

2-6 GRIFFIN MANOR WAY, LONDON BOROUGH OF GREENWICH: GEOARCHAEOLOGICAL DEPOSIT MODEL

C.R. Batchelor

*Quaternary Scientific (QUEST), School of Human and Environmental Sciences, University of Reading,
Whiteknights, PO Box 227, Reading, RG6 6AB, UK*

INTRODUCTION

This report summarises the findings arising out of the geoarchaeological monitoring of geotechnical boreholes and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with potential redevelopment at 2-6 Griffin Way, London Borough of Greenwich (National Grid Reference: centred on TQ 545040 179130 & TQ 544944 178972; Figure 1). During recent geotechnical investigations carried out by Capita Symonds, a total of 4 boreholes (BH1 to 4) and 12 test-pits were put down across the two areas of the site (Figure 2). All the boreholes and a selection of the test-pits were monitored by a geoarchaeologist in an attempt to reconstruct the sub-surface stratigraphy and environs of the site. This work is of significance as recent investigations at nearby Belmarsh West (ca. 200m north-east of 2-6 Griffin Manor Way), revealed the presence of a possible north-south timber trackway and other associated structures dated to the Early Neolithic cultural period (Hart *et al.*, 2009). These structures are deemed of regional and national significance due to their early date (predating all other Neolithic structures in the London region and among the earliest in Britain) and location (no other structures have been recorded in this area of the Lower Thames Valley).

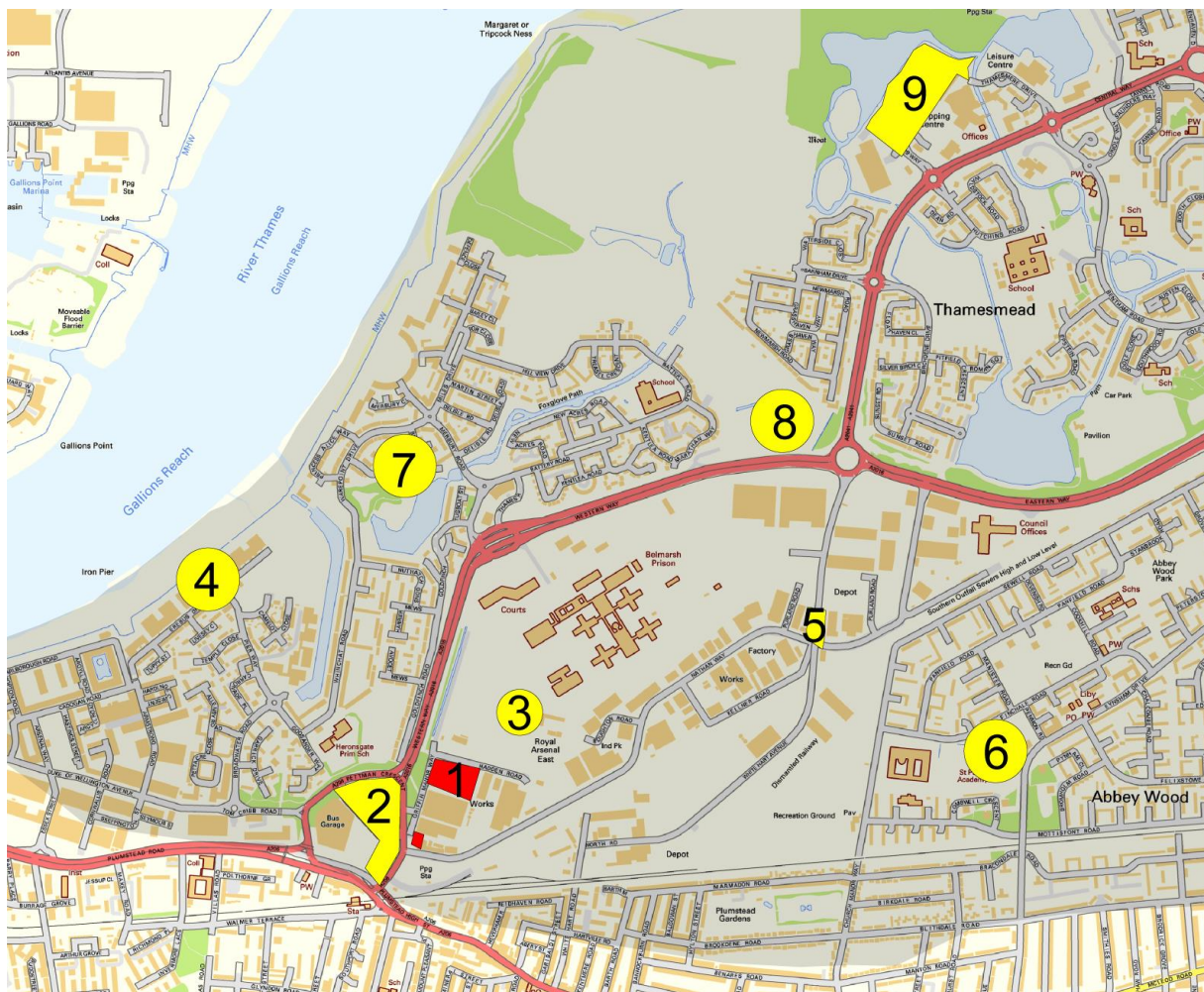
Recording the sequences and modeling the sub-surface stratigraphy at 2-6 Griffin Manor Way will: (1) identify the presence of organic-rich sediments (including peat) that can be used for the reconstruction of past environments, and (2) permit speculation on the possible presence of a similar prehistoric structure at the new site. In order to accomplish the aims of the investigation, the following objectives were formulated:

- (1) To monitor and record select geotechnical boreholes and test-pits being put down across the site
- (2) To carry out a systematic and detailed review of additional archaeological, geoarchaeological and geotechnical records from nearby sites (Figure 1; Table 1).

