URBAN SUSTAINABILITY CENTRE
Royal Victoria Docks
London E16

London Borough of Newham

A Geoarchaeological and Archaeological evaluation report

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MUSEUM OF LONDON ARCHAEOLOGY

REGISTERED ORGANISATION IfA

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A Geoarchaeological and Archaeological evaluation report

Site Code: USC10
National Grid Reference: 540020 180640

Project Manager	Sophie Jackson
Geoarchaeological Project Manager	Jane Corcoran
Author	Craig J Halsey
Graphics	Juan José Fuldain González

Museum of London Archaeology

Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
tel 020 7410 2200 fax 020 7410 2201
MOLAGeneralEnquiries@museumoflondon.org.uk
www.museumoflondonarchaeology.org.uk

Summary (non-technical)

This document reports on a geoarchaeological and archaeological evaluation undertaken on the site of the Urban Sustainability Centre, Royal Victoria Docks, Newham. Museum of London Arcaheology (MOLA) were commissioned to undertake the investigation by Ove Arup Ltd, on behalf of the client, Siemens plc. The investigation consisted of monitoring a number of geotechnical test pits and boreholes undertaken by Ian Farmers Associates Ltd. In addition to this five geoarchaeological specific boreholes were drilled across the site in order to sample the floodplain deposits.

The investigations focused on two key horizons of interest. A lower horizon of floodplain stratigraphy made up a series of sediments derived from fluvial and wetland environments, and an upper horizon consisting of anthropogenic material. The site is situated adjacent to the Royal Victoria Docks, and therefore these anthropogenic deposits have the potential to preserve structures associated with the industrial heritage of the dock.

The borehole data was used to create a sub-surface deposit model of the site in order to assess the palaeoenvironmental and archaeological potential of the floodplain sequence. This deposit model showed that the site occupies a low lying part of the floodplain which formed an active channel belt throughout most of the Holocene epoch (i.e. the last 10 000 years). This channel belt is probably related to a former course of the river Lea, the present course of which runs approximately 400m west of the site boundary.

The basal deposits consisted of the Shepperton floodplain gravels, which were deposited during the closing stage of the last major cold stage (i.e. c 18 000–15 000 years ago, the Late Devensian Glacial). These gravels were deposited within a wide expansive braid plain.

Sands were recorded above these gravels, and define a switch to a lower energy partially braided, multi threaded channel. These deposits may date from the Late Glacial or Early Holocene period (c 15 000–10 000 years ago). Above these sands occurred a series of finely laminated clay silts and fine sands interspersed with thin lenses of organics. These were deposited within a wide, single threaded lower energy fluvial environment. The accumulation of the thin organics may relate to episodic channel cut off, which allowed partial vegetation to develop in backswamp areas. These deposits are likely to have accumulated between 10 000 to 2000 years ago (i.e. the Mesolithic to Iron Age period). However these deposits may not represent a continuous sequence of deposition, as dynamic fluvial environments are prone to phases of erosion as well as deposition.

By the Iron Age the effects of relative sea level rise began to influence the site. The freshwater river transformed to an estuarine environment, resulting in the deposition of intertidal muds within marginal mudflats and salt marsh. The tidal inundation caused aggradation across the floodplain surface raising up the topography significantly. This protected the site from frequent flooding allowing accretionary alluvial soils to develop. These would have consisted of semi terrestrial grasslands, episodically flooded.

The upper made ground predominately consisted of demolition rubble and industrial waste of little archaeological significance. One structure was identified within test pit 6A.

This consisted of a curvilinear wall mad up of two courses of unfrogged bricks resting on a concrete base.

The report concludes that although the floodplain deposits hold no potential for prehistoric dryland occupation, the deposits sampled within the geoarchaeological boreholes do warrant an additional phase of assessment to ascertain levels of palaeoenvironmental preservation and significance. These deposits may hold a long record of palaeoenvironmental change, which can be used to reconstruct changes in the fluvial system and the wider prehistoric landscape.

The significance of the anthropogenic deposits is more difficult to assess due to the low number of small interventions undertaken across the site. These deposits are likely to be impacted on by a number of piled foundations. Where significant impacts are likely to occur a watching brief may be the appropriate form of mitigation.

