

THE MADISON, MERIDIAN GATE, MARSH WALL, LONDON E14

Environmental Archaeological Assessment Report

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1. NON-TECHNICAL SUMMARY

A geoarchaeological borehole survey and a programme of environmental archaeological assessment was carried out at The Madison site in order to (1) to establish the age of the Peat recorded at the site; (2) to assess the palaeoenvironmental potential of the sequence; (3) to highlight any indications of nearby human activity, and (4) to provide recommendations for further analysis (if necessary). The results of the investigations indicate that the sediments recorded at the site are analogous to those recorded elsewhere in the Lower Thames Valley, with a sequence of Shepperton Gravel overlain by Holocene Alluvium (in places containing Peat), capped by Made Ground.

The surface of the Late Devensian Shepperton Gravel at the site is variable, lying at between -3.70 and -1.90m OD; a depression in the Gravel surface towards the centre of the site is consistent with a scour-hollow in the surface of the Pleistocene Gravel, or perhaps erosion associated with a north-south aligned Late Glacial/Early Holocene channel running off the Kempton Park Gravel terrace to the north of the site as hypothesised by MoLA (2014). Within the Holocene alluvial sequence a horizon of woody Peat was recorded at elevations between ca. -1.0 and -0.35m OD, present in thicknesses of between 0.4 and 0.5m and subsequently radiocarbon dated to between 4080-3890 and 3695-3570 cal BP (early to middle Bronze Age). The results of the environmental archaeological assessment revealed that palaeobotanical remains were poorly preserved, and thus only a limited environmental reconstruction of the site could be achieved; the pollen assemblages recorded are typical of herbs and trees growing within a wetland environment, whilst presence of *Cereale* type pollen may be indicative of the growth of cereals within the nearby vicinity. On the basis of the poor preservation of biological remains at site, no further work was recommended.

2. INTRODUCTION

2.1 Site context

This report summarises the findings arising out of the environmental archaeological assessment undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of land at The Madison, Meridian Gate, Marsh Wall, London E14 (National Grid Reference centred on: TQ 38022 79765; Figures 1 and 2). The site is located on the floodplain of the estuarine Thames, ca. 300m to the west of the Blackwall Reach of the River. The site lies towards the centre of the Isle of Dogs, bounded to the north by the Meridian Place residential-led complex, 225 Marsh Wall (Angel House) to the east, Marsh Wall to the south and the University of Sunderland London Campus, which forms part of the Thames Quay complex, to the west. The British Geological Society (BGS; www.bgs.ac.uk/opengeoscience) maps the superficial geology here as 'Alluvium-Clay, Silty, Peaty, Sandy', overlying Palaeogene Lambeth Group bedrock. The ground level is recorded at approximately 5.5m OD.

On the basis of previous geotechnical investigations at the site, a geoarchaeological desk-based assessment (MoLA, 2014) determined that the Alluvium recorded within the site had potential 'for prehistoric and palaeoenvironmental remains'. The previous geotechnical investigations (Ground Engineering Ltd., 2015) at the site incorporated four cable percussion boreholes (BH1 to BH4) and five window samples (WS1 to WS5); of these, only the cable percussion boreholes recorded the entire Holocene sequence. These boreholes indicate a sequence of Pleistocene River gravels (the Late Devensian Shepperton Gravel) overlain by Alluvium including (in places) Peat. The gravel surface is variable, recorded at between -3.15 (BH1) and -1.9m OD (BH2). Peat is recorded within the Alluvium in two boreholes (BH3 and BH4) at between -0.5 to -0.95 and -0.35 to -0.85m OD respectively, representing a period of semi-terrestrial conditions supporting the growth of wetland vegetation. The surface of the Alluvium at the site lies at between 1.55 and 1m OD, where it is overlain by Made Ground to a level of between ca. 5.3 and 5.5m OD.

2.2 Palaeoenvironmental and archaeological significance

The existing records therefore indicate some variation in the height of the Gravel surface, and the type, thickness and age of the subsequent Holocene deposits. 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 former channels and bars; (2) the presence of 'peaty clay' may represent former terrestrial or semi-terrestrial land-surfaces, and (3) the silty clay Alluvium represent periods of inundation/flooding by estuarine or fluvial waters. 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 from the Mesolithic to Late Bronze Age periods. In particular, there is the potential to increase knowledge and understanding of the interactions between human activity, vegetation succession and climate in this area of the Lower

Thames Valley. 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. So called palaeoenvironmental reconstructions have been carried out in this general area at Preston Road, Poplar (Branch *et al.*, 2007) and Delta Junction (Yendell, 2012).

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 structure) and palaeoenvironmental record (e.g. changes in vegetation composition).