To produce 2-Dimensional and/or 3-Dimensional models of the surfaces and thicknesses of the main stratigraphic units across the site

GEOLOGICAL CONTEXT

The site is located ca. 1km to the south of the current course of the River Thames, and north of the margin between the floodplain and dryland edge (Figure 1). The Geological Survey (1:50,000; Sheet 271) has mapped the bedrock geology as Thanet sands (fine-grained silty sands) overlying the Upper Chalk. The Quaternary geology, which overlies these beds, is Terrace Gravel succeeded by alluvium. Based on their altitude above sea level, they are likely to form part of the Shepperton Gravel (Bridgland, 1995). The Shepperton Gravel was deposited during the last cold stage (Marine Isotope Stage 2), with the overlying alluvium deposited during the Holocene (last 10,000 years).



Key: Grey shaded area represents the recorded extent of alluvium

Figure 1: Location of (1) 2-6 Griffin Manor Way and other local sites: (2) Pettman Crescent (POW08; Batchelor & Young, 2008) / Woolwich Trade Park (WTP03; Batchelor, 2009) (3) Belmarsh West (BWQ09; Hart *et al.*, 2009); (4) Thamesmead 8J (no site code; Branch *et al.*, unpublished); (5) White Hart Triangle (WHT03; Spurr, 2003); (6) St Pauls Academy (AWS05; Batchelor *et al.*, 2008); (7) Gallions Reach Urban Village (GAH96; Sidell, 2003); (8) Collingtree Park (no site code; Branch *et al.*, unpublished); (9) Safeway Store Extension (TUM03; Sankey and Spurr, 2004). Contains Ordnance Survey data © Crown copyright and database right [2012]

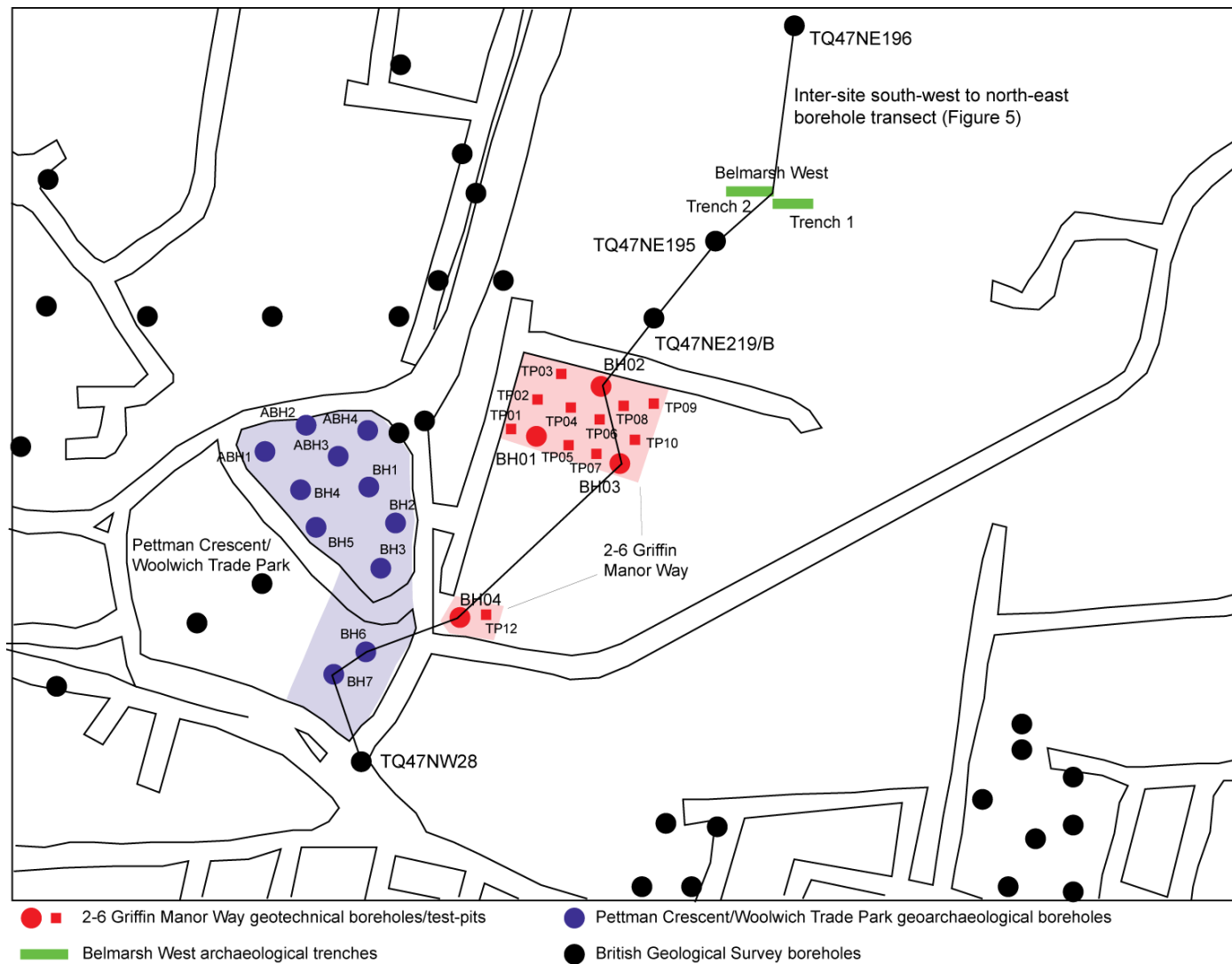


Figure 2: Location map showing the borehole and test-pit locations at 2-6 Griffin Manor Way and those of the nearby Pettman Crescent/Woolwich Trade Park (Batchelor and Young, 2008; Batchelor, 2009) and Belmarsh West (Hart et al., 2009) sites as well as existing BGS borehole records