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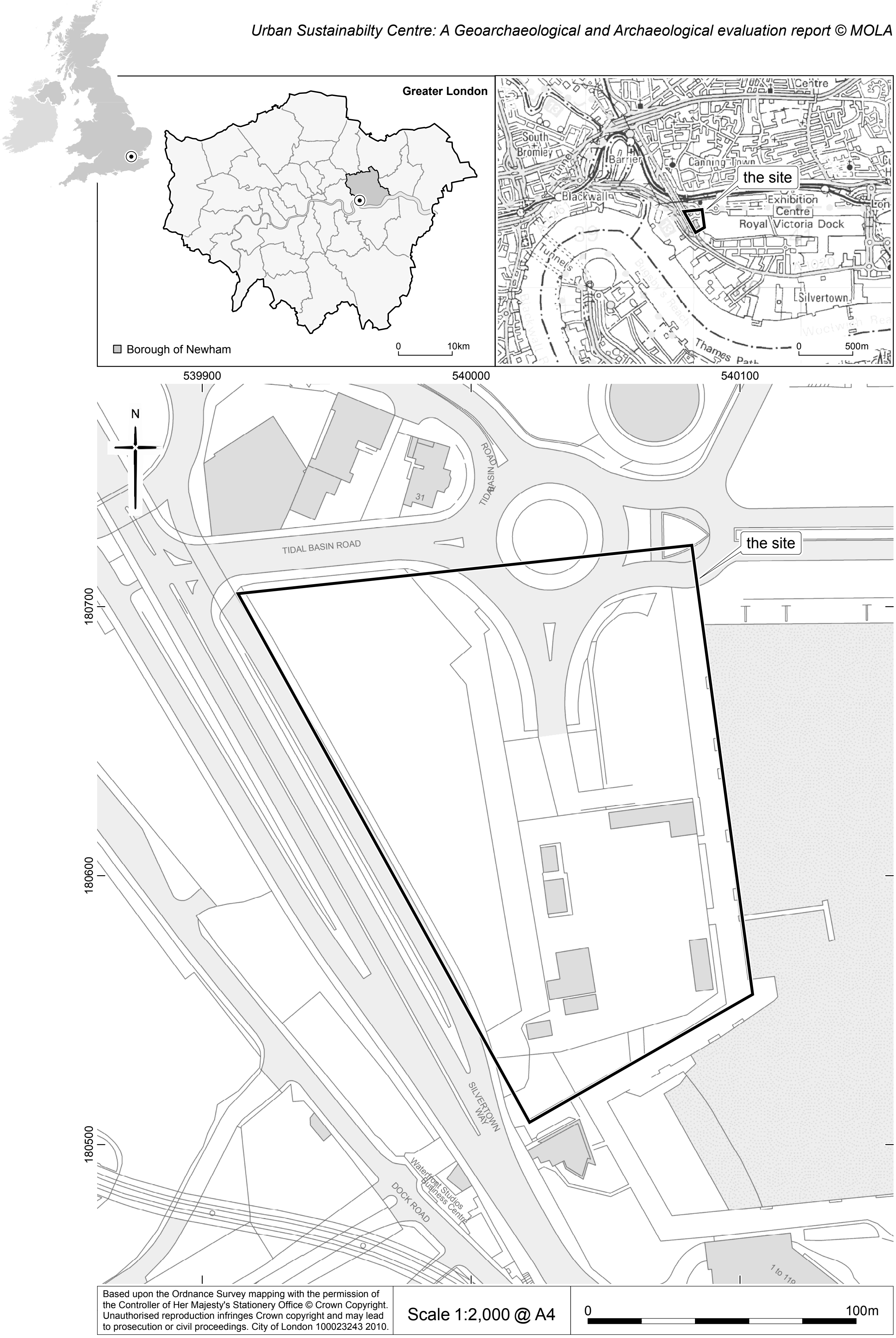

Fig 1 Site location

1 Introduction

1.1 Site Background

This document reports on a geoarchaeological and archaeological evaluation undertaken on the Urban Sustainability Center (referred to as USC within this report) hereafter called the 'the site'. The allocated site code is USC10. The site is situated towards the western end of the Royal Victoria Docks, bound to the west by Silvertown Way, and to the north by Mace Gateway (Fig 1). It forms an area measuring *c* 3 hectares. The southern part of the site is currently occupied by a water sports centre. An area of open waste ground occupies the western part. The OS National Grid Ref. for the centre of the site is approximately 540020/180640. The site lies in an Area of Archaeological Importance as designated by the London Borough of Newham.

The evaluation consisted of monitoring a series of geotechnical test pits and boreholes undertaken by Ian Farmers Associates Ltd. In addition to this, geoarchaeological specific boreholes were undertaken by MOLA to sample the natural floodplain stratigraphy. The results of these exercises have been combined with previous geotechnical data to create a sub-surface deposit model for the site.

