the northwest-southeast transect (see Figure 3) also shown.

## 3. METHODS

### 3.1 Field investigations

A total of five geoarchaeological borehole (boreholes QBH1 to QBH5) were put down at the site in December 2017 along a broadly southwest-northeast transect (Figure 2). The borehole core samples were recovered using a Terrier-type, track-mounted soil sampling rig equipped with casing. In most cases, this coring technique is a suitable method for the recovery of continuous, undisturbed core samples and provides sub-samples suitable for not only sedimentary and microfossil assessment and analysis, but also macrofossil analysis. The borehole locations were obtained using a Leica Differential GPS (see Table 1).

### 3.2 Lithostratigraphic descriptions

The lithostratigraphy of the core samples was described in the laboratory using standard procedures for recording unconsolidated sediment and organic sediments, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter) and inclusions (e.g. artefacts) (Tröels-Smith, 1955). The procedure involved: (1) cleaning the sample using a scalpel; (2) recording the physical properties, most notably colour using a Munsell Soil Colour Chart; (3) recording the composition; gravel (*Grana glareosa*; Gg), fine sand (*Grana arenosa*; Ga), silt (*Argilla granosa*; Ag) and clay (*Argilla steatoides*); (4) recording the degree of peat humification and (5) recording the unit boundaries e.g. sharp or diffuse. The results of the geoarchaeological description of the boreholes are displayed in Tables 2 and 3.

**Table 1: Spatial data for the new geoarchaeological boreholes at Mercia Road, Gloucester.**

Name	Easting	Northing	Elevation (m OD)
QBH1	383143.19	219366.69	10.82
QBH2	383149.61	219384.84	10.91
QBH3	383156.57	219399.83	10.87
QBH4	383162.32	219414.45	10.82
QBH5	383167.13	219432.62	10.66



## 4. RESULTS & INTERPRETATION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS

The results of the lithostratigraphic description of boreholes QBH1 to QBH5 are shown in Tables 2 to 6, with an illustrated two-dimensional southwest-northwest transect shown in Figure 3. The full sequence of sediments recorded in the boreholes comprises:

*Made Ground* – widely present

*Upper Wentlooge Formation* – widely present

*Lower Wentlooge Formation* – widely present

*Gravel* – reached only in selected boreholes

### 4.1 Gravel

A horizon of sandy gravel was present in all the boreholes that penetrated to the bottom of the Holocene sequence. This unit most likely represents a cold-climate (Pleistocene) deposit, perhaps deposited during the Devensian Late Glacial (15,000 to 10,000 years before present) and comprises the sands and gravels of a high-energy braided river system which, while it was active would have been characterised by longitudinal gravel bars and intervening low-water channels in which finer-grained sediments might have been deposited. Allen & Scaife (2010) include the deposits of the sandy gravel as the lowermost part of the Lower Wentlooge Formation.

The surface of the Gravel was recorded only in two of the new geoarchaeological boreholes, at between 3.31 and 3.71m OD (QBH1 and QBH2 respectively). Boreholes QBH4 and QBH5 were put down to similar depths (2.82 and 3.66m OD respectively) but the gravel was not reached here, indicating that it falls at least slightly towards the northeast of the site. The previous geotechnical boreholes at the site (WS01-WS17; Ruddlesden Geotechnical, 2017) did not reach the gravel, terminating at levels of between 0.6 and 6m below ground level (bgl).

### 4.2 Lower Wentlooge Formation

A predominantly sandy or silty unit rests directly on the Gravel in boreholes QBH1 and QBH2, and forms the basal unit in boreholes QBH4 and QBH5 (QBH3 was put down only to 4.87m OD, and did not reach this unit). This unit is interpreted here as the Lower Wentlooge Formation referred to by Rippon (2006) and Allen & Scaife (2010), and is similar to that recorded towards the base of the sequence in other Holocene alluvial sequences in southern England. On the basis of the geotechnical logs it seems unlikely that this unit was reached in any of the previous geotechnical boreholes at the site (WS01-WS17; Ruddlesden Geotechnical, 2017), which terminated at levels of between 0.6 and 6m bgl (see above).

The deposits of the Lower Wentlooge Formation are predominantly silty, tending to become increasingly coarse (sandy) downward in most sequences. The Lower Wentlooge Formation is most likely indicative of deposition during the Early to Middle Holocene, as the main course of the Severn became confined to a few meandering channels. During this period, the surface of the Gravel was progressively buried beneath the sandy and silty flood deposits of the river. The richly-

organic nature of the Lower Alluvium suggests that this was a period during which the valley floor was occupied by a network of actively shifting channels, with a drainage pattern on the floodplain that was still largely determined by the relief on the surface of the underlying Gravel.

