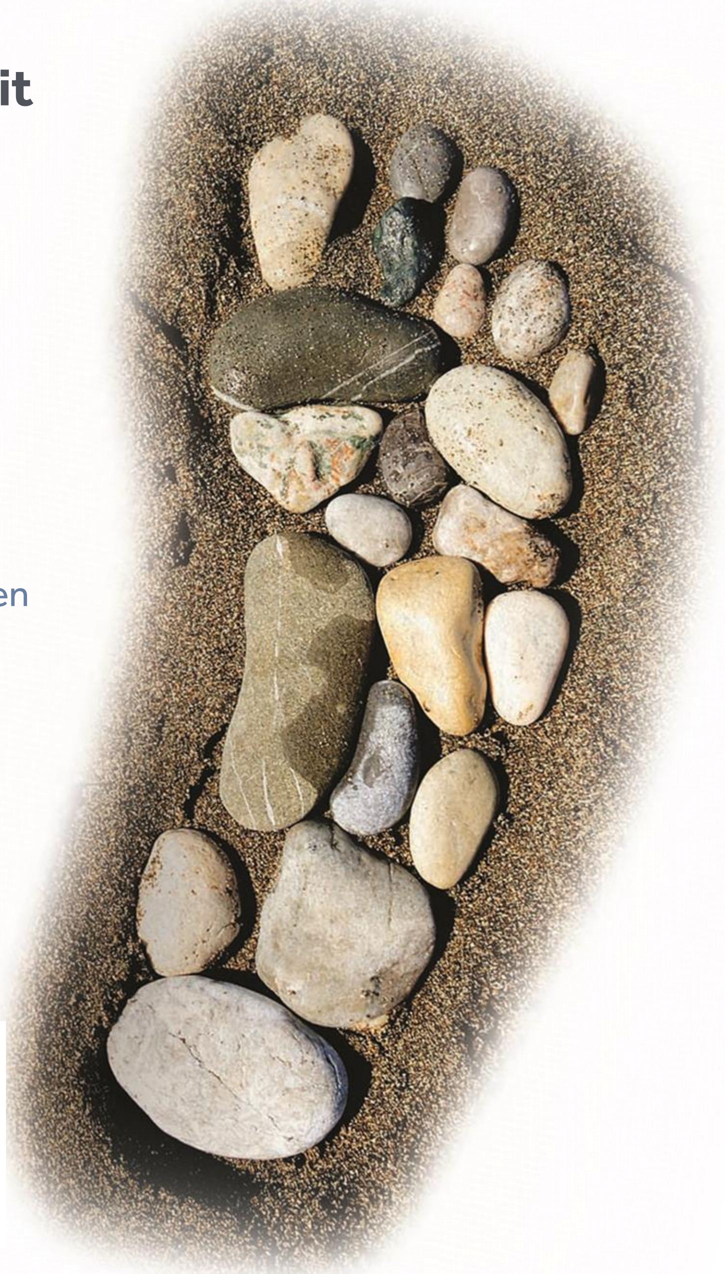
QUEST
QUATERNARY SCIENTIFIC

University of Reading

# PERUVIAN WHARF NORTH WOOLWICH ROAD SILVERTOWN LONDON BOROUGH OF NEWHAM

## Geoarchaeological Deposit Model Report



**NGR**: TQ 4034 8015

**Site Code:** PWF16

**Date:** 23rd February 2016

**Written by:** C.R. Batchelor & C.P. Green

**QUEST**, School of Archaeology, Geography and Environmental Science, Whiteknights, University of Reading, RG6 6AB

**Tel**: 0118 378 7978 / 8941
**Email**: c.r.batchelor@reading.ac.uk
http://www.reading.ac.uk/quest

# CONTENTS

1. INTRODUCTION ........ 1
2. METHODS ........ 7
3. RESULTS, INTERPRETATION AND DISCUSSION OF THE DEPOSIT MODELLING ........ 9
4. CONCLUSIONS & RECOMMENDATIONS ........ 22
5. REFERENCES ........ 22

# 1. INTRODUCTION

This report summarises the findings arising out of the deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development at Peruvian Wharf, North Woolwich Road, Silvertown, London Borough of Newham (National Grid Reference centred on: TQ 40340 80150; site code: PWF16; Figures 1-3). The Peruvian Wharf site is approximately 4 hectares in size, and lies on the floodplain of the Lower Thames where the Woolwich Reach of the river forms a broad southward bend. The ground across the area originally formed part of the natural floodplain of the Thames and is underlain by Holocene alluvial deposits (British Geological Survey (BGS) 1:50,000 Sheets 257 Romford 1996), which consisted of fine-grained mineral-rich sediments and peat. Beneath the alluvium, sand and gravel is present and is assigned by Gibbard (1994) to the Late Devensian Shepperton Gravel. The bedrock beneath this is the Lower Tertiary Lambeth Group.

No previous geoarchaeological or archaeological work has been carried out on the site. However, 19 boreholes (BH1 to BH19) and 50 test pits (TP1 to TP50) were put down as part of geotechnical site investigations in 2000 by Waterman Environmental (Figure 2; Table 1). Of these, all boreholes and four of the test pits recorded the entire Holocene alluvial sequence and surface of the underlying Shepperton Gravel. Nine of the borehole records (BH1-7 and BH10-11) and several of the test pits lie beyond the southern boundary of the site (see Figure 2).

The Shepperton Gravel is recorded between 4 and 6m below ground level (bgl) across the site and much of the area to the south; only in BH1, BH2 and BH4 does it reach a greater depth (7.5-9.3m bgl). This pattern is similar to that recorded on the nearby Royal Wharf site (Batchelor *et al.*, 2014), where the Gravel surface is recorded between -3 and -4m OD across the northern part of the site, and falls sharply to >-7m OD to the south. Gravel surfaces above -2.5m OD are recorded in the area of Barnwood Court (Farid, 1997), Fort Street (Wessex Archaeology, 2000; Crocket *et al.*, 2003) and towards the Thames Barrier Park East site (Green *et al.*, 2006).

In 13 of the 19 boreholes a Peat horizon is recorded, which in most cases is described as containing fibrous plant remains; the Peat is absent in boreholes BH5, 7, 10, 11, 14 and 17 – most of which are located beyond the margins of the site. Where present, the Peat generally overlies the Gravel and is between 1.2 (BH3) and 3.55m thick (BH12). Once again, these findings are similar to Royal Wharf, where thick horizons of Peat were recorded towards the north, but tended to be absent towards the south (Batchelor *et al*., 2014). At other nearby sites radiocarbon dating has shown that the Peat and organic-rich deposits accumulated over several millennia, spanning several cultural periods – *ca*. 12,000 to 2500 cal BP at Silvertown, (Wilkinson *et al.,* 2000), *ca*. 5500 to 3500 cal BP at Fort Street (Wessex Archaeology, 2002; Crockett et al., 2003) and *ca*. 4000 to 500 cal BP at Thames Barrier Park East (Green et al., 2006). The Peat is overlain by generally silty clay Alluvium, which (where the Peat is absent) directly overlies the Gravel. The upper surface of the Alluvium is generally recorded between 1 and 2m bgl, and is capped by Made Ground.

Combined, the site-based geotechnical records and nearby geoarchaeological investigations indicate considerable variation in the height of the Shepperton 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 Shepperton Gravel may represent the location of former channels and bars; (2) the presence of Peat represents former terrestrial or semi-terrestrial land-surfaces, and (3) the Lower and Upper Alluvium represent periods of seasonal 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 over space and time.

Furthermore, 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). Prehistoric structures have been identified in the peat locally to the site at Fort Street (Wessex Archaeology, 2000; Crockett *et al*., 2003; Figure 1); here a Neolithic trackway was recorded within the Peat between -0.99 to -1.28m OD, overlying a sand and gravel surface ranging between 0.53 and -1.28m OD.