The work was requested by the local authority archaeological advisor in order to assess the buried archaeological and palaeoenvironmental potential of the site. The results of the evaluation are intended to enable the local planning authority to develop an appropriate response to any identified archaeological or palaeoenvironmental resource. The work was undertaken in accordance with the *Written Scheme of Investigation* (Halsey 2010) in order to satisfy the archaeological condition applied to the planning consent for the development scheme. The report has been prepared within the terms of the relevant standard specified by the Institute of Field Archaeologists (IFA 2001).

1.2 Planning background and proposed development

A planning application has been submitted for the site under the reference 10/01576/FUL. Based on the archaeological environmental impact assessment and following consultation with the Greater London Archaeology Advisory Service (GLASS), an archaeological Planning Condition, responding to Newham Policy EQ43 and London Development Plan Policy 4B.15, has been imposed.

The proposed redevelopment involves the construction of a new exhibition building for the Urban Sustainability centre. A number of piled foundations within the footprint of the exhibition centre are likely to impact on the archaeological and palaeoenvironmental resource. Areas of landscaping are also proposed on the western periphery of the site. The location of the building footprint and pile cap locations is illustrated on Fig 2, Fig 5, Fig 6 and Fig 7.

1.3 Origin and scope of the report

This report was commissioned by Over Arups & Partners Ltd on behalf of the client, Siemens plc and produced by the Museum of London Archaeology (MOLA).

This document reports on the results of the archaeological/geoarchaeological monitoring of geotechnical test pits and boreholes, with an additional geoarchaeological borehole survey. This work constitutes a preliminary evaluation of the site. It is intended to provide sufficient information to determine archaeological survival and the likely impact of the proposed scheme on any surviving deposits of archaeological and/or palaeoenvironmental interest. The results of the evaluation will be used to formulate an appropriate archaeological/geoarchaeological mitigation strategy

Field evaluation, and the *Evaluation Report* which comments on the results of that exercise, are defined in the most recent English Heritage guidelines (English Heritage 1998) as intended to provide information about the archaeological resource in order to contribute to the:

- formulation of a strategy for the preservation or management of those remains; and/or
- formulation of an appropriate response or mitigation strategy to planning applications or other proposals which may adversely affect such archaeological remains, or enhance them; and/or
- formulation of a proposal for further archaeological investigations within a programme of research

Geoarchaeological Borehole surveys are usually undertaken where traditional archaeological evaluations by trial trenches are impracticable. This might be because of the depth of the archaeological deposits, a high water-table, the nature of the sediments anticipated or the thickness of the ground-slab.

Geoarchaeological boreholes, and the monitoring of geotechnical investigations are unlikely to provide direct evidence for archaeological features or artefacts, it can merely report on the stratigraphy that is likely to contain such remains. It is a form of evaluation. The objectives of a geoarchaeological borehole evaluation are:

- to report in detail on the nature of a sites' stratigraphy and to determine the environment of deposition and chronology for the deposit sequence

- to assess the potential of any preserved ecological remains for reconstructing the past landscape and understanding environmental change.

- to identify horizons which might:

(a) provide data on past environments and resource availability
(b) represent events which are likely to have had an impact on local human occupation and activities
(c) have been deposited or transformed as a result of human activities
(d) contain indirect evidence of local human activity.

The information gathered from a geoarchaeological evaluation is therefore capable of providing relevant data to assess the archaeological resource as defined in the most recent English Heritage guidelines (English Heritage 1998).

1.4 Aims and Objectives

This *Evaluation report* provides information about the archaeological and palaeoenvironmental resource by examining the sediments, soils and anthropogenic deposits recorded in the geotechnical investigations and geoarchaeological borehole core samples. The evaluation aims to assess two significant horizons of potential. Firstly the upper anthropogenic deposits of made ground which may contain evidence of historic structures associated with the Royal Victoria Dock, and secondly the underlying floodplain deposits which hold potential for palaeoenvironmental remains and possible prehistoric activity.