Table 1: Borehole and test-pit locations at 2-6 Griffin Way, London Borough of Greenwich, and those from other nearby archaeological/geoarchaeological sites

Location on Figure 1	Site name	Site code	Borehole/ Trench number	Easting	Northing	Surface elevation (m OD)	Chronological methods	Biostratigraphic methods	Prehistoric archaeology	Reference
1	2-6 Griffin Way	N/A	BH1	545054	179144	1.29	None	None	None	This report
			BH2	545010	179104	1.28	None	None	None	
			BH3	545076	179084	1.34	None	None	None	
			BH4	544946	178960	1.83	None	None	None	
			TP1	544990	179113	1.19	None	None	None	
			TP2	545003	179135	1.15	None	None	None	
			TP3	545032	179158	1.21	None	None	None	
			TP4	545032	179126	1.23	None	None	None	
			TP5	545032	179095	1.24	None	None	None	
			TP6	545056	179119	1.21	None	None	None	
			TP7	545056	179088	1.62	None	None	None	
			TP8	545075	179134	1.14	None	None	None	
			TP9	545090	179108	1.18	None	None	None	
			TP10	545095	179140	1.15	None	None	None	
			TP11	?	?	1.68	None	None	None	
			TP12	544968	178968	1.34	None	None	None	
2	Pettman Crescent	PWO08	BH1	544896	179102	2.24	Radiocarbon	None	None	Batchelor and Young, 2008
			BH2	544886	179049	2.41	Radiocarbon	None	None	
			BH3	544883	179002	2.77	None	None	None	
			BH4	544815	179064	2.66	None	None	None	
			BH5	544824	179033	2.73	None	None	None	
			BH6	544878	178936	3.19	None	None	None	
			BH7	544864	178915	3.28	None	None	None	
2	Woolwich Trade Park	WTP03	ABH1	544786	179807	2.32	None	None	None	Batchelor, 2009
			ABH2	544873	179126	2.1	Radiocarbon	Pollen	None	
			ABH3	544809	179114	2.25	None	None	None	
			ABH4	544839	179103	2.23	None	None	None	
3	Belmarsh West	BWQ09	Trench 1	545210	179290	2.5	Radiocarbon	Pollen	Early Neolithic structure	Hart <i>et al.</i> , 2009

			Trench 2	545175	179300	2.5	Radiocarbon	Pollen	Early Neolithic structure	
4	Thamesmead 8J	None	BH1	544400	179600	Unknown	Radiocarbon	Pollen, diatoms, waterlogged wood, insects	None	Branch <i>et al.</i> , unpublished(a)
5	White Hart Triangle	WHT03	ABH1 to 3	545938	179515	1.6	Radiocarbon on ABH's 1 and 2	Pollen, diatoms	None	Spurr, 2003
6	St Paul's Academy	AWS05	Trench 5	546175	179150	0.82	Radiocarbon	Pollen, diatoms, waterlogged plant macrofossils (seeds and wood), insects	None	Batchelor <i>et al.</i> , 2008
			BH5	546180	179220	0.82	Radiocarbon	Pollen, diatoms, waterlogged plant macrofossils (seeds and wood), insects	None	
7	Gallions Reach	None	BH1 to 8	544900	179850	0-1	Radiocarbon on BH's 1, 2, 4 and 8	Pollen, diatoms, waterlogged plant macrofossils (seeds and wood)	None	Sidell, 2003
8	Collingtree Park	None	BH's 2 and 3	545800	180000	Unknown	Radiocarbon	Pollen, diatoms, waterlogged wood	None	Branch <i>et al.</i> , unpublished(b)
9	Safeway Store Extension	TUM03	ABH1 to 5	546186	180821	1.7	Radiocarbon on ABH2	Pollen, diatoms	None	Sankey and Spurr, 2004
10	Bexley Pupil Referral Unit	ABB09	BH1	547437	179377	0.68	None	Pollen, diatoms, WPMs (seeds and wood), insects	None	Batchelor and Young, 2009
			BH2	547474	179364	0.92	None	None	None	
			BH3	547571	179384	0.85	None	None	None	
			BH4	547617	179380	1.06	None	None	None	
			BH5	547465	179403	0.95	None	None	None	
			BH6	547476	179345	1.03	None	None	None	

METHODS

Fieldwork

Four geotechnical boreholes were put down across the site by cable percussion (BH1 to 4), and twelve test-pits were dug using a JCB. The spatial co-ordinates were recorded by Capita Symonds (Table 1). All the boreholes and a selection of the test-pits were monitored and described by Quaternary Scientific, 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) (Troels-Smith, 1955). The procedure involved: (1) cleaning the samples with a spatula or scalpel blade and distilled water to remove surface contaminants; (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 recordings made in the field were made by observation in combination with discussion with the on-site drilling team, therefore the depths and thicknesses of the units may be subject to some imprecision's. The results of the geoarchaeological borehole descriptions are displayed in Tables 2 to 5 and Figure 3. The geotechnical test-pits logs are displayed in Appendix 1, and are referred to in the Results and Interpretation section.