2.3 Aims and objectives

Significantly, the Peat horizons recorded at The Madison site have the potential to provide suitable palaeobotanical and zooarchaeological remains for reconstructing the past environmental conditions (including evidence for human activity) of the site and its environs. Two geoarchaeological boreholes were therefore collected at the site (QBH1 and QBH2), and a programme of environmental archaeological assessment carried out on borehole QBH1, the aims of which were (1) to establish the age of the Peat recorded in this borehole; (2) to assess the palaeoenvironmental potential of the sequence; (3) to highlight any indications of nearby human activity, and (4) to provide recommendations for further analysis (if necessary).



Figure 1: Location of (1) The Madison, Meridian Gate, Marsh Wall, London E14 and nearby sites discussed in the text: (2) 1-3 Turnberry Quay (Batchelor & Young, 2016a), (3) Atlas Wharf (Lakin, 1998); (4) Heron Quays (Batchelor and Young, 2014); (5) Delta Junction (Yendell, 2012) and (6) 7 Limeharbour, Isle of Dogs (Batchelor & Young, 2016b). *Contains Ordnance Survey data © Crown copyright and database right [2016].*



● Proposed geoenvironmental borehole

Key					
	Borehole Position		Window Sample Position		Trial Pit Position

Figure 2: Location of the new geoenvironmental boreholes and existing geotechnical boreholes at The Madison, Meridian Gate, Marsh Wall, London E14. Original figure provided by Ground Engineering Ltd.

3. METHODS

Field investigations and lithostratigraphic descriptions

Two geoarchaeological boreholes (boreholes QBH1 and QBH2) were put down at the site in February 2015 by Quaternary Scientific. Borehole core samples were recovered using an Eijkelkamp window sampler and gouge set using an Atlas Copco TT 2-stroke percussion engine. 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 recorded using a Leica GS09 Differential GPS (Table 1). Whilst borehole QBH1 recorded the entire Holocene alluvial sequence, an obstruction within the Peat at the location of QBH2 prevented drilling below -0.70m OD.

The lithostratigraphy of the retained 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. A programme of three-dimensional topographic surface modelling was not undertaken at the present site, due to the distribution (broadly linear) of the available geotechnical and geoarchaeological records. However, a two-dimensional stratigraphic profile is shown in Figure 3.

The results of the geoarchaeological descriptions of the boreholes are displayed in Tables 2 and 3 and in Figure 3. The spatial attributes of the boreholes are displayed in Table 1 and in Figure 2.

Table 1: Borehole attributes for the new geoarchaeological boreholes at The Madison, Meridian Gate, Marsh Wall, London E14.

Borehole	Easting	Northing	Elevation (m OD)
QBH1	538,004.46	179,775.32	5.30
QBH2	538,030.25	179,775.88	5.50

Organic matter determinations

A total of 25 subsamples from borehole QBH1 were taken for determination of the organic matter content (Table 5; Figure 3). These records were important as they can identify increases in organic matter possibly associated with more terrestrial conditions. The organic matter content was determined by standard procedures involving: (1) drying the sub-sample at 110°C for 12 hours to remove excess moisture; (2) placing the sub-sample in a muffle furnace at 550°C for 2 hours to remove organic matter (thermal oxidation), and (3) re-weighing the sub-sample obtain the 'loss-on-ignition' value. The samples were then re-weighed after 2 hours at 950°C for determination of the calcium carbonate content (see Bengtsson and Enell, 1986).

Radiocarbon dating

Two subsamples of unidentified twig wood (<2-3 years old) were extracted from the top and base of the Peat horizon in borehole QBH1 for radiocarbon dating. The samples were submitted for AMS radiocarbon dating to the BETA Analytic Radiocarbon Dating Facility, Miami, Florida. The results have been calibrated using OxCal v4.0.1 (Bronk Ramsey, 1995; 2001 and 2007) and the IntCal13 atmospheric curve (Reimer *et al.*, 2013). The results are displayed in Figure 3 and in Table 5.

Pollen assessment

10 subsamples from borehole QBH1 were extracted for an assessment of pollen content. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) adding two tablets of the exotic clubmoss *Lycopodium clavatum* to provide a measure of pollen concentration in each sample; (3) deflocculation of the sample in 1% Sodium pyrophosphate; (4) sieving of the sample to remove coarse mineral and organic fractions (>125 μ); (5) acetolysis; (6) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm³); (7) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the University of Reading pollen type collection and the following sources of keys and photographs: Moore *et al* (1991); Reille (1992). The assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of pollen grains and spores, and the principal taxa on four transects (10% of the slide) (Table 6).