Organic-rich sediments (in particular peat) also have high potential to provide a detailed reconstruction of past environments through the assessment/analysis of palaeoecological remains (e.g. pollen, plant macrofossils & insects) and radiocarbon dating. So-called palaeoenvironmental reconstructions have also been carried out on the sedimentary sequences from West Silvertown (Wilkinson et al., 2000), Fort Street (Wessex Archaeology, 2000) and the London Cable Car North Intermediate Tower (Batchelor *et al*., 2015). Commonly the peat forms during the Middle Holocene between 6500 and 2500 cal BP equating to the Late Mesolithic, Neolithic, Bronze Age and Iron Age cultural periods. However, the sequences from West Silvertown and the London Cable Car North Intermediate Tower also included organic-rich deposits dating from the late Devensian / early Holocene (*ca*. 12,000 cal BP) equating to the early Mesolithic cultural period.

The aim of this report is to produce a model of the sub-surface stratigraphy of the site and its surroundings using a combination of the geotechnical and archaeological records resulting from new geotechnical site investigation works (Figure 3), and previous investigations both on and immediately adjacent to the site. This model will be used to provide a reconstruction of the site's former landscape and its evolution through time. These findings will also be used to guide recommendations for further archaeological, geoarchaeological and palaeoenvironmental investigations (if necessary).

Table 1: Select summary of the Waterman Environmental (2000) geotechnical records

| Borehole / Test-Pit | Easting | Northing | Approximate Elevation (m OD) | Depth (m bgl) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Top of Alluvium | Top of Peat | Top of Lower Alluvium | Top of Gravel | Top of London Clay |
| BH1 | 540176 | 179900 | 1-2 | 4.2 | 6.9 | | 9.3 | |
| BH2 | 540092 | 180001 | 1-2 | 2.5 | 4.4 | | 7.5 | |
| BH3 | 540072 | 180068 | 1-2 | 2.4 | 3.7 | 4.9 | 5.6 | 12.6 |
| BH4 | 540169 | 179922 | 1-2 | 1.1 | 5.7 | | 9.2 | 12.3 |
| BH5 | 540124 | 180057 | 1-2 | 2.3 | | | 5.8 | |
| BH6 | 540245 | 180045 | 1-2 | 1.5 | 2.8 | | 5.1 | |
| BH7 | 540200 | 180040 | 1-2 | 1.4 | | | 5.3 | |
| BH8 | 540162 | 180137 | 1-2 | 1.8 | 2.8 | | 4.8 | |
| BH9 | 540185 | 180085 | 1-2 | 0.5 | 3 | | 4.8 | |
| BH10 | 540278 | 179976 | 1-2 | 1.45 | | | 5.6 | |
| BH11 | 540194 | 180003 | 1-2 | | | | 6 | 11.9 |
| BH12 | 540238 | 180114 | 1-2 | 2.2 | 2.45 | | 6 | |
| BH13 | 540245 | 180157 | 1-2 | 2 | 3.6 | | 4.9 | 12.1 |
| BH14 | 540312 | 180094 | 1-2 | 1.1 | | | 4 | |
| BH15 | 540331 | 180155 | 1-2 | 2 | 2.8 | | 5.8 | |
| BH16 | 540292 | 180207 | 1-2 | 1.3 | 2.95 | | 5.1 | 12.1 |
| BH17 | 540420 | 180131 | 1-2 | 1 | | | 6.1 | 12.2 |
| BH18 | 540474 | 180135 | 1-2 | 1.1 | 4 | | 5.2 | |
| BH19 | 540484 | 180078 | 1-2 | 1.3 | 2.4 | | 3.8 | 10.9 |
| TP1 | 540053 | 180034 | 1-2 | 4.1 | | | 4.7 | |
| TP26 | 540189 | 180156 | 1-2 | 1.1 | 4.3 | | 4.4 | |
| TP27 | 540247 | 180078 | 1-2 | 1.8 | 4.1 | | 4.7 | |
| TP30 | 540254 | 180114 | 1-2 | 1.9 | | | 3.8 | |

*N.B. Table excludes records that do not reach the Shepperton Gravel surface*

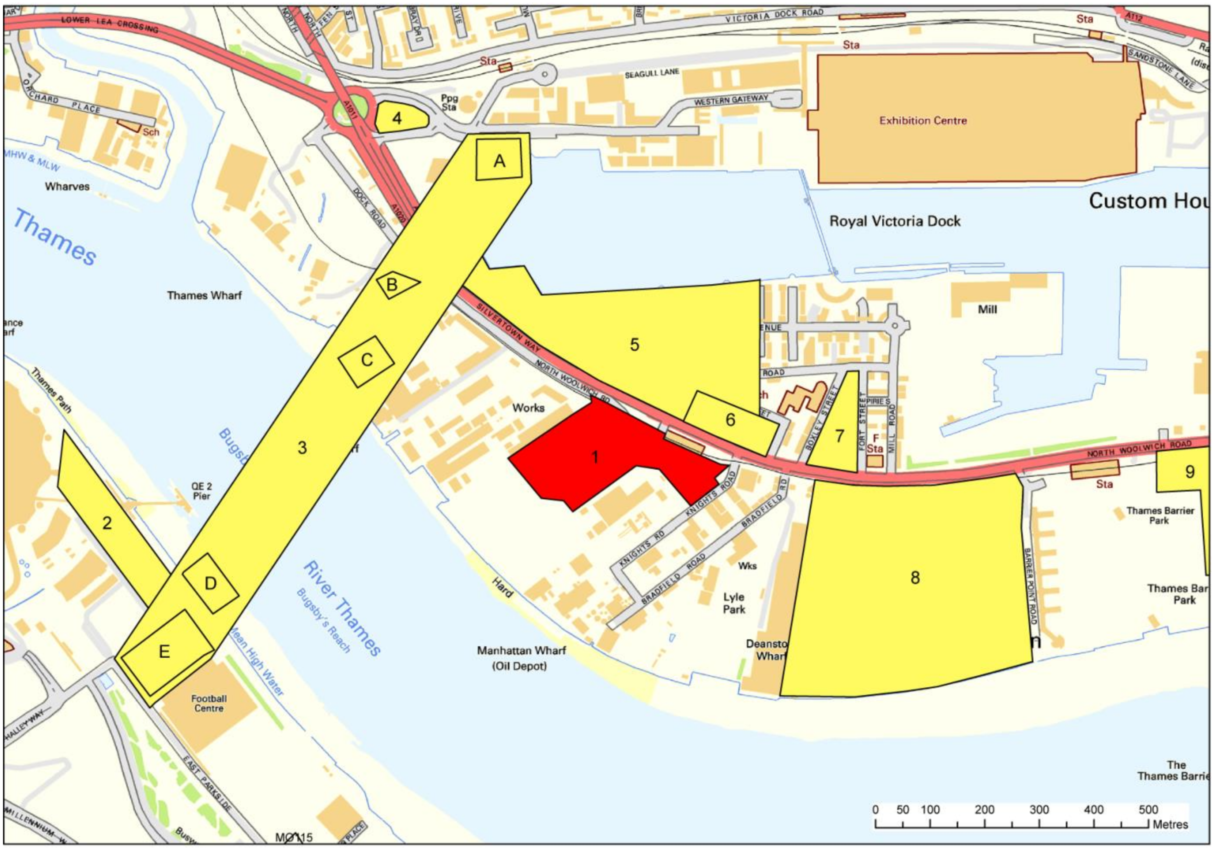



**Figure 1: Location of (1) the Peruvian Wharf site and other nearby geoarchaeological/archaeological investigations: (2) Greenwich Peninsula Central East (Young et al., 2015); (3) the Cable Car route (CAB11; Batchelor et al., 2015) (A) North Station; (B) North Intermediate Tower; (C) North Tower; (D) South Tower; (E) South Station); (4) Tidal Basin Road (Young & Batchelor, 2013); (5) West Silvertown (Wilkinson et al., 2000); (6) Barnwood Court (Farid, 1997); (7) Fort Street (Wessex Archaeology, 2000; Crockett et al., 2003); (8) Royal Wharf (Batchelor et al., 2014) and (9) Thames Barrier Park East (Green et al., 2006). Contains Ordnance Survey data © Crown copyright and database right [2016].**