The interface between the Lower Alluvium and the overlying units is unclear in boreholes QBH1, QBH2, QBH4 and QBH5, since no material was recovered immediately above what was recorded of this unit. However, its surface lies at a minimum of 5.34, 4.91, 3.82 and 4.66m OD in these boreholes respectively. No material was recovered in the boreholes above these levels, fairly consistently to a level of around ca. 6.8m OD (see Figure 3).

### **4.3 Upper Wentlooge Formation**

Overlying the Lower Wentlooge Formation at a level of around ca. 6.8m OD in all five boreholes was a unit of predominantly silty clay alluvium, interpreted here as the Upper Wentlooge Formation. The surface of the Alluvium (Figure 3) was recorded at between 8.36 (QBH2) and 8.66m OD (QBH5), where it is overlain by Made Ground (see below). The majority of the previous geotechnical boreholes at the site (WS01-WS17) terminate in this unit at a level of between 3 and 6m bgl.

The sediments of the Upper Wentlooge Formation are indicative of deposition within low energy fluvial and/or semi-aquatic conditions during the Middle to Late Holocene. The high mineral content of the sediments may reflect increased sediment loads resulting from intensification of agricultural land use from the later prehistoric period onward, combined with the effects of rising sea level.

### **4.4 Made Ground**

Between ca. 2 and 2.5m of Made Ground caps the sequence across the transect. Towards the base of the Made Ground it is frequently composed of redeposited/reworked remnants of the underlying alluvium, with waste material (e.g. glass, pottery and brick) in a matrix of silty clay.