Diatom assessment

Four sub-samples from borehole QBH1 were extracted for the assessment of diatoms. The diatom extraction involved the following procedures (Battarbee *et al.*, 2001): (1) treatment of the sub-sample (0.2g) with Hydrogen peroxide (30%) to remove organic material and Hydrochloric acid (50%) to remove remaining carbonates; (2) centrifuging the sub-sample at 1200 for 5 minutes and washing with distilled water (4 washes); (3) removal of clay from the sub-samples in the last wash by adding a few drops of Ammonia (1%); (4) two slides prepared, each of a different concentration of the cleaned solution, were fixed in mounting medium of suitable refractive index for diatoms (Naphrax). Duplicate slides each having two coverslips were made from each sample and fixed in Naphrax for diatom microscopy. The coverslip with the most suitable concentration of the sample preparation was selected for diatom evaluation. A large area of this coverslip was scanned for diatoms at magnifications of x400 and x1000 under phase contrast illumination using a Leica microscope. The results are displayed in Table 7.

Macrofossil assessment

A total of four small bulk samples from borehole QBH1 were extracted for the recovery of macrofossil remains including waterlogged plant macrofossils, wood, insects and Mollusca. The

extraction process involved the following procedures: (1) removing a sample of either 5 or 10cm in thickness; (2) measuring the sample volume by water displacement, and (3) processing the sample by wet sieving using 300µm and 1mm mesh sizes. Each sample was scanned under a stereozoom microscope at x7-45 magnifications, and sorted into the different macrofossil classes. The concentration and preservation of remains was estimated for each class of macrofossil (Table 8).

4. RESULTS AND INTERPRETATION OF THE GEOARCHAEOLOGICAL BOREHOLE INVESTIGATIONS, ORGANIC MATTER DETERMINATIONS AND RADIOCARBON DATING

The results of the geoarchaeological borehole investigations are shown in Tables 2 and 3, with the results of the organic content analysis and radiocarbon dating shown in Tables 4 and 5. The results of the lithostratigraphic descriptions, organic matter determinations and radiocarbon dating for boreholes QBH1 and QBH2, along with the geotechnical descriptions of boreholes BH1 to BH4, are displayed in a west-east transect in Figure 3.

The basal unit recorded at the site is a horizon of sand and gravel (the Shepperton Gravel). These sediments were deposited during the Late Devensian (Marine Isotope Stage 2, ca. 16,000-11,500 cal BP), within a high energy braided river system. The surface of this unit is recorded in borehole QBH1 at -3.70m OD; the Gravel was not reached in borehole QBH2 (see methods). This level is slightly lower than those recorded in the geotechnical boreholes (BH1 to BH4; -1.90 to -3.15m OD); the overall impression of the east-west transect shown in Figure 3 is of a depression in the Gravel surface towards the centre of the site. Such a depression might be consistent with a scour-hollow in the surface of the Pleistocene Gravel, or perhaps erosion associated with a Late Glacial/Early Holocene channel running off the Kempton Park Gravel terrace to the north of the site as hypothesised by MoLA (2014); however, further interpretation of this feature is not possible due to the limited distribution of the available borehole records.

The Gravel is overlain in the geotechnical and geoarchaeological boreholes by a horizon of generally sandy and in places organic silty clay, typical of the Lower Alluvium recorded elsewhere in the Lower Thames Valley and indicative of the former presence of low energy fluvial or estuarine conditions during the Early to Middle Holocene. The surface of this unit generally lies at ca. -1.0m OD across the site; in borehole QBH1 the organic content in this unit is recorded at between ca. 2 and 10% (Figure 3). In the central and eastern areas of the site in boreholes QBH1, BH3, BH4 (and most likely QBH2) the Lower Alluvium is overlain by a horizon of woody Peat with occasional herbaceous remains, indicative of a transition to semi-terrestrial conditions supporting the growth of wetland vegetation in this area of the site. Where recorded, this unit is consistently present at elevations between ca. -1.0 and -0.35m OD and present in thicknesses of between 0.4 and 0.5m. In borehole QBH1 the organic content within this horizon is generally recorded at between 20 and 80%. Radiocarbon dating of the base (-0.94 to -1.03m OD) and top (-0.64 to -0.70m OD) of the Peat in this borehole shows that it accumulated at between 4080-3890 and 3695-3570 cal BP (early to middle Bronze Age).

Where present, the Peat is overlain across the site by a horizon of silty clay, also present above ca. -1.0m OD in those boreholes where no Peat is recorded (BH1 and BH2). This unit is referred to here as the Upper Alluvium, indicative of inundation of the Peat surface and sediment accumulation on the floodplain at a distance from any active channels. In borehole QBH1 this unit is consistently between 5 and 7% organic. The surface of the Upper Alluvium is relatively even across the site,

generally lying at between 1.0 and 1.5m OD (Figure 3). The sequence at the site is capped by between 4.0 and 4.5m of Made Ground, so that the modern surface of the site lies at between ca. 5.0 and 5.5m OD.

Table 2: Lithostratigraphic description of borehole QBH1, The Madison, Meridian Gate, Marsh Wall, London E14.