Deposit modelling

The surface of the Shepperton Gravel was identified at 2-6 Griffin Manor Way and a number of nearby geoarchaeological, geotechnical and archaeological records. This data for groups was input into a database with the RockWorks 2009 geological utilities software. A model of the surface height was generated (Figures 6). Because the boreholes are not uniformly distributed over the area of investigation, the reliability of the model generated using RockWorks is variable. In general, reliability improves from outlying areas where the model is largely supported by scattered archival records towards the core area of commissioned boreholes. Because of the 'smoothing' effect of the modelling procedure, the modelled levels of stratigraphic contacts may differ slightly from the levels recorded in the borehole logs.

In addition, the reliability of individual models is affected by the quality of the stratigraphic records which in turn are affected by the nature of the sediments and/or their post-depositional disturbance during previous stages of development on the site. In particular, it is important to recognise that multiple sets of boreholes by different companies (i.e. Quaternary Scientific and BGS) recorded using different descriptive terms, and subject to differing technical constraints in terms of recorded detail including the exact levels of the stratigraphic

boundaries. In addition, whilst cable percussion coring allows generalised recording of the sediments and their depths, the level of detail and accuracy is restricted within geotechnical investigations.

RESULTS AND INTERPRETATION OF THE MONITORING AND DEPOSIT MODELLING

The results of the geoarchaeological field descriptions of the four geotechnical boreholes are presented in Tables 2 to 5 and Figure 3. The twelve geotechnical test-pit logs are displayed in Appendix 1.

The deepest sedimentary units recorded at 2-6 Griffin Manor Way comprised coarse-grained mineral-rich deposits of sands and gravels. Within the main northern part of the site, the surface of these deposits was recorded between -2.56m and -2.91m OD (<BH1> to <BH3>; Figures 2 and 3). To the south in the smaller area of investigation, the same surface was recorded higher at -1.17m OD (<BH4>). These sediments most likely represent the upper surface of the Pleistocene Shepperton Gravel, which was deposited under high energy conditions within a braided river environment during the Late Glacial. This surface apparently slopes upwards from north to south between the two parts of the Griffin Manor Way site and towards the margin of the floodplain. The same surface was not reached in any of the geotechnical test-pits.

Above the Shepperton Gravel in all boreholes was a sequence of Holocene Alluvial and Peat deposits that extended to between ca. 0.5m and 0m OD. In three of these boreholes (<BH1>, <BH3>, and <BH4>), the alluvial sequence can be divided into three main stratigraphic units as follows: (1) Lower Alluvium; (2) Peat and (3) Upper Alluvium. The Lower Alluvium comprises mineral-rich deposits of silts and sands which were laid down in a lower energy riverine environment. The Lower Alluvium was not categorically reached in any of the geoarchaeological test-pits.

Overlying this was a horizon of generally well humified wood Peat with small quantities of fine-grained mineral deposits (clays). This Peat horizon is indicative of a period of semi-terrestrial conditions, most likely supporting fen carr woodland. The Peat was thicker in boreholes <BH1> and <BH3> than in <BH4>, most likely as a consequence of the higher gravel surface at the latter. However in all three boreholes, a substantial horizon of Peat was recorded, ranging between ca. 0.75m and 1.75m in thickness. Wood remains were common in all boreholes and test-pits, indeed, it is of note that large quantities of substantially sized wood were removed from TP09 (Figure 4). This wood did not have the appearance of an archaeological structure, but the occurrence was noted nonetheless.

Peat is commonly recorded in the Lower Thames Valley, with thick horizons often forming anywhere between 6500 and 3000 cal BP primarily as a consequence of variations in relative sea level (see Devoy, 1979; Sidell, 2003). At 2-6 Griffin Manor Way, the age of the Peat is uncertain, although its thickness might suggest that it formed for 1000 years or more (1000 years per 1m of peat is often used as a general guide). Furthermore, potential *Taxus* remains (yew), which is currently believed to have occupied the Lower Thames Valley floodplain between ca. 5000 and 4000 cal BP (Batchelor, 2009), were noted from the peat removed from TP02 which might provide a potential age indication.

Above the Peat was a generally thin (<50cm) horizon of fine-grained mineral-rich deposits of silty clay, referred to here as the Upper Alluvium. These deposits indicate flooding of the peat surface by river or estuarine waters.

In borehole <BH2>, the tripartite alluvial sequence was not recorded, although this may have been caused by problems with the drilling at this location as opposed to a natural difference in the sedimentary sequence at this location. For this reason, the sequence from <BH2> is regarded with some degree of caution.

Capping the Holocene alluvial thickness in all boreholes was a variable thickness of Made Ground.