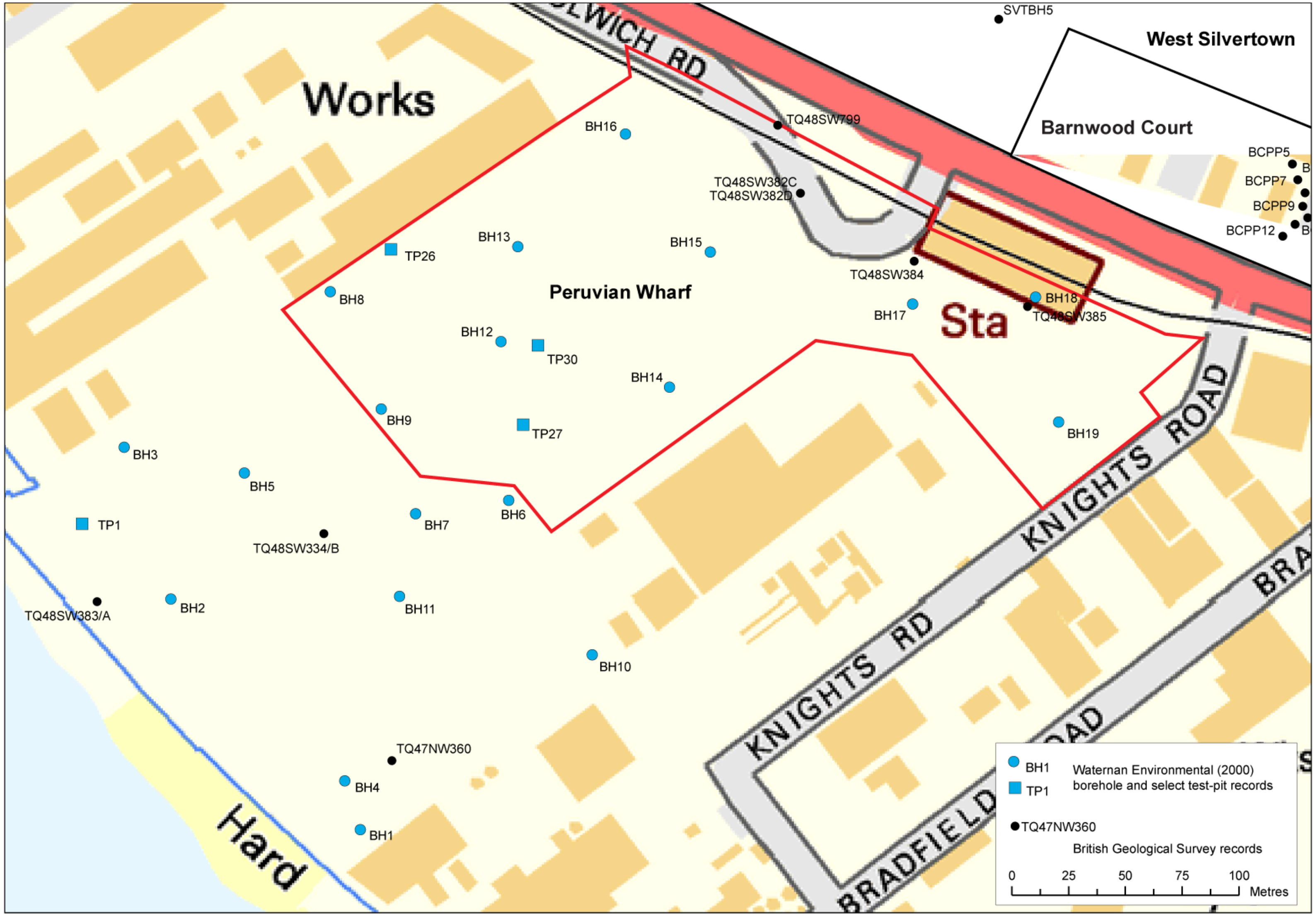



**Figure 2: Detailed plan of Royal Wharf, London Borough of Newham, illustrating the location of complete Holocene historical geotechnical and archaeological sequences on and adjacent to the site.** ***Contains Ordnance Survey data © Crown copyright and database right [2016]***

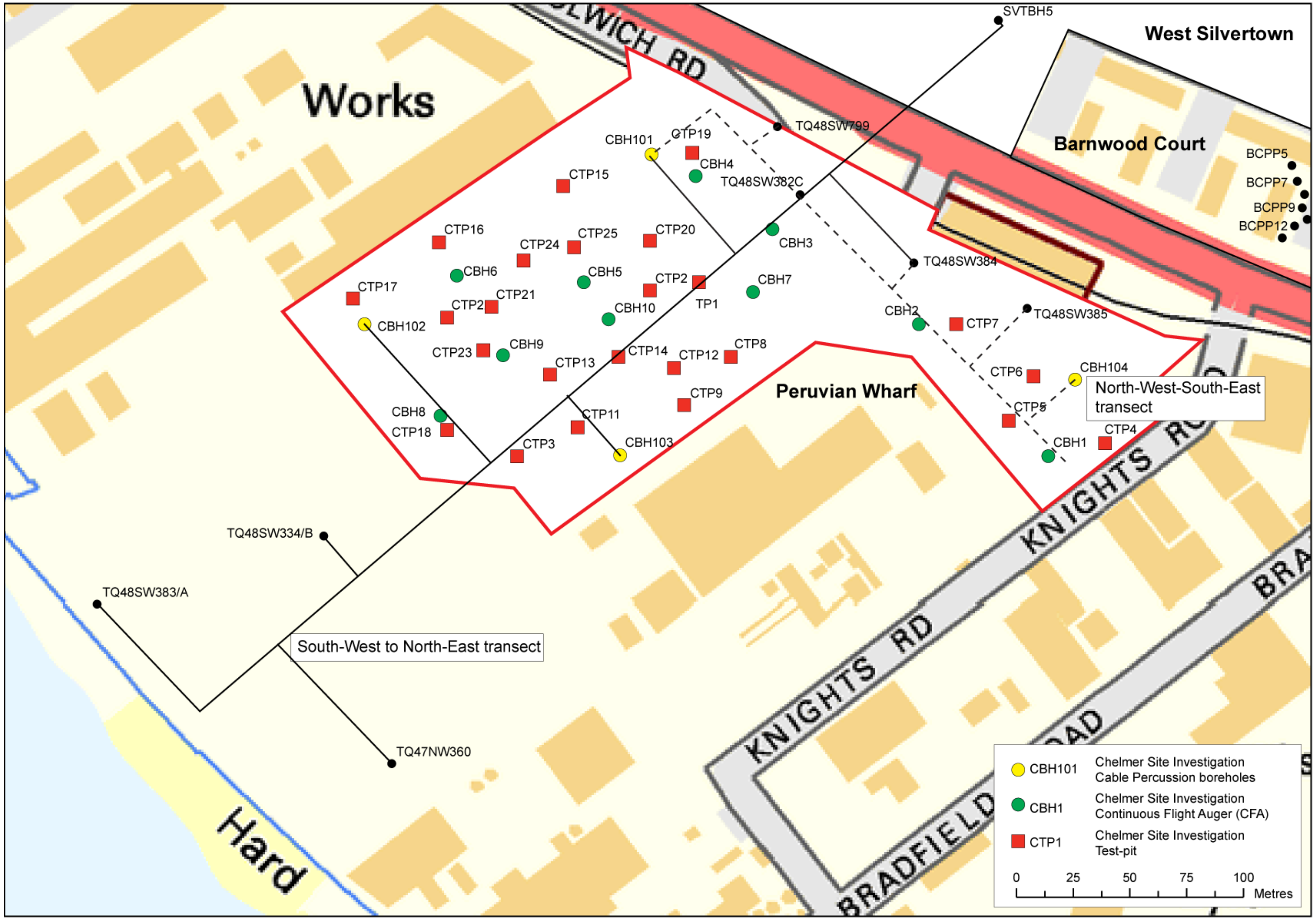



**Figure 3: Detailed plan of Royal Wharf, London Borough of Newham, illustrating the location of recent geotechnical works on the site carried out by Chelmer Site Investigations. Also illustrating the location of borehole transects.** ***Contains Ordnance Survey data © Crown copyright and database right [2016]***

# 2. METHODS

### Field investigations and lithostratigraphic descriptions

In January 2016, new geotechnical site investigations comprising 4 cable percussion boreholes, 10 continuous flight auger (CFA) boreholes and 25 test-pits were undertaken by Chelmer Site Investigations. Monitoring of the cable percussion boreholes was carried out by Quaternary Scientific. The lithostratigraphy of the core samples was described in the field 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 descriptions of the monitored boreholes are displayed in Tables 2 to 5. A summary of the Chelmer Site Investigation records is displayed in Table 6.