Depth (m OD)	Depth (m bgs)	Composition
5.30 to 2.70	0.00 to 2.60	Made Ground
2.70 to 1.30	2.60 to 4.00	Redeposited Alluvium (Made Ground)
1.30 to 0.80	4.00 to 4.50	Gley 1 4/10Y; As3 Ag1; dark greenish grey silty clay. Sharp contact in to:
0.80 to 0.70	4.50 to 4.60	10YR 5/2; As3 Ag1 Sh+ Dh+ Ga+; greyish brown silty clay with traces of organic matter, detrital herbaceous material and sand. Diffuse contact in to:
0.70 to 0.30	4.60 to 5.00	Gley 1 4/10Y; As3 Ag1; dark greenish grey silty clay.
0.30 to -0.60	5.00 to 5.90	Gley 1 4/10Y; As3 Ag1; dark greenish grey silty clay with occasional Mollusca. Diffuse contact in to:
-0.60 to -0.70	5.90 to 6.00	10YR 2/1; Sh3 Ag1 Th+; humo. 3/4; black well humified silty peat with a trace of herbaceous material.
-0.70 to -1.03	6.00 to 6.33	10YR 2/1; Sh2 Tl ² 1 Ag1; humo. 2; black moderately humified silty wood peat. Diffuse contact in to:
-1.03 to -1.39	6.33 to 6.69	Gley 1 3/N; Ag2 As1 Ga1 Dl+; very dark grey sandy clayey silt with a trace of detrital wood.
-1.39 to -1.70	6.69 to 7.00	VOID
-1.70 to -1.88	7.00 to 7.18	Gley 1 3/N; Ag2 As1 Ga1 Dl+; very dark grey sandy clayey silt with a trace of detrital wood. Diffuse contact in to:
-1.88 to -2.15	7.18 to 7.45	10YR 5/2; Ga3 Ag1; greyish brown silty sand. Diffuse contact in to:
-2.15 to -2.33	7.45 to 7.63	10YR 5/2; Ag2 As1 Ga1 Dh+; greyish brown sandy clayey silt with a trace of detrital herbaceous material. Rare calcareous nodules. Sharp contact in to:
-2.33 to -2.70	7.63 to 8.00	10YR 4/3; Ga4 Ag+; brown sand with a trace of silt.
-2.70 to -3.70	8.00 to 9.00	10YR 5/2; Ag3 Ga1; greyish brown sandy silt.
-3.70 to -3.75	9.00 to 9.05	10YR 4/3; Gg3 Ga1; brown sandy gravel. Clasts mainly flint, up to 40mm in diameter, sub-angular to rounded.

Table 3: Lithostratigraphic description of borehole QBH2, The Madison, Meridian Gate, Marsh Wall, London E14.

Depth (m OD)	Depth (m bgs)	Composition
5.50 to 2.80	0.00 to 2.70	Made Ground
2.80 to 2.50	2.70 to 3.00	Redeposited Alluvium (Made Ground)
2.50 to 1.50	3.00 to 4.00	Made Ground
1.50 to 0.50	4.00 to 5.00	Gley 1 4/10Y; As2 Ag2 Dh+ Ga+; dark greenish grey silt and clay with traces of sand and detrital herbaceous material. Diffuse contact in to:
0.50 to -0.41	5.00 to 5.91	Gley 1 4/10Y; As3 Ag1; dark greenish grey silty clay. Diffuse contact in to:
-0.41 to -0.70	5.91 to 6.20	10YR 2/1; Sh3 Ag1 Th+; humo. 3/4; black well humified silty peat with a trace of herbaceous material.
-0.70	6.20	Obstruction- borehole abandoned