By examining in detail the characteristics of the sedimentary units, the mode of deposition and the related environmental conditions of these deposits can be inferred. The geoarchaeological deposit modelling aims to reconstruct the sub-surface stratigraphy to identify major features of topography and thus gain information on the potential archaeological and palaeoenvironmental resource on the site. The sediments can also be assessed in relation to preservation potential, and the degree to which they will preserve a range of proxy environmental indicators (i.e. pollen, plant macro fossils, ostracods, diatoms and foraminifera) useful for past landscape reconstruction. All research is undertaken within the priorities established in the Museum of London's *A research framework for London archaeology*, 2002

A number of site specific aims and research questions for the archaeological investigations were first set out in the *specification for an archaeological evaluation* (Arup 2010, section 4.2). These are set out below;

- *What is the extent of the archaeological resource on this site and are they typical of the general area?*
- *What is the nature of the archaeological preservation conditions on site?*
- *Is there any evidence of prehistoric settlement activity on the site?*
- *Can it be demonstrated that there was continuous land utilisation between the Mesolithic and Iron Age eras, or was it intermittent and selective?*
- *What, if any, is the nature of Roman activity on the site and how does it help in defining the character of the roman landscape to the east of Roman Londinium?*
- *What, if any, is the nature of mid- to late-Saxon and Medieval activity on the site and how does it help in defining the character of topography then evidence in maps and documents?*
- *What is the character of Post-medieval to mid 19th century agricultural activities?*

- *What remain on site of the mid - late 19th century to mid 20th century dock side facilities including of the sheds, internal features and external railway infrastructure?*

- *What remain on site of the mid - late 19th century to early-mid 20th century light commercial and residential area and what potential do the remains offer to be related to historical documents about the habitants and living conditions?*

- *How does the archaeology on this site change our perception of the archaeological resource of this part of Newham?*

The information provided within this report is intended to enable an appropriate mitigation strategy to be recommended by the Local Planning Authority.

Note: within the limitations imposed by dealing with historical material, maps and geotechnical data the information in this document is, to the best knowledge of the author and MOLA, correct at the time of writing. Further archaeological investigation, more information about the nature of the present buildings, and/or more detailed proposals for redevelopment may require changes to all or parts of the document.

1.5 Palaeoenvironmental and Archaeological background

According to the BGS mapping of the area (Sheet No.257) the site is situated on the Thames alluvial floodplain. The basal Quaternary deposits consist of the Shepperton Gravel formation which was deposited during the last major cold stage of the Devensian Glaciation (c 18–15000 BP). These gravel deposits accumulated as mid channel bars within a cold climate unstable braided river system. The overlying deposits consist of variable sands, silts, clays and organic deposits which reflect the changing environment and riverine conditions occurring throughout the Holocene epoch (i.e. the last 10 000 years).

The basal floodplain gravels are usually found to be overlain by a series of sand and silts which represent the transition to a low energy meandering or anatomising river regime following the amelioration of the climate at the beginning of the Holocene. The sands and silts were deposited as lag sediments within lower lying threads and also as higher relief channel bars exposed during low flow discharge. Following stabilisation of the river system and localised channel incision in the early part of the Holocene, the higher relief channel bars developed into dry terrestrial landsurfaces, essential forming eyots within the floodplain suitable for occupation.

However, from the late Mesolithic (c 7000 BP), the rapid increase in sea levels began to impact on the fluvial regime further upstream. ‘Ponding back’, caused by the migration of the tidal head, increased the river levels substantially, leading to the accumulation of freshwater mudflats and peat deposits developing across waterlogged channel marginal areas. However, the Thames has not undergone a regular rise in river levels, but rather a sequence of regression and transgression events related to rising and falling sea levels. Thus minerogenic and organic peat deposits developed at different times at different locations and was dependant on topographic location, localised changes to hydrology, and the overall basin wide effects of relative sea level rise.

This sequence of peats, organic and minerogenic deposits preserve a range of environmental proxy indicators which can be used to reconstruct the past palaeoecology, fluvial geomorphology, and hydrology of the Thames during the last 10 000 years. These deposits provide an important resource in reconstructing and understanding the causes and effects of climatic and landscape change, and the environmental context in which human occupation and activity took place. These deposits also preserve indirect evidence of human activity such as woodland clearance, the onset of agricultural practises and wetland management and exploitation.

Wetland environments were particularly attractive to Prehistoric populations due to the range of subsistence resources these ecologies provided, and the importance of the river itself as a means of transport and communication. Evidence of prehistoric wetland exploitation has been found within the Thames alluvium in the form of trackways constructed to traverse the wetlands, as well as jetties, wharfs, fish traps and boats.

Although no archaeological or geoarchaeological work has been carried out in the immediate vicinity of the site one site undertaken to the south east does gives an indication of the depositional environments likely to be encountered on USC and also provides a possible chronology. Work undertaken on the West Silverton Urban Village (referred to in this report as WSUV; site code BWC96, Wilkinson *et al* 2000) identified a series of deposits related to the changing fluvial and environmental conditions present on the Thames floodplain during a large part of the Holocene epoch.