### Deposit modelling

Combined, the Waterman Environmental and Chelmer Site Investigation works provide over 30 complete Holocene stratigraphic records for the site and its immediate surroundings, in addition to approximately 70 test-pit records. Of these, it is only possible to confidently use 13 sequences for the purposes of deposit modelling. This is due to: (1) incomplete spatial data in the 2000 Waterman Environmental records (the boreholes were put down prior to demolition and there is no record of the elevation at the time, a variable that is vital for deposit modelling), and (2) the Chelmer Site Investigations CFA boreholes are insufficiently reliable at recording both the nature of, and boundaries between each stratigraphic unit; they are also inconsistent with other records from the site.

In the present investigation, modelling was undertaken using RockWorks software. The term 'deposit modelling' describes any method used to depict the sub-surface arrangement of geological deposits, but particularly the use of computer programmes to create contoured maps or three dimensional representations of contacts between stratigraphic units. The first requirement is to classify the recorded borehole sequences into uniformly identifiable stratigraphic units. At the sub-station site five stratigraphic units were recognised: (1) Shepperton Gravel; (2) Lower Alluvium; (3) Peat; (4) Upper Alluvium and (5) Made Ground.

How effectively Rockworks portrays the relief features of stratigraphic contacts or the thickness of sediment bodies depends on the number of data points (e.g. boreholes) per unit area and the extent to which these points are evenly distributed across the modelled area. The portrayal is also affected by the significance assigned to these data points, in terms of the extent of the area around the point to which the data are deemed to apply. This can be predetermined for each data set. Obviously the larger the chosen distance the less reliable the overall portrayal. In the present case the distance chosen for each data point has been set to a radius of 50m; thus for complete coverage across any given site, the boreholes must be spaced on a grid of approximately 100m intervals.

Because the boreholes are not uniformly distributed over the area of investigation, the reliability of the models is variable. In general, reliability improves from the boundaries of the modelled area, where edge effects adversely influence the reconstructions, towards the core area of the site where mutually supportive data are likely to be available from several adjacent boreholes

Reliability is also 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 land-use on the site. Quality is also affected where boreholes have been put down at different times and recorded using different descriptive terms and subject to differing technical constraints in terms of recorded detail including the exact levels of the stratigraphic boundaries.

Finally, because of the 'smoothing' effect of the modelling procedure, the modelled levels of stratigraphic contacts may differ slightly from the levels recorded in borehole logs.

# 3. RESULTS, INTERPRETATION AND DISCUSSION OF THE DEPOSIT MODELLING

The geoarchaeological descriptions of the cable percussion boreholes are displayed in Tables 2 to 5. A summary of the other Chelmer Site Investigation records is displayed in Table 5. The results of the deposit modelling are displayed in Figures 4 to 11. Figure 4(a) and (b) are two dimensional transects across the site; Figures 5 to 11 represent surface elevation and thickness models for each of the main stratigraphic units across the site and immediate surrounding area. Figure 11 is a surface elevation model for the Shepperton Gravel across the wider area.

A sufficient number of boreholes/test-pits have been put down to provide complete coverage of the Peruvian Wharf site, but as outlined above, the absence of spatial co-ordinates and/or reliability of the drilling technique employed has limited the number of records that can be used for deposit modelling. Also highlighted is the stark contrast in the Holocene Alluvial and Peat sequence between the Waterman Environmental and Chelmer Site Investigation geotechnical records. In particular, thick horizons of Peat (1-3m) are frequently evident within the Waterman Environmental and BGS records (Table 1), but are considerably thinner or absent within the Chelmer Site Investigations (see Tables 2-5).

Nevertheless, results of the deposit modelling indicate that the number and spread of usable boreholes logs is sufficient to permit modelling with a high level of confidence across the northern part of the site, and with a moderate degree of confidence to the south (Figures 4-11).

The full sequence of sediments recorded in the boreholes comprises:

*Made Ground*

*Upper Alluvium* – widely present

*Peat* – inconsistently present across the site and wider area

*Lower Alluvium* – largely absent across the site; locally present and occasionally peaty across the wider area

*Gravel (Shepperton Gravel)*

### The Shepperton Gravel

The Shepperton Gravel was present beneath the Holocene alluvial sediments in all the boreholes that penetrated to the bottom of the Holocene sequence. It comprises the deposits of a high-energy braided river system which, while it was active would have been characterised by longitudinal gravel bars (eyots) and intervening low-water channels in which finer-grained sediments might have been deposited. Such a relief pattern would have been present on the valley floor at the beginning of the Holocene when a lower-energy fluvial regime was being established.

The results of the deposit modelling of the Shepperton Gravel indicate the presence of a broad upstanding gravel surface mainly between -2.5 and -4m OD with a potential W-E alligned margin beyond the southern boundary of the Peruvian Wharf site. Beyond this point, the Gravel surface appears to reduce in height to at least -5m OD, (possibly more depending upon the surface height of the Waterman Environmental records) (Table 1; Figures 4 and 5). However, this boundary is much more prominent on the Royal Wharf site where it is aligned WNW-ESE (Batchelor et al., 2014; Figure 11). Here, the gravel surface falls away steeply towards the modern channel of the River Thames. the downward slope is apparently dissected by a number of depressions with roughly N-S alignments. Some of these depressions are substantially deep; (-8.25m OD and -7.20m OD in some borehole records).

The more elevated gravel surface on the Peruvian Wharf site and beyond has a gently undulating relief which probably indicates the presence of low gravel bars and intervening channels, but in general the relief amplitude is only 1.0-2.0m. On the Peruvian Wharf site, the gravel surface is not recorded above -2.50m OD within the boreholes selected for modelling. However, CFA boreholes CBH2, CBH3, CBH7 and CBH8 which are randomly distributed around the site, record the gravel surface at -0.38 to -1.78m OD (Table 5); as outlined above, this method of drilling is considered to be insufficiently reliable. Nevertheless, this is highlighted because on the Fort Street site just to the east of Peruvian Wharf, the gravel surface reaches approximately -1.5m OD and the sediments above it contain a Neolithic trackway (Wessex Archaeology, 2000; Crockett *et al*., 2003).

### The Holocene Alluvial Sequence

The sediments overlying the Shepperton Gravel surface in stratigraphic order consist of the Lower Alluvium, Peat (Figures 6 & 7) and Upper Alluvium (Figure 8). The Lower Alluvium is defined here as a generally silty or sandy (sometimes organic) deposit that accumulated during the Early to Middle Holocene (Mesolithic cultural period) within a fluvial or estuarine environment. In many cases across the Lower Thames Valley it is separated from the widespread, more clayey and inorganic Middle to Late Holocene Upper Alluvium by a thick horizon of Peat representative of a shift towards semi-terrestrial environment supporting the growth of fen woodland. Across the Peruvian Wharf site and wider modelled area, the Peat is not always present, generally preventing definitive distinction between the Lower Alluvium and Upper Alluvium.