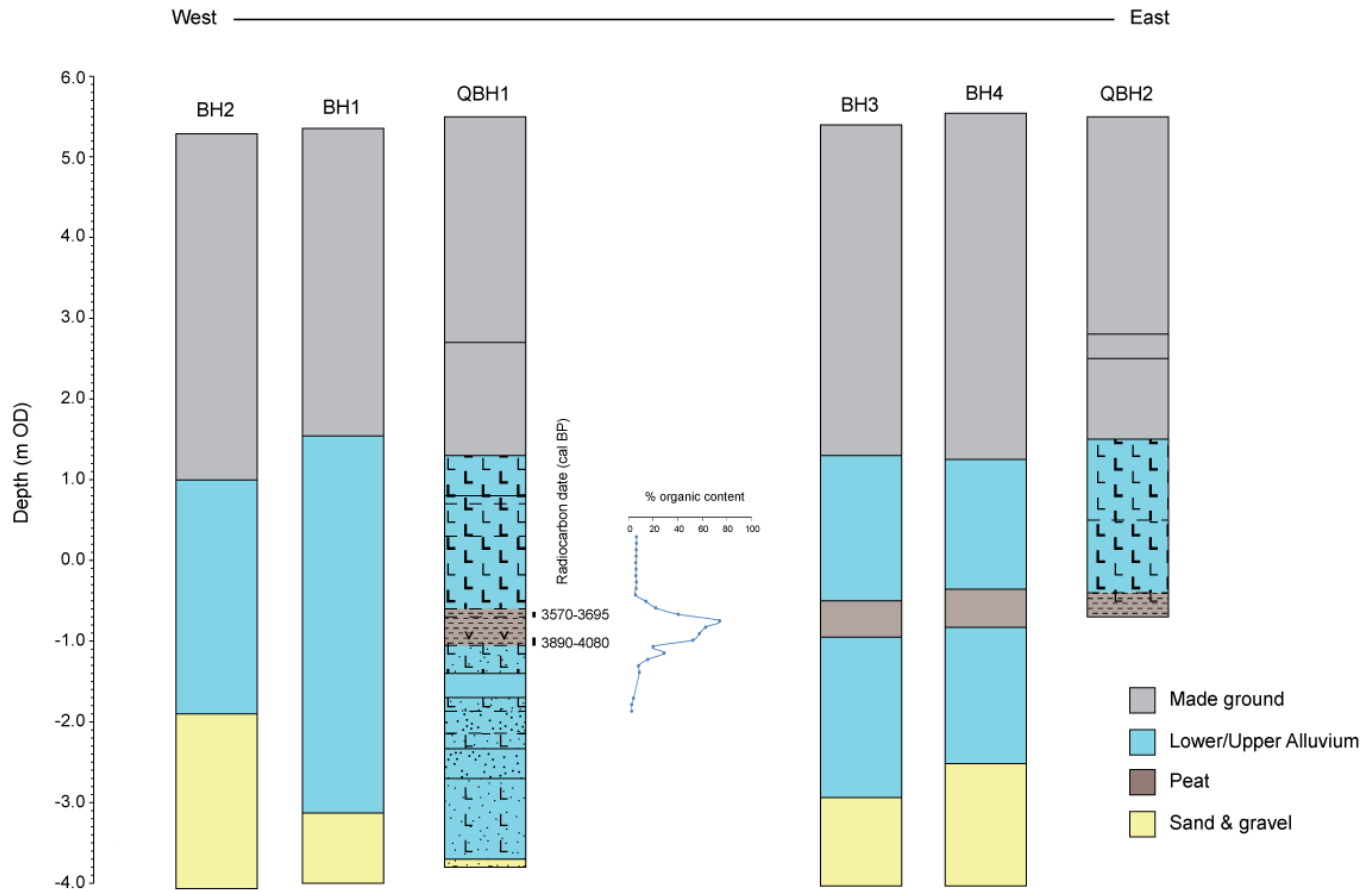


Figure 3: West-east stratigraphic profile of geotechnical and geoarchaeological boreholes across the site, showing the results of the lithostratigraphic analysis, organic content analysis and radiocarbon dating of QBH1. The Madison, Meridian Gate, Marsh Wall, London E14.

Table 4: Results of the borehole QBH1 organic matter determinations, The Madison, Meridian Gate, Marsh Wall, London E14.

Depth (m OD)		Organic matter content (%)
From	To	
0.30	0.29	6.32
0.22	0.21	6.38
0.14	0.13	6.19
0.06	0.05	6.16
-0.02	-0.03	5.78
-0.10	-0.11	6.02
-0.18	-0.19	5.82
-0.26	-0.27	6.34
-0.34	-0.35	6.10
-0.42	-0.43	5.54
-0.50	-0.51	14.09
-0.58	-0.59	21.99
-0.66	-0.67	40.28
-0.74	-0.75	73.73
-0.82	-0.83	62.40
-0.90	-0.91	57.33
-0.98	-0.99	52.07
-1.06	-1.07	19.84
-1.14	-1.15	28.80
-1.22	-1.23	15.61
-1.30	-1.31	7.99
-1.38	-1.39	8.72
-1.46	-1.47	3.97
-1.54	-1.55	2.54
-1.62	-1.63	2.55

Table 5: Results of the borehole QBH1 radiocarbon dating, The Madison, Meridian Gate, Marsh Wall, London E14.