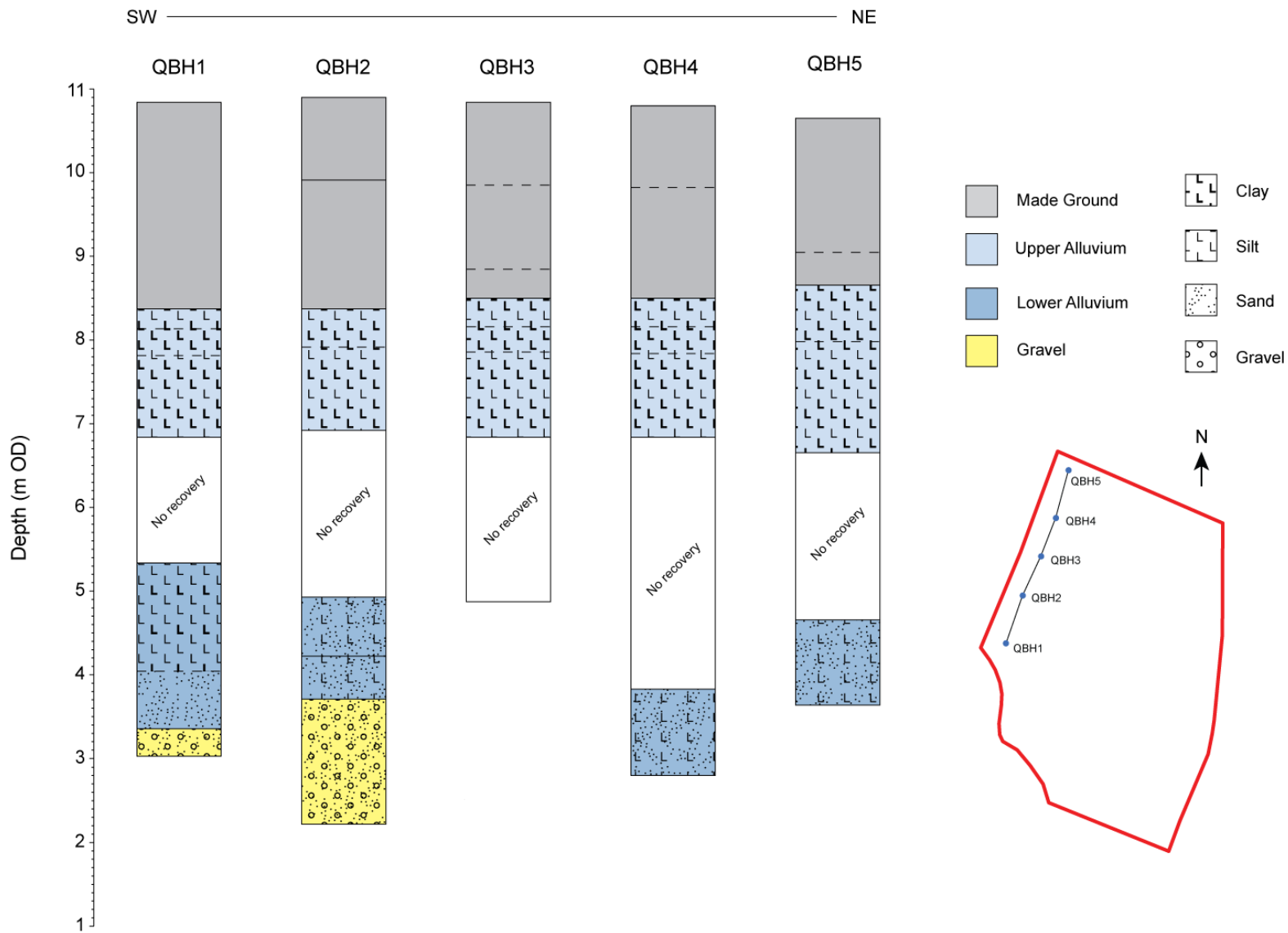


Figure 3: Southwest-northeast transect of geotechnical boreholes across the Mercia Road site.

**Table 2: Lithostratigraphic description of borehole QBH1, Mandela Way, Gloucester.**

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
10.82 to 8.38	0.00 to 2.44	Tarmac hardstanding over mortar, concrete, brick and glass in brown silty clay matrix. Diffuse contact in to:	MADE GROUND
8.38 to 8.12	2.44 to 2.70	As3 Ag1; blue grey silty clay. Diffuse contact in to:	UPPER ALLUVIUM
8.12 to 7.82	2.70 to 3.00	As3 Ag1; firm brown silty clay. Diffuse contact in to:	
7.82 to 6.82	3.00 to 4.00	As3 Ag1; blue grey silty clay.	
6.82 to 5.34	4.00 to 5.48	NO MATERIAL RETAINED	N/A
5.34 to 4.02	5.48 to 6.80	Ag3 As1 Ga+; brown clayey silt with a trace of sand. Some very fine horizontal bedding. Diffuse contact in to:	LOWER ALLUVIUM
4.02 to 3.31	6.80 to 7.51	Ga4 Ag+; brown sand with a trace of silt. Sharp contact in to:	
3.31 to 3.02	7.51 to 7.80	Gg3 Ga1; grey sandy gravel. Clasts are flint, well-rounded to sub-angular, average diameter 20mm.	GRAVEL

**Table 3: Lithostratigraphic description of borehole QBH2, Mandela Way, Gloucester.**

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
10.91 to 9.91	0.00 to 1.00	Tarmac hardstanding over concrete and brick rubble.	MADE GROUND
9.91 to 8.36	1.00 to 2.55	Made Ground of mortar, concrete, brick and glass in brown silty clay matrix. Diffuse contact in to:	
8.36 to 7.91	2.55 to 3.00	As3 Ag1; blue grey silty clay. Diffuse contact in to:	UPPER ALLUVIUM
7.91 to 6.91	3.00 to 4.00	As3 Ag1; brown silty clay.	
6.91 to 4.91	4.00 to 6.00	NO MATERIAL RETAINED	N/A
4.91 to 4.21	6.00 to 6.70	Ag2 Ga2; brown clayey silt with a trace of sand. Some very fine horizontal bedding. Sharp contact in to:	LOWER ALLUVIUM
4.21 to 3.71	6.70 to 7.20	Ag2 Ga2; grey silt and sand. Sharp contact in to:	
3.71 to 2.21	7.20 to 8.70	Gg3 Ga1; grey sandy gravel. Clasts are flint, well-rounded to sub-angular, average diameter 30mm. Some sandier sub-units (Ga4Gg+).	GRAVEL