The Lower Alluvium is almost entirely absent across the Peruvian Wharf site, and is recorded inconsistently across the wider area. Instead, where present, Peat tends to rest directly on the surface of the Shepperton Gravel. Figures 6 and 7 display the modelled surface and thickness of the Peat, indicating horizons of between 1-2m on the northern part of the site, with an upper surface around -1m OD. This however would appear to be an inaccurate representation, since Peat is recorded in a number of the Waterman Environmental records from across the site (e.g. BH8, 9, 12, 13, 16, 18 & 19). As outlined above there is therefore a stark contrast in the recorded Holocene Alluvial and Peat sequence between the Waterman Environmental/BGS and Chelmer Site Investigation geotechnical records, with the Peat considerably thinner or absent according to the Chelmer Site Investigations (see Tables 2-5). The absence of distinct Peat horizons being identified within the CFA boreholes is not unsurprising considering the method of coring, but its absence in CBH101-104 (all of which were monitored by a geoarchaeologist) is enigmatic, particularly as each of these sequences is adjacent to records containing Peat. Three possibilities are suggested here: (1) natural variations in the presence of Peat across the site; (2) varying types of sediment description, or (3) truncation of the sequences during demolition. Only further geoarchaeological boreholes are likely to elucidate the pattern of the alluvial deposits across the site.

However, these results do have some affinities with the findings made on the Royal Wharf site. Here, on the southern part of the site, the Peat is almost completely absent and the limited sequences in which it does occur tend to overlie the more elevated parts of the gravel surface (i.e. the areas intervening between the N-S depressions that dissect the gravel surface in this area of the site; see above). Thicker occurrences of Peat are recorded on the higher gravel surface on the northern part of the site and beyond, though even in these areas Peat development was found to be irregular. Where present, the Peat generally varies between 1 and 3m thick, although thicker horizons up to 4m are occasionally recorded (Batchelor *et al.*, 2014).

Where present, the Peat surface is overlain by silty and clayey deposits of the Upper Alluvium. These deposits vary between 0.3 and 6m thick, with an upper surface resting between 0 and +1m OD when not truncated by Made Ground. In a small number of randomly distributed test-pits, an upper Peat horizon of 20cm (CTP12, CTP13 & CTP19) and 90cm (CTP15) was recorded at the interface between the Upper Alluvium and Made Ground (Table 5). The elevation of this Peat is unusually high however (between 1 & 2m OD), when compared to the likely natural level of the Thames floodplain prior to artificial raising (0 to 1m OD). Thus it is uncertain whether or not this represents a natural or redeposited Peat horizon. A similar findings was made on the south-east of the Royal Wharf site, where thin Peat horizons were recorded above 2m OD (Batchelor *et al.*, 2014).

### Holocene landscape evolution

The pattern of alluvial deposits indicates the presence of two contrasting landscapes across the wider modelled area, throughout much of the Holocene. Beyond the southern margins of the site (particularly evident at Royal Wharf), it seems likely that deposition of mineral-rich alluvium reflects the presence of active river channels, probably the main channel of the River Thames and short N-S aligned steams draining off the slightly more elevated area to the north. Peat formation here was restricted to the more elevated remnants of the gravel surface between the depressions in which fluvial deposition persisted for much of the Holocene.

To the north (and where Peruvian Wharf is located) there are no obvious deep depressions that might have been the site of Peat formation early in the Holocene. Moreover the pattern of Peat accumulation shows very little relationship to the relief of the surface of the Shepperton Gravel on which the Peat rests as is suggested by modelling exercises elsewhere along the River Thames (see below). This might reflect post-formational erosion of the Peat, or it may reflect a pattern of formation controlled by subtle variations of relief and hydrological conditions which are not recognisable at the level of resolution possible in the modelling exercise.

**Table 2: Lithostratigraphic description of borehole CBH101, Peruvian Wharf, North Woolwich Road, Silvertown, London Borough of Newham**

| Depth (m OD) | Depth (m bgs) | Description |
|---|---|---|
| 1.82 to 0.32 | 0 to 1.50 | Made Ground |
| 0.32 to 0.12 | 1.50 to 1.70 | 10YR 3/3; As1, Sh1, Ag2; Brown mottled black organic-rich silty clay with traces of gravel; diffuse contact into: |
| 0.12 to -2.68 | 1.70 to 4.50 | 10YR 3/1; Ag1, Sh1, As2; Very dark grey organic-rich silty clay; sharp contact into: |
| >-2.68 | >4.50 | 10YR 4/1; Gg2, Ga2; Dark grey sandy gravel with sub-rounded to sub-angular flint clasts up to 40mm in size. |

**Table 3: Lithostratigraphic description of borehole CBH102, Peruvian Wharf, North Woolwich Road, Silvertown, London Borough of Newham**

| Depth (m OD) | Depth (m bgs) | Description |
|---|---|---|
| 1.80 to -3.20 | 0 to 5.00 | Made Ground |
| >-3.20 | 5.00 | 10YR 4/1; Gg2, Ga2; Dark grey sandy gravel with sub-rounded to sub-angular flint clasts up to 40mm in size. |

**Table 4: Lithostratigraphic description of borehole CBH103, Peruvian Wharf, North Woolwich Road, Silvertown, London Borough of Newham**

| Depth (m OD) | Depth (m bgs) | Description |
|---|---|---|
| 1.80 to -1.20 | 0 to 3.00 | Made Ground |
| -1.20 to -1.70 | 3.00 to 3.50 | 10YR 5/1; As3, Ag1; Grey silty clay with fragments of detrital wood; diffuse contact into: |
| -1.70 to -2.70 | 3.50 to 4.50 | 2.5Y 5/3; Ag2, As1, Dl1; Olive grey clayey silt with detrital wood and traces of Mollusca fragments; sharp contact into: |
| >-2.70 | >4.50 | 10YR 4/1; Gg2, Ga2; Dark grey sandy gravel with sub-rounded to sub-angular flint clasts up to 40mm in size. |

**Table 5: Lithostratigraphic description of borehole CBH104, Peruvian Wharf, North Woolwich Road, Silvertown, London Borough of Newham**

| Depth (m OD) | Depth (m bgs) | Description |
|---|---|---|
| 1.80 to 0.30 | 0 to 1.50 | Made Ground |
| 0.30 to -0.20 | 1.50 to 2.00 | 10YR 3/3 to 10YR 5/1; As2, Ag1, Sh1; Brown to grey silty clay with laminations of peat. Diffuse contact into: |
| -0.20 to -3.20 | 2.00 to 5.00 | 10YR 5/1; Ag2, As2; Grey silty clay with occasional sand; sharp contact into: |
| >-3.20 | >5.00 | 10YR 4/1; Gg2, Ga2; Dark grey sandy gravel with sub-rounded to sub-angular flint clasts up to 40mm in size. |