Laboratory code / Method	Material and location	Depth (m OD)	Uncalibrated radiocarbon years before present (yr BP)	Calibrated age BC/AD (BP) (2-sigma, 95.4% probability)	$\delta^{13}C$ (‰)
BETA 433762	Twig wood; top of Peat	-0.64 to -0.70	3390 ± 30 BP	2130 to 1940 cal BC (4080 to 3890 cal BP)	-27.3
BETA 433763	Twig wood; base of Peat	-0.94 to -1.03	3650 ± 30 BP	1745 to 1620 cal BC (3695 to 3570 cal BP)	-27.5

5. RESULTS AND INTERPRETATION OF THE POLLEN ASSESSMENT

The results of the assessment (Table 6) indicate either an absence or very limited concentration of pollen, in a poor to moderate state of preservation within seven of the samples. The remaining three samples (-1.30, -0.66 and -0.50m OD) contain a slightly higher, but still low concentration of remains. The most frequently recorded grains include *Alnus* (alder), *Quercus* (oak), *Pinus* (pine), Cyperaceae (sedges), Poaceae (grasses), *Cereale* type (e.g. barley), Lactuceae (dandelions) and *Filicales* (ferns). The pollen grains recorded are largely typical of herbs and trees growing within a wetland environment. The limited concentration and preservation of remains restricts further environmental reconstruction of the site, though the presence of *Cereale* type pollen does suggest the growth of cereals within the nearby vicinity, and thus an anthropogenic signal. Some caution must be taken with this interpretation however, as certain wetland grasses are known to produce pollen with a similar morphology to that of cereal grains.

Table 6: Results of the pollen assessment of borehole QBH1, The Madison, Meridian Gate, Marsh Wall, London E14.

	Depth (m OD)	-0.18	-0.34	-0.50	-0.66	-0.74	-0.82	-0.90	-0.98	-1.14	-1.30
Latin name	Common name										
Trees											
<i>Alnus</i>	alder			3	4			2	2	1	1
<i>Quercus</i>	oak			1		1					1
<i>Pinus</i>	pine	1		1							2
<i>Ulmus</i>	elm				1						
<i>Tilia</i>	lime										1
Shrubs											
<i>Corylus</i> type	e.g. hazel			1	1						
<i>Viburnum</i> type	wayfaring tree				1						
<i>Lonicera periclymenum</i>	honeysuckle			1							
Herbs											
Cyperaceae	sedge family	1		3							
Poaceae	grass family	4		1							4
<i>Cereale</i> type	e.g. barley			1			1				1
Asteraceae	daisy family			1							
Lactuceae	dandelion family	1			1						1
<i>Chenopodium</i> type	goosefoot family			2							
Apiaceae	carrot family				1						
Aquatics											
<i>Typha latifolia</i>	bulrush			1							
<i>Sparganium</i> type	bur-reed			1							
Spores											
<i>Filicales</i>	ferns	2		17	3		2	1			1
<i>Polypodium vulgare</i>	polypody				2						
Total Land Pollen (grains counted)											
		9	0	15	9	1	1	2	2	1	11
Concentration*		2	0	2	2	1	1	1	1	1	2
Preservation**		2	0	2-3	2	3	2	2	2	2	3
Microcharcoal Concentration***		3	1	2	1	1	2	0	1	2	2-3
Suitable for further analysis											
		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Key: *Concentration: 0 = 0 grains; 1 = 1-75 grains, 2 = 76-150 grains, 3 = 151-225 grains, 4 = 226-300, 5 = 300+ grains per slide; **Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent; ***Microcharcoal Concentration: 0 = none, 1 = negligible, 2 = occasional, 3 = moderate, 4 = frequent, 5 = abundant

6. RESULTS AND INTERPRETATION OF THE DIATOM ASSESSMENT

Four sub-samples were extracted from borehole QBH1 for the assessment of diatoms (Table 7). The sub-samples were focussed on the upper and lower interfaces between the peat and alluvium. Diatoms were either absent or recorded in low concentrations (and a poor state of preservation) in the two samples at the lower interface, whilst at the upper interface diatoms were present in moderate concentrations and were well-preserved.

With regards to the lower interface, a number of factors influence diatom preservation, and it is probable that in the sediments examined here diatom concentrations were always low and that post-depositional destruction of the frustules has occurred due to drying-out, abrasion and possibly unfavourable chemical conditions. Dissolution of the diatom silica, for example, can occur as a response to the ambient dissolved silica concentration, the pH in open water, and the interstitial water in sediments. Using both fossil and modern diatoms, these and other environmental factors have been shown to affect the quality of preservation of assemblages.

The two samples from the upper interface are suitable for further, more detailed assessment or analysis.

Table 7: Results of the diatom assessment of borehole QBH1, The Madison, Meridian Gate, Marsh Wall, London E14.

Depth (m OD)	Diatom concentration	Quality of preservation	Diversity
-0.58 to -0.59	3	3	Moderate
-0.62 to -0.63	3	2	Moderate
-1.02 to -1.03	1	1	Low
-1.05 to -1.06	0	-	-

Key:

*Concentration: 0 = 0, 1 = 1-75, 2 = 76-150, 3 = 151-225, 4 = 226-300, 5 = 300+ frustules per slide

**Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent

7. RESULTS AND INTERPRETATION OF THE MACROFOSSIL ASSESSMENT

A total of four small bulk samples from borehole QBH1 were extracted for the recovery of macrofossil remains, including waterlogged plant macrofossils, waterlogged wood, insects and Mollusca (Table 8). The samples were focussed on the Peat horizon in borehole QBH1. The results of the macrofossil rapid assessment indicate that waterlogged wood was present in moderate to high concentrations in all four samples, whilst charcoal was recorded in low concentrations in two samples (-0.74 to -0.84 and -0.84 to -0.94m OD). In both samples the fragments were too small for identification. No waterlogged seeds, Mollusca, bone or insects were recorded in the samples.