**Table 4: Lithostratigraphic description of borehole QBH3, Mandela Way, Gloucester.**

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
10.87 to 9.87	0.00 to 1.00	Tarmac hardstanding over mortar, concrete, brick and glass in brown silty clay matrix. Diffuse contact in to:	MADE GROUND
9.87 to 8.87	1.00 to 2.00	Made Ground of glass, pottery and brick in dark brown silty clay matrix. Diffuse contact in to:	
8.87 to 8.52	2.00 to 2.35	Redeposited peaty alluvium with wood, brick and concrete fragments. Sharp contact in to:	
8.52 to 8.18	2.35 to 2.69	As3 Ag1; blue grey silty clay with black mottling. Diffuse contact in to:	UPPER ALLUVIUM
8.18 to 7.87	2.69 to 3.00	As3 Ag1; firm brown silty clay. Diffuse	

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
		contact in to:	
7.87 to 6.87	3.00 to 4.00	As3 Ag1; firm blue grey silty clay.	
6.87 to 4.87	4.00 to 6.00	NO MATERIAL RETAINED	N/A

Table 5: Lithostratigraphic description of borehole QBH4, Mandela Way, Gloucester.

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
10.82 to 9.82	0.00 to 1.00	Tarmac hardstanding over concrete and brick rubble.	MADE GROUND
9.82 to 8.49	1.00 to 2.33	Made Ground of mortar, concrete, brick and glass in brown silty clay matrix. Diffuse contact in to:	
8.49 to 8.14	2.33 to 2.68	As3 Ag1; grey silty clay. Diffuse contact in to:	UPPER ALLUVIUM
8.14 to 7.82	2.68 to 3.00	As3 Ag1; brown silty clay. Diffuse contact in to:	
7.82 to 6.82	3.00 to 4.00	As3 Ag1; firm brown silty clay.	
6.82 to 3.82	4.00 to 7.00	NO MATERIAL RETAINED	N/A
3.82 to 2.82	7.00 to 8.00	Ag3 As1 Ga+; brown clayey silt with a trace of sand. Some very fine horizontal bedding.	LOWER ALLUVIUM

Table 6: Lithostratigraphic description of borehole QBH5, Mandela Way, Gloucester.

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
10.66 to 9.03	0.00 to 1.63	Tarmac hardstanding over mortar, concrete, brick and glass in brown silty clay matrix. Diffuse contact in to:	MADE GROUND
9.03 to 8.66	1.63 to 2.00	As3 Ag1; firm brown silty clay with gravel, brick and concrete fragments. Redeposited alluvium. Diffuse contact in to:	
8.66 to 7.99	2.00 to 2.67	As3 Ag1; blue grey silty clay. Diffuse contact in to:	UPPER ALLUVIUM
7.99 to 6.66	2.67 to 4.00	As3 Ag1; brown silty clay.	
6.66 to 4.66	4.00 to 6.00	NO MATERIAL RETAINED	N/A
4.66 to 3.66	6.00 to 7.00	Ag3 As1 Ga+; brown clayey silt with a trace of sand. Some very fine horizontal bedding.	LOWER ALLUVIUM

## 5. DISCUSSION & CONCLUSION

The aim of the geoarchaeological investigations at the Mercia Road site were: (1) to clarify the nature of the sub-surface stratigraphy, and (2) to clarify the nature, depth, extent and possible date of any alluvium and organic/peat deposits. In order to address these aims, a total of five geoarchaeological boreholes were put down at the site, and the stratigraphic data from these boreholes used to produce a basic deposit model of the major depositional units.

The results of the geoarchaeological investigations indicate that the sediments recorded at the site are similar to those recorded elsewhere in the valley of the estuarine River Severn (e.g. Rippon, 2006; Allen & Scaife, 2010), where the alluvial deposits of the Wentlooge Formation can be identified. In two of the five boreholes the basal unit was a sandy gravel, considered to represent a Pleistocene gravel that underlies the Holocene alluvial sequence. This unit was not recorded in boreholes QBH3 to QBH5 due to poor sample recovery, but its surface was recorded at 3.31 and 3.71m OD in QBH1 and QBH2 respectively. Overlying the gravel and forming the basal unit in boreholes QBH4 and QBH5 is a predominantly silty or sandy unit, interpreted here as the Lower Wentlooge Formation described by Allen & Scaife (2010) and most likely comprised of estuarine deposits deposited during the Early to Middle Holocene. This unit was recorded at elevations of between ca. 3 and 5m OD. No organic horizons, or indeed organic material, was recorded within this unit.