**Table 5: Summary of the Chelmer Site Investigation geotechnical records**

| Borehole / Test-Pit name | Easting | Northing | Height | Top of Upper Alluvium | Top of Peat | Top of Gravel | Notes |
|---|---|---|---|---|---|---|---|
| CBH1 | 540479.4 | 180065.8 | 1.51 | 3 | | 4.8 | Alluvium contains bands of Peat |
| CBH2 | 540421.9 | 180123.2 | 2.12 | 0.9 | | 2.5 | |
| CBH3 | 540357.9 | 180164.3 | 2.23 | 2 | | 3.6 | Alluvium contains bands of Peat |
| CBH4 | 540323.7 | 180188.2 | 2.14 | 2 | | 4.8 | |
| CBH5 | 540274.4 | 180140.8 | 1.99 | | | | No data |
| CBH6 | 540218.4 | 180144.2 | 1.99 | | | | No data |
| CBH7 | 540349.2 | 180137.4 | 2.02 | 1.3 | | 3.8 | Alluvium contains bands of Peat |
| CBH8 | 540211.8 | 180082.4 | 2.02 | 2.3 | | 3.6 | |
| CBH9 | 540238.9 | 180109.6 | 2.12 | | | | No data |
| CBH10 | 540286 | 180124.9 | 2.09 | | | | No data |
| CTP1 | 540325.7 | 180142 | 1.96 | | | | |
| CTP2 | 540304.1 | 180138 | 1.91 | 1.9 | | | |
| CTP3 | 540245.5 | 180065.2 | 1.98 | | | | |
| CTP4 | 540504.2 | 180070.9 | 1.34 | 0.7 | | | |
| CTP5 | 540461.9 | 180081.4 | 2.06 | 0.6 | | | |
| CTP6 | 540472.9 | 180099.6 | 1.9 | 1.1 | | | |
| CTP7 | 540439.1 | 180122.9 | 1.83 | 0.7 | | | |
| CTP8 | 540338.8 | 180109.1 | 1.76 | | | | |
| CTP9 | 540319.3 | 180087.5 | 1.88 | 1.6 | | | Vertical timber beams penetrating deeper into the alluvium here |
| CTP11 | 540271.9 | 180078.1 | 1.84 | 1.35 | | | |
| CTP12 | 540314.4 | 180104.2 | 1.75 | 1.2 | | | 20cm peat horizon between MG & Alluvium |
| CTP13 | 540259.8 | 180100.9 | 1.72 | 1.5 | | | 20cm peat horizon between MG & Alluvium |
| CTP14 | 540289.4 | 180108.4 | 1.95 | 1.1 | | | |
| CTP15 | 540266.1 | 180183.7 | 1.79 | 0.3 | | | 90cm peat horizon between MG and Alluvium |
| CTP16 | 540210.9 | 180159.5 | 1.63 | 0.6 | | | |
| CTP17 | 540172.9 | 180134.2 | 1.64 | | | | |
| CTP18 | 540214.3 | 180076.9 | 2.06 | 1.2 | | | |
| CTP19 | 540322.2 | 180198.5 | 2.01 | 1.1 | | | 20cm peat horizon between MG & Alluvium |
| CTP20 | 540304 | 180159.5 | 2 | | | | No data |
| CTP21 | 540233.8 | 180130.9 | 1.85 | | | | No data |
| CTP22 | 540214.1 | 180126.2 | 1.89 | | | | No data |
| CTP23 | 540230.2 | 180112.1 | 2 | | | | No data |
| CTP24 | 540247.8 | 180151.5 | 2 | | | | No data |
| CTP25 | 540270 | 180157.8 | 2.1 | | | | No data |

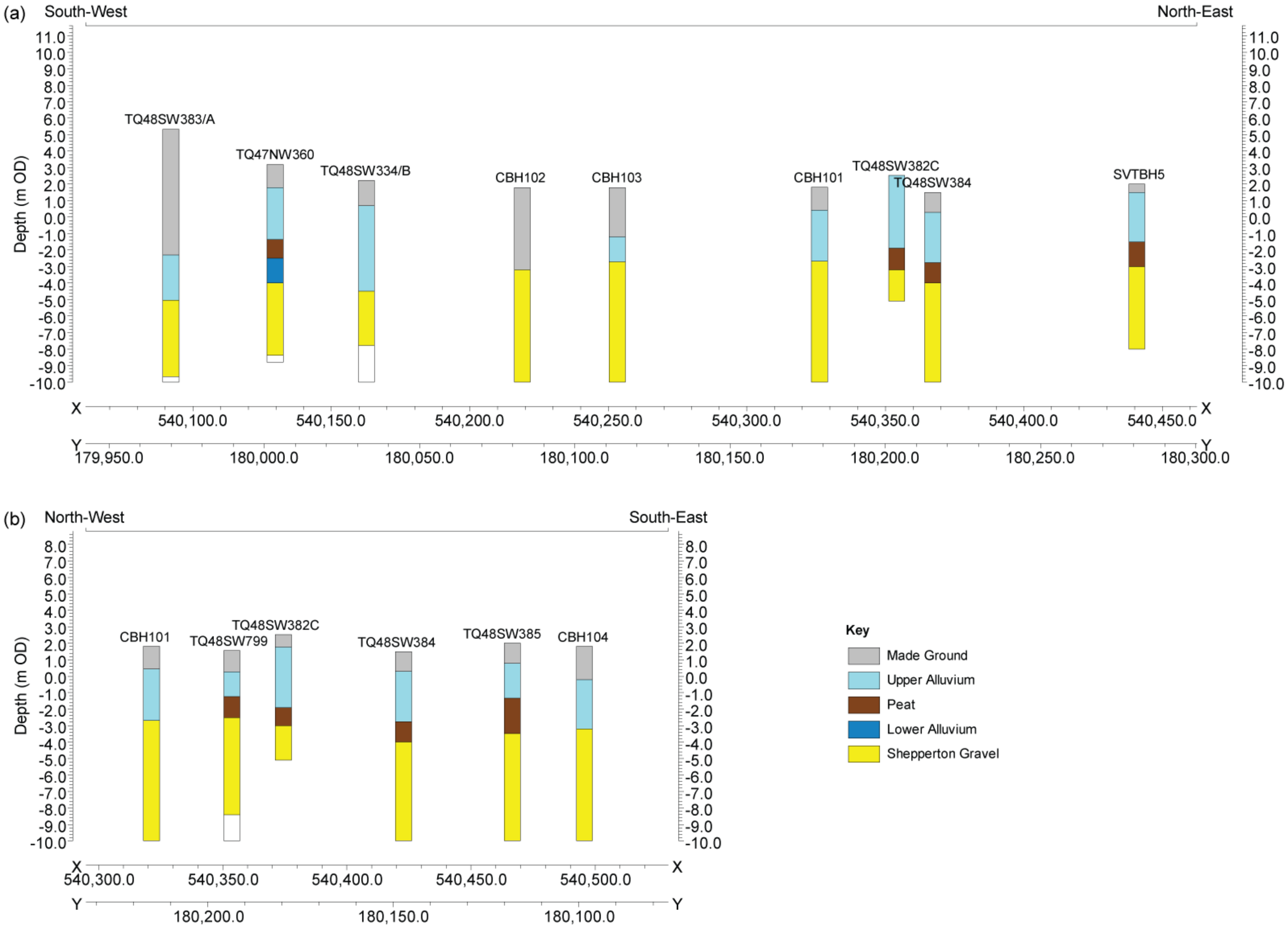



Figure 4: (a) South-West to North-East borehole transect and (b) North-West to South-East borehole transect, Peruvian Wharf, London Borough of Newham