Table 8: Results of the macrofossil assessment of borehole QBH1, The Madison, Meridian Gate, Marsh Wall, London E14.

Depth (m OD)	Volume sampled (ml)	Volume processed (ml)	Fraction	Charred					Waterlogged		Mollusca		Bone			Insects	Artefacts
				Charcoal (>4mm)	Charcoal (2-4mm)	Charcoal (<2mm)	Seeds	Chaff	Wood	Seeds	Whole	Fragments	Large	Small	Fragments		
-0.64 to -0.70	25	25	>300µm	-	-	-	-	-	3	-	-	-	-	-	-	-	-
-0.74 to -0.84	25	25	>300µm	-	1	1	-	-	2	-	-	-	-	-	-	-	-
-0.84 to -0.94	25	25	>300µm	-	-	1	-	-	2	-	-	-	-	-	-	-	-
-0.94 to -1.03	25	25	>300µm	-	-	-	-	-	4	-	-	-	-	-	-	-	-

Key: 0 = Estimated Minimum Number of Specimens (MNS) = 0; 1 = 1 to 25; 2 = 26 to 50; 3 = 51 to 75; 4 = 76 to 100; 5 = 101+

8. DISCUSSION AND CONCLUSIONS

The aims of the environmental archaeological assessment at The Madison site were (1) to establish the age of the Peat recorded at the site; (2) to assess the palaeoenvironmental potential of the sequence; (3) to highlight any indications of nearby human activity, and (4) to provide recommendations for further analysis (if necessary). In order to achieve this aim, an environmental archaeological assessment of one borehole (QBH1) was carried out.

The results of the geoarchaeological investigations indicate that the sediments recorded at the site are analogous to those recorded elsewhere in the Lower Thames Valley, with a sequence of Shepperton Gravel overlain by Holocene Alluvium (in places containing Peat), capped by Made Ground. The surface of the Late Devensian Shepperton Gravel at the site is variable, lying at between -3.70 and -1.90m OD; a depression in the Gravel surface towards the centre of the site is consistent with a scour-hollow in the surface of the Pleistocene Gravel, or perhaps erosion associated with a north-south aligned Late Glacial/Early Holocene channel running off the Kempton Park Gravel terrace to the north of the site as hypothesised by MoLA (2014). Further interpretation of this feature is not possible however, due to the limited (and broadly linear) distribution of the available borehole records. It can be noted that if this feature represents a north-south aligned palaeochannel, it does not extend to the 7 Limeharbour site, ca. 300m to the south (Batchelor & Young, 2016a).

At the 7 Limeharbour site (see Figure 1 (no. 6); Batchelor & Young, 2016a) the Shepperton Gravel surface was generally higher than at the present site, recorded at between 0 and -2m OD, except towards the south where it falls to as low as -4.6m OD. This pattern was considered to be indicative of a west-east aligned trough (possible palaeochannel) traversing the site and nearby area, hypothesised as a maximum of 60m wide and ca. 2.5m deep (Batchelor & Young, 2016a). At 1-3 Turnberry Quay (see Figure 1 (no. 2); Batchelor & Young, 2016b), ca. 250m to the southwest of 7 Limeharbour, the Gravel surface rises again to the south of this channel to between ca. -1 and -2m.

Within the Holocene alluvium at the present site a horizon of woody Peat was recorded at elevations between ca. -1.0 and -0.35m OD, present in thicknesses of between 0.4 and 0.5m. Radiocarbon dating of the base (-0.94 to -1.03m OD) and top (-0.64 to -0.70m OD) of the Peat in borehole QBH1 shows that it accumulated at between 4080-3890 and 3695-3570 cal BP (early to middle Bronze Age). At 7 Limeharbour, peat between 0.3 and 1.2m thick was recorded at elevations between -0.5 and -1.8m OD, whilst at 1-3 Turnberry Quay peat at between -1.0 and -1.5m OD was been radiocarbon dated to between 4420-4180 to 3910-3710 cal BP (late Neolithic to early Bronze Age). Elsewhere on the Isle of Dogs, peat was recorded at Preston Road, Poplar (Branch *et al.*, 2007) between -0.46 to -0.32m OD and accumulated between 4260-3910 and 3650-3360 cal BP (late Neolithic to Bronze Age). Undated Peat was also recorded beneath the Delta Junction site between 0.3 and -0.86m OD (Yendell, 2012). At the Atlas Wharf site (Lakin, 1998) Peat formation occurred during the early/middle Neolithic (ca. 5750 cal BP) through to the Bronze Age. Significantly, a Bronze Age structure (possible platform) was recorded at this site, the earliest construction date radiocarbon dated to 3840-3550 cal BP (Lakin, 1998).