Unfortunately, sample retention was extremely poor in all five of the new geoarchaeological boreholes, rather consistently at levels between ca. 5 and 6.8m OD. The composition of the alluvial sequence at these levels is therefore uncertain, and it is indeed possible that organic units survive here, as noted in previous geotechnical borehole WS09. However, it is note that that no organic or peaty residue was identified in the sample gouges put down to these depths, and it seems more likely that the sequence here was comprised of extremely soft, waterlogged minerogenic deposits similar to the underlying sandy/silty, or overlying clay-rich, deposits. In addition, only peaty lenses up to 0.1m thick were recorded in borehole WS09, perhaps indicative of only localised peat accumulation rather than a widespread unit across the site.

The uppermost unit in the alluvial sequence was a clay-rich, silty unit interpreted as the Upper Wentlooge Formation, recorded at levels between ca. 6.5 and 8m OD and most likely deposited on the floodplain at a distance from any active channels during the Middle to Late Holocene. Again, no organic horizons or inclusions were recorded within this unit.

## 6. RECOMMENDATIONS

Although sample retention was poor for a significant component of the alluvial sequence at the site, it seems unlikely that organic or peaty units exist in this part of the Mercia Road site. Should they exist, they are likely to be relatively deeply buried at between ca. 5 and 6.8m OD (ca. 4 to 6m below ground level). It is possible that an alternative drilling technique (for example, hand held percussion coring or cable-percussion) may achieve better sample retention; however, the justification for further work on site might be addressed by the likely impact of future development at a depth of 4-6m below ground level. No further environmental archaeological assessment is recommended on the samples retained from the site during the present investigation.

## 7. REFERENCES

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Trøels-Smith, J. (1955) Karakterisering af løse jordarter (Characterisation of unconsolidated sediments), *Danm. Geol. Unders., Ser IV 3*, 73.



## 9. APPENDIX 2: OASIS

<b>OASIS ID: quaterna1-310318</b>	
<b>Project details</b>	
Project name	Mercia Road, Gloucester
Short description of the project	A programme of geoarchaeological investigation was undertaken at the Mercia Road site in order (1) to clarify the nature of the sub-surface stratigraphy, and (2) to clarify the nature, depth, extent and possible date of any alluvium and organic/peat deposits. The results of the geoarchaeological investigations indicate that the sediments recorded at the site are similar to those recorded elsewhere in the valley of the estuarine River Severn, where the alluvial deposits of the Wentlooge Formation can be identified. In two of the five boreholes the basal unit was a sandy gravel, considered to represent the Pleistocene gravel that underlies the Holocene alluvial sequence, recorded at 3.31 and 3.71m OD in QBH1 and QBH2 respectively. Overlying the gravel is a predominantly silty or sandy unit, interpreted here as the Lower Wentlooge Formation and most likely comprised of estuarine deposits dated to the Early to Middle Holocene. This unit was recorded at elevations of between ca. 3 and 5m OD. No organic horizons, or indeed organic material, was recorded within this unit. Sample retention was extremely poor in the new geoarchaeological boreholes at levels between ca. 5 and 6.8m OD. The composition of the alluvial sequence at these levels is therefore uncertain, and it is indeed possible that organic units survive here. However, no organic or peaty residue was identified in the sample gouges put down to these depths, and it seems more likely that the sequence here was comprised of extremely soft, waterlogged minerogenic deposits similar to the underlying sandy/silty, or overlying clay-rich, deposits. The uppermost unit in the alluvial sequence was a clay-rich, silty unit interpreted as the Upper Wentlooge Formation, recorded at levels between ca. 6.5 and 8m OD and most likely deposited on the floodplain at a distance from any active channels during the Middle to Late Holocene. Again, no organic horizons or inclusions were recorded within this unit.
Project dates	Start: 01-11-2017 End: 27-02-2018
Previous/future work	No / Not known
Type of project	Environmental assessment
Survey techniques	Landscape
<b>Project location</b>	
Country	England
Site location	GLOUCESTERSHIRE GLOUCESTER GLOUCESTER Mercia Road

Postcode	GL1 2PY
Study area	1.3 Hectares
Site coordinates	SO 83174 19360 51.872118397296 -2.244424234767 51 52 19 N 002 14 39 W Point
<b>Project creators</b>	
Name of Organisation	Quaternary Scientific (QUEST)
Project brief originator	Avon Archaeology
Project design originator	D.S. Young
Project director/manager	C.R. Batchelor
Project supervisor	D.S. Young
<b>Project archives</b>	
Physical Archive Exists?	No
Digital Archive Exists?	No
Paper Archive recipient	Gloucester City Council
Paper Contents	"Stratigraphic"
Paper Media available	"Report"
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