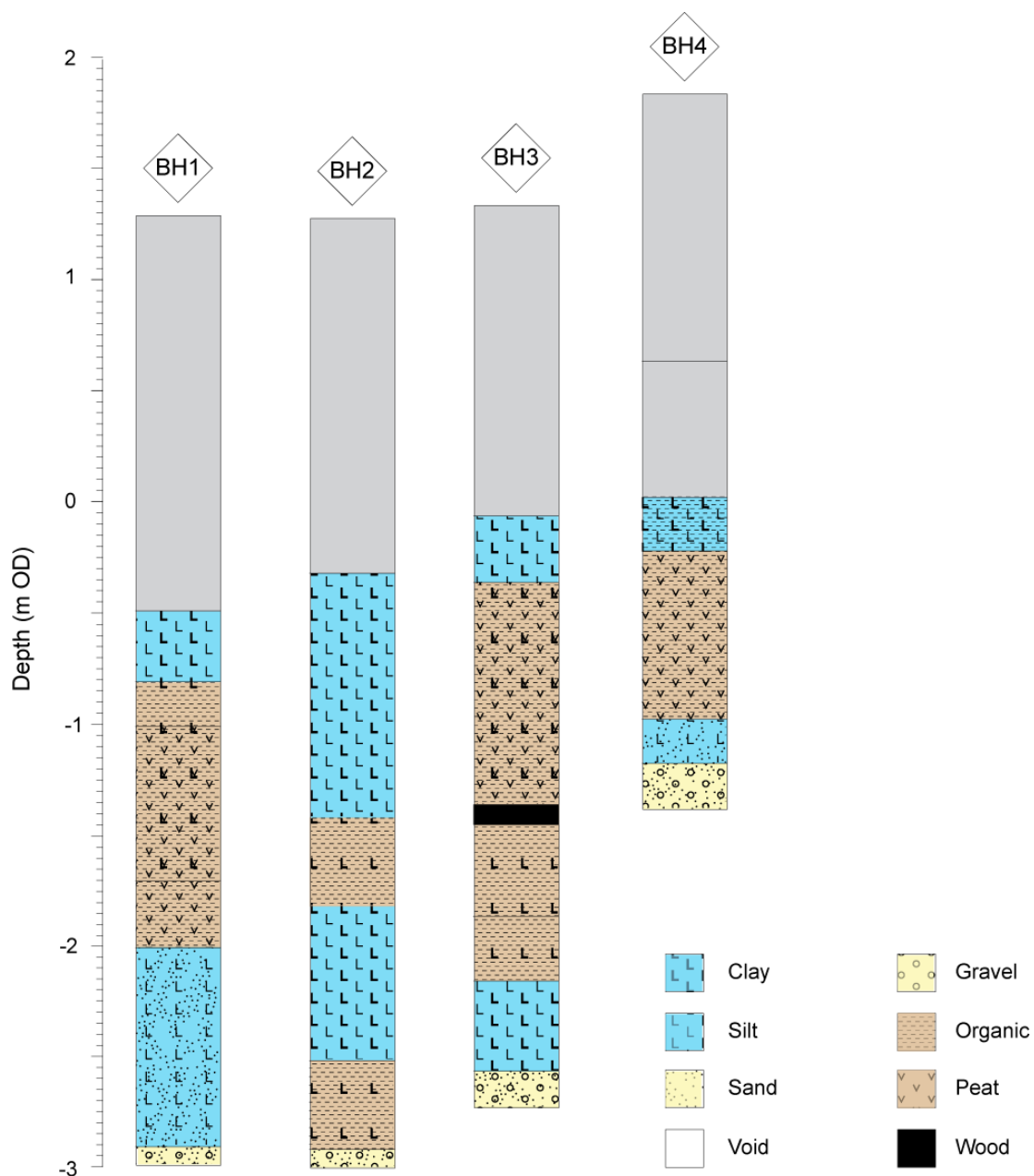


Figure 3: Lithostratigraphy of boreholes <BH1>, <BH2>, <BH3> & <BH4> from 2-6 Griffin Manor Way, London Borough of Greenwich

Table 2: Lithostratigraphic descriptions of Borehole <BH1>, 2-6 Griffin Way, London Borough of Greenwich

Depth (m OD)	Unit number	Description
1.29 to -0.51	5	Made Ground
-0.51 to -0.81	4	Gley 2 6/1; As3, Ag1; Blue grey silty clay
-0.81 to -1.01	3	10YR 4/2; Sh2, As2, Ti+; Dark greyish brown very organic rich clay with wood inclusions
-1.01 to -1.71	3	10YR 4/2; Sh2, Ti ² 1, As1; Humo 3; Dark greyish brown well humified wood peat with clay becoming 10YR 3/3; Sh3, As1, Ti+, Th+; Humo 3; Dark brown well humified unidentifiable peat with clay and traces of wood and herbaceous remains
-1.71 to -2.01	3	5YR 3/3; Sh3, Ti ² 1, As+; Humo 3; Dark reddish brown well humified wood peat with traces of clay
-2.01 to -2.91	2	10YR 5/1; Ag3, Ga1; Grey sandy silt
>-2.91	1	10YR 4/1; Ga2, Gg2; Dark grey sandy gravel

Table 3: Lithostratigraphic descriptions of Borehole <BH2>, 2-6 Griffin Way, London Borough of Greenwich

Depth (m OD)	Unit number	Description
1.28 to -0.32	5	Made Ground
-0.32 to -2.52	4	Gley 2 6/1; As3, Ag1; Blue grey silty clay with pockets of 10YR 4/2; Sh3, As1; Dark greyish brown peaty clay recorded between -1.42 and 1.82m OD. Unit potentially disturbed due to drilling method employed to ca. 3m BGL depth
-2.52 to -2.92	3	10YR 3/3; Sh3, As1, Ti+; Humo 3; Dark brown well humified unidentifiable peat with clay and traces of wood remains
>-2.92	1	10YR 4/1; Ga2, Gg2; Dark grey sandy gravel

Table 4: Lithostratigraphic descriptions of Borehole <BH3>, 2-6 Griffin Way, London Borough of Greenwich