The results of the assessment of the peat at the present site have revealed that palaeobotanical remains are poorly preserved, and thus only a limited environmental reconstruction of the site can be attempted. No waterlogged seeds were recorded during the assessment; however, the pollen assemblages recorded are typical of herbs and trees growing within a wetland environment. The presence of *Cereale* type pollen does suggest however the growth of cereals within the nearby vicinity, and thus an anthropogenic signal. As discussed above, some caution must be taken with this interpretation however, as certain wetland grasses are known to produce pollen with a similar morphology to that of cereal grains. In contrast, environmental archaeological analysis of the peat at Preston Road, Poplar (Branch *et al.*, 2007) revealed better preservation of biological remains, and three broad phases of vegetation composition: (1) Prior to 4260-3910 cal BP, alder and willow fen Carr woodland dominated the wetland vegetation cover, with oak, lime, elm and sycamore on the dryland with an understorey consisting of hazel shrubs and a range of herbs; (2) from 4260-3910 cal BP to just before 3650 to 3360 cal BP, the Carr woodland reached maturity, creating a closed structure that may have encouraged the colonisation of yew, forming mixed stands with alder and willow on the peat surface and within a stagnant freshwater environment; and (3) from 3650-3360 cal BP, the formation of open alder Carr woodland, marshland formation (including probably salt marsh), and a general decline in dryland woodland cover.

9. RECOMMENDATIONS

The results of the environmental archaeological investigations have contributed to our understanding of landscape evolution in this area of the Isle of Dogs. However, on the basis of the poor preservation of biological remains at The Madison site, no further environmental archaeological analysis is recommended.

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11. APPENDIX 1: OASIS

OASIS ID: quaterna1-248582

Project details

Project name	The Madison, Meridian Gate, Isle of Dogs
Short description of the project	<p>A geoarchaeological borehole survey and a programme of environmental archaeological assessment was carried out at The Madison site in order to (1) to establish the age of the Peat recorded at the site; (2) to assess the palaeoenvironmental potential of the sequence; (3) to highlight any indications of nearby human activity, and (4) to provide recommendations for further analysis (if necessary). The results of the investigations indicate that the sediments recorded at the site are analogous to those recorded elsewhere in the Lower Thames Valley, with a sequence of Shepperton Gravel overlain by Holocene Alluvium (in places containing Peat), capped by Made Ground. The surface of the Late Devensian Shepperton Gravel at the site is variable, lying at between -3.70 and -1.90m OD; a depression in the Gravel surface towards the centre of the site is consistent with a scour-hollow in the surface of the Pleistocene Gravel, or perhaps erosion associated with a north-south aligned Late Glacial/Early Holocene channel running off the Kempton Park Gravel terrace to the north of the site as hypothesised by MoLA (2014). Within the Holocene alluvial sequence a horizon of woody Peat was recorded at elevations between ca. -1.0 and -0.35m OD, present in thicknesses of between 0.4 and 0.5m and subsequently radiocarbon dated to between 4080-3890 and 3695-3570 cal BP (early to middle Bronze Age). The results of the environmental archaeological assessment revealed that palaeobotanical remains were poorly preserved, and thus only a limited environmental reconstruction of the site could be attempted; the pollen assemblages recorded are typical of herbs and trees growing within a wetland environment, whilst presence of Cereale type pollen may be indicative of the growth of cereals within the nearby vicinity. On the basis of the poor preservation of biological remains at site, no further environmental archaeological analysis was recommended.</p>
Project dates	Start: 01-01-2016 End: 18-04-2016
Previous/future work	Yes / No
Type of project	Environmental assessment
Significant Finds	PEAT Early Bronze Age

Significant Finds PEAT Middle Bronze Age

Survey techniques Landscape

Project location

Country England

Site location GREATER LONDON TOWER HAMLETS TOWER HAMLETS The Madison, Meridian Gate, Marsh Wall

Postcode E14 9YT

Site coordinates TQ 38022 79765 51.499447010939 -0.011317651188 51 29 58 N 000 00
40 W Point

Project creators

Name of Quaternary Scientific (QUEST)
Organisation

Project brief Pre-Construct Archaeology
originator

Project design D.S. Young
originator

Project C.R. Batchelor
director/manager

Project supervisor D.S. Young

Type of Developer
sponsor/funding
body

Project archives

Physical Archive No
Exists?

Digital Archive No
Exists?

Paper Archive LAARC
recipient

Paper Contents "Environmental"

Paper Media "Report"
available

Entered by Daniel Young (d.s.young@reading.ac.uk)

Entered on 18 April 2016