**Figure 5: Modelled surface of the Shepperton Gravel (m OD)**


**Figure 6: Modelled surface of the Peat (m OD)**

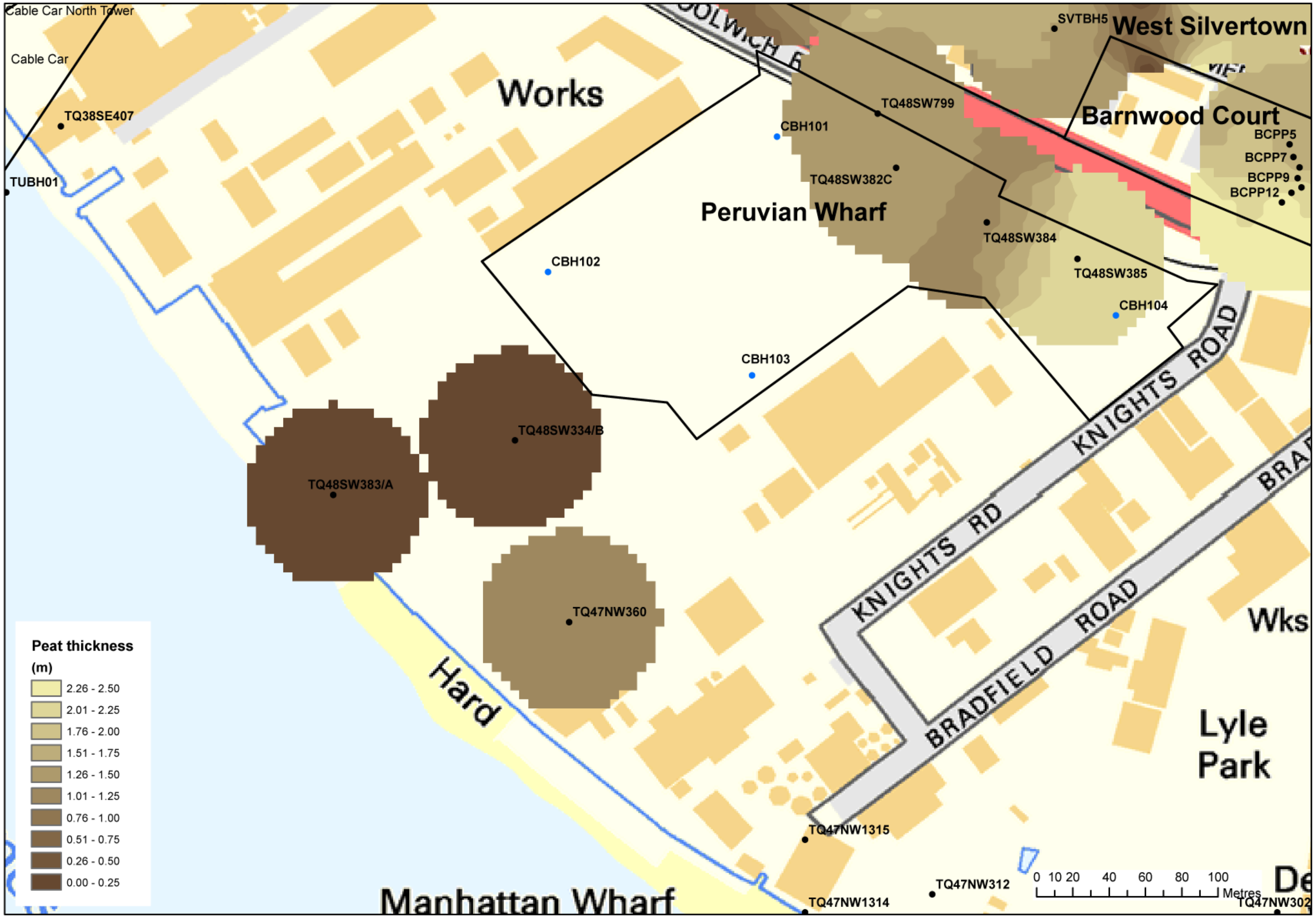



**Figure 7: Modelled thickness of the Peat (metres)**


**Figure 8: Modelled surface of the Upper Alluvium (metres OD)**

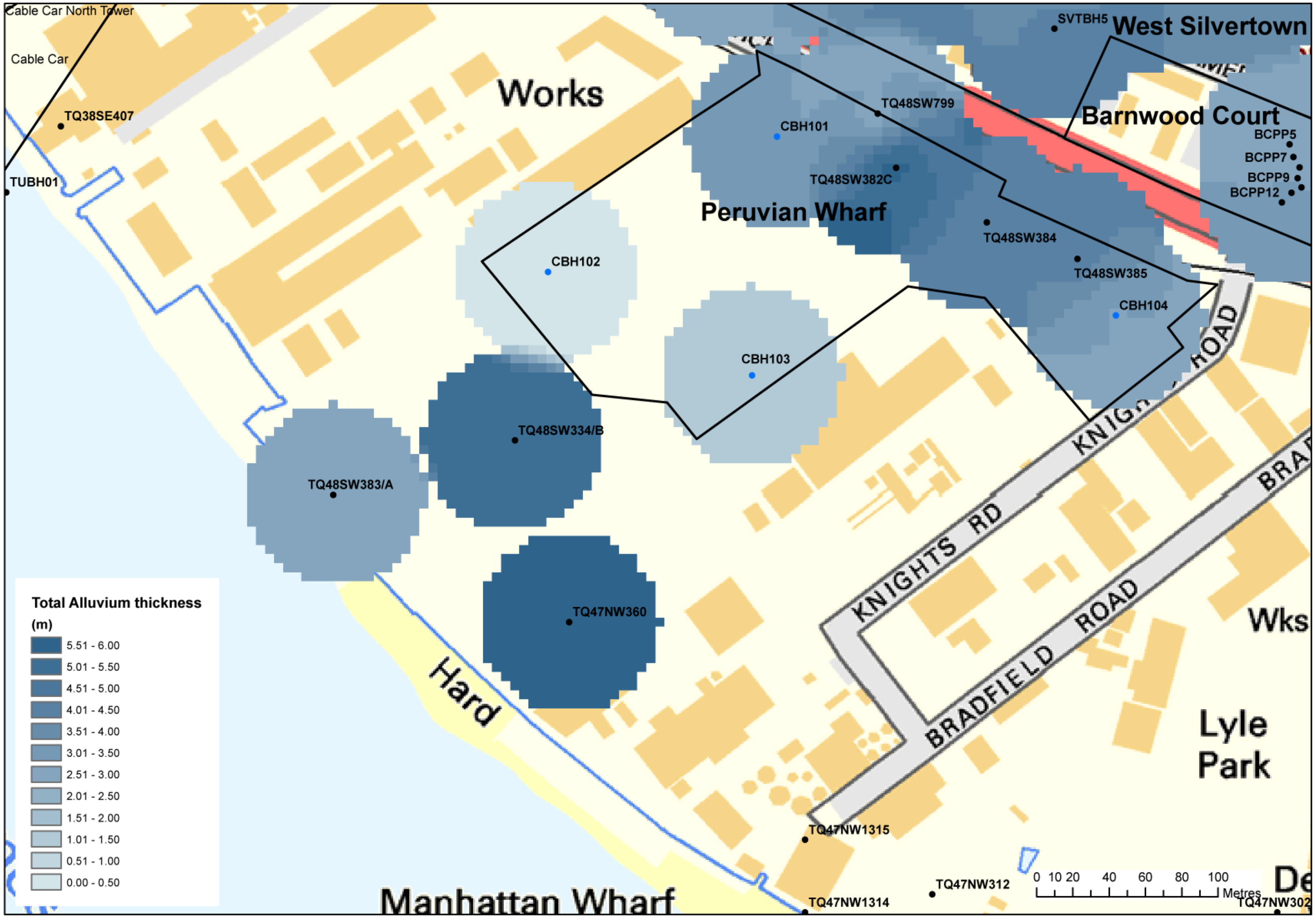



**Figure 9: Modelled thickness of the Total Alluvium (metres)**


**Figure 10: Modelled thickness of the Made Ground (metres)**

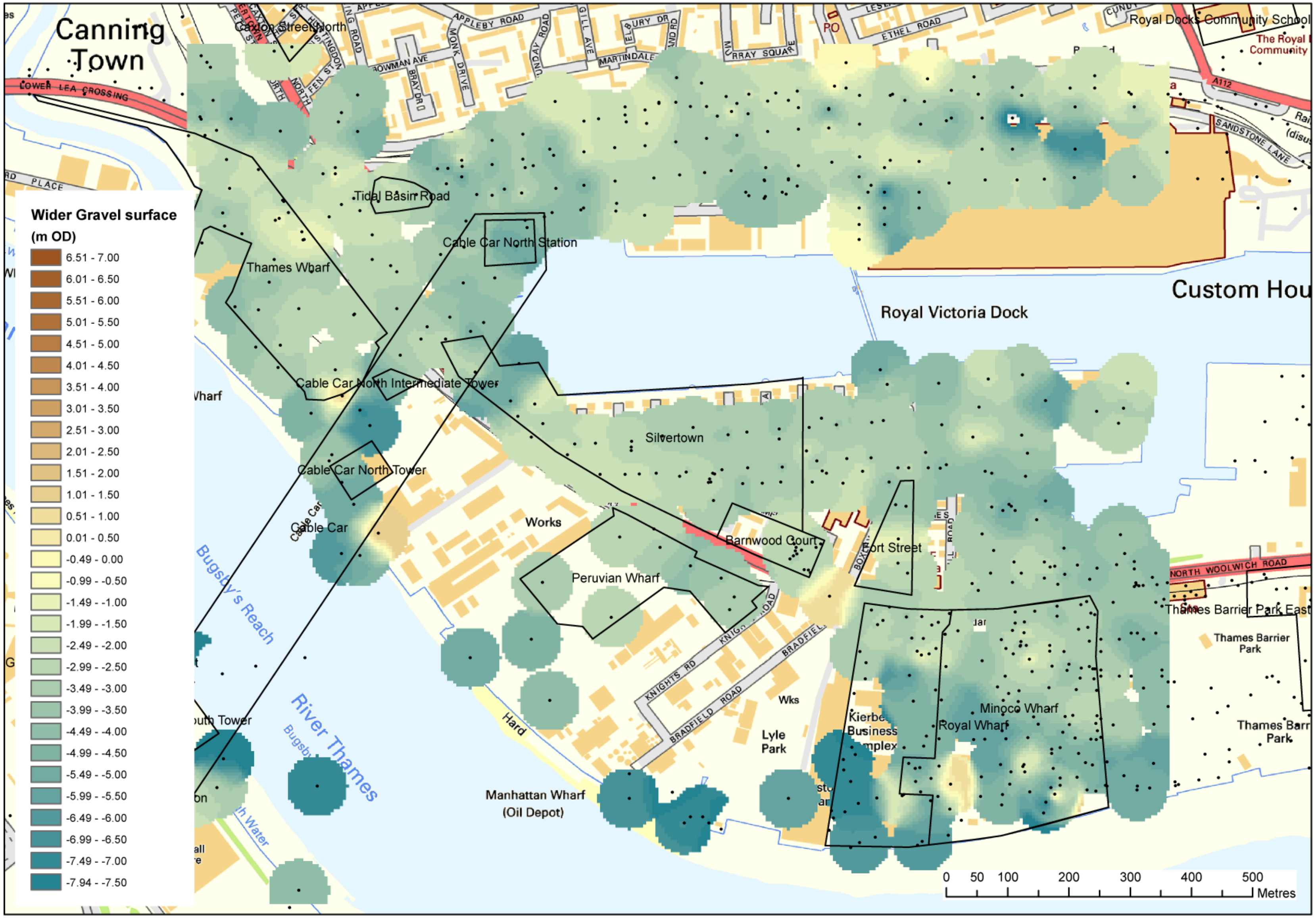


**Figure 11: Modelled surface of the Shepperton Gravel (m OD) across the wider area**

# 4. CONCLUSIONS & RECOMMENDATIONS

The distribution of sediments on the Peruvian Wharf site is quite different to those recorded during recent large-scale modelling exercises carried out on the Greenwich Peninsula (e.g. Batchelor *et al*., 2012) and further along the Lower Thames Valley floodplain (e.g. the Barking Reach [Green *et al*., 2012] and on the Plumstead and Erith Marshes [Quest, in prep]), where thicker Peat horizons tend to be associated with areas of lower rather than higher Shepperton Gravel topography. There are however, some similarities with the conditions described by Corcoran et al (2011) in the Lower Lee valley where they were able to recognise contrasts between areas affected by persistent Holocene river activity and characterised by mineral-rich sediment sequences, and more stable areas where Peat accumulation had occurred.

The results of the deposit modelling exercise are considered to make a valuable contribution to our knowledge and understanding of the evolution of the floodplain landscape along this stretch of the Lower Thames Valley, against which the archaeological record can considered. It is therefore recommended that the results are used to contribute towards a publication that builds upon similar recent regional site investigations carried out along the Barking Reach, Plumstead and Erith Marshes, Greenwich Peninsula and Lower Lea Valley. Records with insufficient spatial co-ordinates on the southern part of the site has resulted in voids in the deposit model; it is recommended that four geoarchaeological boreholes are put down in these areas of the site to complete the study, and clarify the extent of Peat formation. It is also recommended that any peat sequences present are radiocarbon dated to improve the chronological framework of deposition. The placement of these boreholes will also enable investigation of the suspect Peat horizon in the Upper Alluvium identified in CTP12, 13, 15 and 19. Palaeoenvironmental investigation is unlikely to be required unless unusual findings are made; detailed reconstructions have already been carried out in the nearby area (e.g. the London Cable Car [Batchelor *et al*., in press], Fort Street [Wessex Archaeology, 2000; Crockett *et al*., 2003] and West Silvertown [Wilkinson et al., 2000]). This work can be follow the granting of planning permission secured by condition.