Depth (m OD)	Unit number	Description
1.34 to -0.06	5	Made Ground
-0.06 to -0.36	4	10YR 4/1; Ag3, As1, Ga+, Gg+; Dark grey silty clay with sand and gravel inclusions
-0.36 to -1.36	3	10YR 3/2; Sh2, Ti ³ 1, As1; Humo 3; Dark greyish brown well humified wood peat with clay.
-1.36	3	Large wood fragment
-1.36 to -1.86	3	10YR 3/3; Sh3, As1, Ti+, Th+; Humo 3; Dark brown well humified unidentifiable peat with clay and traces of wood and herbaceous peat
-1.86 to -2.16	3	10RY 3/2; Sh2 As2; Dark greyish brown very organic rich clay
-2.16 to -2.56	2	Gley 2 6/1; As3, Ag1; Blue grey silty clay
>-2.56	1	10YR 4/1; Ga2, Gg2; Dark grey sandy gravel

Table 5: Lithostratigraphic descriptions of Borehole <BH4>, 2-6 Griffin Way, London Borough of Greenwich

Depth (m OD)	Unit number	Description
1.83 to 0.63	5	Made Ground
0.63 to -0.02	4	Gley 2 6/1; As3, Ag1, brick+, Gg+, Ga+; Blue grey silty clay with brick, gravel and sand inclusions
-0.02 to -0.22	4	10YR 4/1; As3, Sh1; Dark grey organic-rich clay
-0.22 to -0.97	3	5YR 3/3; Sh3, Ti ² 1, As+; Humo 3; Dark reddish brown well humified wood peat with traces of clay
-0.97 to -1.17	2	Gley 2 6/1; Ag3, Ga1; Bluish grey sandy silt
>-1.17	1	10YR 4/1; Ga2, Gg2; Dark grey sandy gravel



Figure 4: Wood remains from Test-Pit 9, Griffin Manor Way, London Borough of Greenwich

DISCUSSION AND CONCLUSIONS

Geoarchaeological, geotechnical and archaeological stratigraphic data from a series of locations nearby to the site have been analysed in order to allow comparison with the sedimentary sequences recorded at 2-6 Griffin Manor Way (Figures 5 and 6). The diagrams facilitate comparison of the main lithostratigraphic units between each site, in particular elevation, thickness and approximate age. In addition, the position and age of the Early Neolithic archaeological structures recorded at Belmarsh West have been plotted onto the cross-section of Figure 5.

Figures 5 and 6 clearly indicate that the north-south sloping gravel surface recorded between -1.17m (<BH4>) and -2.92m OD (<BH2>) at 2-6 Griffin Manor Way continues to rise towards the south as would be expected. Towards the north, the gravel surface remains the same within the immediate area (e.g. at Belmarsh West ca. 200m north-east, it was recorded between -2.33m and -2.70m OD) However, more distally on the floodplain at sites such as Gallions Reach (Sidell, 2003), the gravel surface drops below -6.00m OD.

The 2-6 Griffin Manor Way site appears to contain a substantial horizon of Peat in the main northern part of the site. This horizon is of similar thickness (0.75 to 1.75m) and height to that recorded at Belmarsh West where the Peat accumulated between -2.70/-2.33m and -0.60m OD and was dated from 6180-5950 to 2150-1990 cal BP (Hart *et al.*, 2009). Elsewhere to the south and closer to the floodplain edge, Peat was located at a higher elevation in 2-6 Griffin Manor Way borehole BH4. Nearby to this borehole, at Pettman Crescent and Woolwich Trade Park a number of Peat horizons were recorded at different elevations reflecting variations in the gravel surface and were radiocarbon dated between ca. 5500 and 3500 cal BP.

The new site at 2-6 Griffin Manor Way is considered of potential archaeological significance due to the recent discovery of a possible Early Neolithic trackway and associated structures within the peat at nearby Belmarsh West (ca. 200m north-east). Specifically, it is possible that these structures extend from Belmarsh West towards 2-6 Griffin Manor Way. It is also recognised that there may be a higher potential to recover archaeological remains at the site due to its position closer towards the margin of the floodplain, adjacent to the higher drier ground. For example, a number of platform and trackway structures have been recorded in the Beckton region on the northern margins of the Lower Thames Valley floodplain (Divers, 1995; Meddens, 1996; Carew, 2003; Batchelor, 2009).

The archaeological structures at Belmarsh West comprised a north-south aligned trackway (dated 5910-5650 and 5910-5660 cal yr BP), posts retaining the deck of the possible trackway (dated 5590-5320 cal yr BP) and an east-west aligned timber structure/platform (dated 5860-5620, 5910-5640 and 5920-5710 cal yr BP), all of which were recorded around - 2.21m OD towards the base of a 2m thick peat sequence (Hart *et al.*, 2009). Since the geoarchaeological investigations at 2-6 Griffin Manor Way have identified a thick horizon of Peat within the northern site at a similar depth and elevation to that of Belmarsh West, the potential for archaeological remains is considered to remain. Furthermore, the importance of the sites' location closer to the dryland combined with: (1) a thick horizon of Peat, (2) substantial quantities of wood in TP09, (3) potential yew remains from TP02, are highlighted

RECOMMENDATIONS

On the basis of the nature and elevation of the Peat at 2-6 Griffin Manor Way, in comparison to that of the Peat encompassing the archaeological structures at Belmarsh West, it is recommended that archaeological investigations be considered if redevelopment of this site is carried out. One method of clarifying the existence of any archaeological structures would be to insert a continuous west-east evaluation trench across the site. This would intersect any north-south aligned archaeological structures.