Finally, the results of the deposit modelling provide an indication of the archaeological potential of the site. The Shepperton Gravel surface and Peat sediments from the northern part of the site have some potential, particularly when considering the presence of the known archaeological remains on the Fort Street site. However, even this is considered to be moderate at best, since the surface of the Shepperton Gravel does not appear to rise above -2.50m OD.

# 5. REFERENCES

Batchelor, C.R., Green, C.P. and Young, D.S. (2014) A report on the geoarchaeological borehole investigations and deposit modelling on land at Royal Wharf, Silvertown, London Borough of Newham. *Quaternary Scientific (QUEST) Unpublished Report September 2014; Project Number 089/14.*

Batchelor, C.R., Green, C.P., Young, D.S., Austin, P., Cameron, N. and Elias, S. (2015) Prehistoric Landscapes beneath the London Cable Car. *London Archaeologist* **14**(3):65-72.

Chelmer Site Investigations (2000) *Peruvian Wharf Shell and Auger, Continuous Flight Auger and Test-Pit logs*. Unpublished Report.

Crockett, A.D., Allen, M.J., Scaife, R.G., Boismier, W.A., Mepham, L., Gale, R. (2002) A Neolithic trackway within peat deposits at Silvertown, London. *Proceedings of the Prehistoric Society* **68**, 185-213.

Farid, S. (1997) *An archaeological evaluation at Barnwood Court, North Woolwich Road, London Borough of Newham, E16*. Pre-Construct Archaeology Unpublished Report.

Gibbard, P.L. (1994) *Pleistocene History of the Lower Thames Valley*. Cambridge University Press, Cambridge.

Green, C.P., Wilkinson, K., Branch, N.P. & Swindle, G.E. (2006) *Thames Barrier Park East, Silvertown, London Borough of Newham (site code: TBP06): Geoarchaeology and radiocarbon dating*. ArchaeoScape Unpublished Report 2006.

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

Waterman Environmental (2000) *Peruvian Wharf Borehole and Test-Pit logs*. Unpublished Report.

Wessex Archaeology (2000) Fort Street (West) Silvertown, London, E16, Archaeological excavation assessment report. *Wessex Archaeology: Unpublished Report.*

Wilkinson, K.N., Scaife, R.J. & Sidell, E.J. (2000) Environmental and sea-level changes in London from 10,500 BP to the present: a case study from Silvertown. *Proceedings of the Geologists' Association,* **111**, 41-54.

Young, D.S. & Batchelor, C.R. (2013) A report on the geoarchaeological borehole investigations and deposit modelling on land at Tidal Basin Road, London Borough of Newham *(NGR: TQ 39950 80750)*. *Quaternary Scientific (QUEST) Unpublished Report August 2013; Project Number 156/13.*

Young, D.S. & Batchelor, C.R. (2015) Greenwich Peninsula Central East, Plots N0205, N0206 and N0207 (Site Code: CTT15): Environmental archaeological assessment report. *Quaternary Scientific (QUEST) Unpublished Report August 2015; Project Number 067/15.*