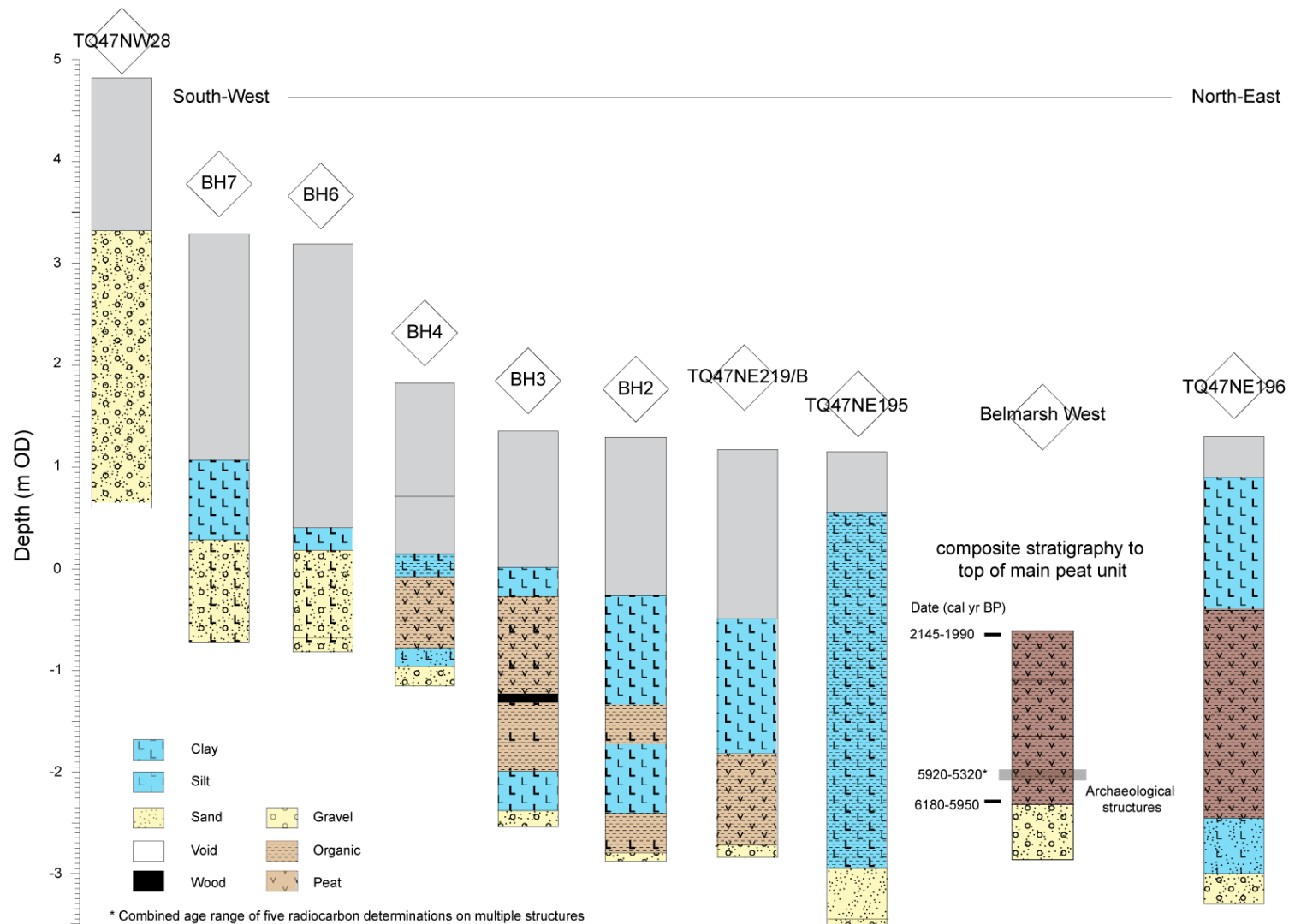


Figure 5: Inter-site south-west to north-east borehole transect North-south cross-section incorporating stratigraphic and archaeological data from 2-6 Griffin Manor Way, Pettman Crescent (PWO08), Woolwich Trade Park (WTP03), Belmarsh West (BWQ09) and various BGS boreholes (Based upon records provided by British Geological Survey (NERC)). The sites are not accurately spaced to representing their geographical location

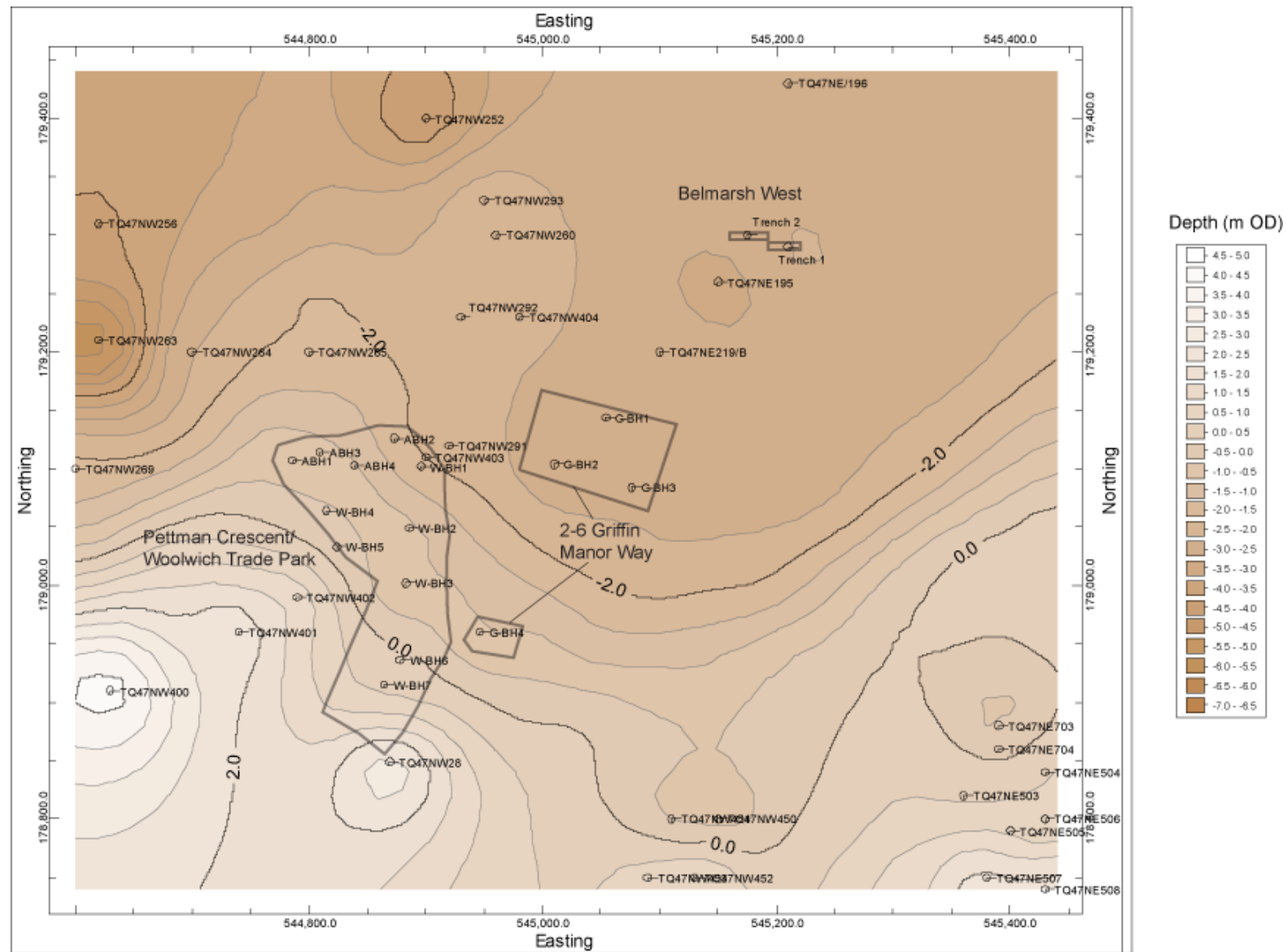


Figure 6: Modelled surface of the Shepperton Gravel in the area of Griffin Manor Way, London Borough of Greenwich

REFERENCES

Batchelor, C.R. (2009) *Middle Holocene environmental changes and the history of yew (Taxus baccata L.) woodland in the Lower Thames Valley*. Royal Holloway, University of London unpublished PhD thesis.

Batchelor, C.R., Elias, S., Young, D., Branch, N.P., Green, C.P., Swindle, G. (2008b) *St Paul's Academy, Abbey Wood School, Eynsham Drive, Abbey Wood, London Borough of Greenwich (site code: AWS05): environmental archaeological analysis*. ArchaeoScape Unpublished Report.

Branch, N.P., Williams, A. & Swindle, G.E. (no date(a)) *Thamesmead 8J: an environmental archaeological assessment*. ArchaeoScape Unpublished data.

Branch, N.P., Williams, A. & Swindle, G.E. (no date(b)) *Collingtree Park: an environmental archaeological assessment*. ArchaeoScape Unpublished data.

Bridgland, D.R. (1995) *Quaternary of the Thames*. Chapman & Hall, London

Carew, T. (2003) *Assessment of an archaeological excavation at the Golfers' Driving Range Site, Woolwich Manor Way, North Beckton*. Pre-Construct Archaeology Ltd Unpublished Report.

Corcoran, J. (2003) DLR Woolwich Arsenal Extension, a report on archaeological monitoring of geotechnical test pits and boreholes. MoLAS Unpublished Report.

Devoy, R.J.N. (1979) Flandrian sea-level changes and vegetational history of the lower Thames estuary. *Philosophical Transactions of the Royal Society of London*, **B285**, 355-410.

Divers, D. (1995) *Archaeological Excavation of the former Beckton Nursery*. Newham Museum Service Unpublished Report.

Hart, D., Allott, L., Bamforth, M., Bates, M., Davies, S., Driver, G., Jones, S., Marshall, P., Whittaker, J. (2009). *Archaeological investigations at Belmarsh West, London Borough of Greenwich: post-excavation assessment and project design for publication*. Archaeology South-East unpublished report.

Meddens, F.M. (1996) Sites from the Thames Estuary Wetlands, England and their Bronze

Age use. *Antiquity*, **70**, 325-334.

Sankey, D. & Spurr, G. (2004) *Safeway Store Extension, Thamesmead: An archaeological watching brief and geo-archaeological auger survey report*. MoLAS Unpublished Report.

Sidell, E.J. (2003) *Relative sea-level change and archaeology in the inner Thames estuary during the Holocene*. University College, London, Unpublished PhD Thesis.

Spurr, G. (2003) *White Hart Triangle, Thamesmead: a geoarchaeological evaluation report*. MoLAS Unpublished Report.