The basal deposits consisted of the Shepperton gravels which formed an elevated area of land occurring at *c* -1m OD. Just to the south east of USC a palaeochannel feature was identified which consisted of laminated silts and peat units. The palaeochannel was dated to the Late Glacial/Early Holocene and provided radiocarbon dates ranging form c 12000–10 000 BP. With the upstream effect of rising river levels wetland peat deposits, indicative of sedge fen and alder carr environments began to develop across the site from the Early Neolithic (c 6000 BP). This peat formation continued into the Iron Age (c 2000 BP), by which time the rate of rising sea levels outstripped the rate of peat formation. Consequently the site was inundated by intertidal muds indicative of salt marsh and mudflat environments. The organic deposits preserved on the site provided a palaeoenvironmental resource (i.e. pollen and plant macrofossils) which could be used to reconstruct the Neolithic to Bronze landscape.

In addition to the prehistoric potential of the alluvial deposits, the site also has the potential for post-medieval industrial archaeology within the made ground deposits. Such structures are likely to be associated with the Royal Victoria Docks which was constructed between 1853 top 1855. Immediately prior to this the site had existed as grassland floodplain meadows known on the historic maps as Plaistow marshes.

The first evidence of structures on the site occurs on the 1869 OS map, which shows a number of warehouses and sheds fronting onto the Royal Victoria docks. Residential buildings are also shown on the western periphery of the site. The 1896 map shows that the smaller warehouses and sheds were replaced by a large goods and coal depot which by 1910 was being utilised by the Midlands railway as a depot. In 1968 this structure was replaced by a second large warehouse which exited up until the 1990's. In addition to these structures cranes and railway sidings associated with these building may also occur on the site.

1.6 Preparation of the report

The results of the deposit model are discussed in section 3, in terms of the evolving Quaternary landscape on the site. The results were compared to what is already known about the geoarchaeology of the area (as summarised in section 1.5) and, as a result of the better understanding of the past landscape of the site itself, afforded by the deposit model, predictions have been made regarding key areas of potential for archaeology and the preservation of palaeoenvironmental remains (section 4). Based on the inferred impact of the proposed development on the archaeological resource, recommendations for further archaeological investigation (if required) are suggested in section 5.

2 The evaluation

2.1 Methodology

All archaeological and geoarchaeological on-site and off-site work, was carried out in accordance with the *Written Scheme of Investigation* (Halsey 2010), the MOLA *Archaeological Site Manual* (MOLA 1994), and where appropriate guided by the recommendations outlined in the *English Heritage Guidelines for Environmental Archaeology and Geoarchaeology* (EH 2002; 2004 respectively). The sections below outline the methodology employed during the monitoring of the geotechnical works, the geoarchaeological borehole survey, deposit recording and the off-site sub-surface deposit modelling.

2.1.1 Monitoring of the geotechnical investigations

The geotechnical works were monitored by a MOLA senior geoarchaeologist between the 27th July to 17th August 2010. All window samples and boreholes were undertaken by the geotechnical contractor Ian Farmers Associates Ltd. The geotechnical site investigation work initially consisted of 6 cable percussion boreholes (BH1A–BH6A) and 23 trial pits (TP1A–TP23A). A number of boreholes were either relocated or re-drilled due to obstructions or for geotechnical purposes. These are listed below.

- BH3A re-drilled as BH3B for geotechnical purposes. BH3B not monitored due to close proximity of BH3A *c* 2m south.
- BH4A abandoned at *c* 3m bgl due to obstruction. Re-drilled and monitored as BH4B *c* 2m north of BH4A position.
- BH5A abandoned at *c* 2.8m bgl due to obstruction. Re-drilled as BH5B c 2m west of BH5A position. BH5B abandoned at c 3.5m bgl due to obstruction. Re-drilled as BH5C. BH5C not monitored due to close proximity of geoarchaeological borehole MoLBH5.

The boreholes were recorded by retrieving blocks of consolidated or small grab samples of unconsolidated sediment at regular intervals (c 0.5m) to obtain as complete a seuqnce as possible. The depths of the samples were indicated by the driller. All drilling was monitored until the base of the Quaternary sequence was reached. Across the site the surface of the Eocene London Clay formed the base line for deposits of archaeological/palaeoenvironmental interest.

All the trial pits were excavated by machine. The majority of these test pits measured *c* 3m x 0.5m and varied in depth between *c* 0.5 to 3m depending on ground obstructions encountered. The test pits were monitored by observing, measuring and recording the deposits exposed from the adjacent ground surface and by examination of the spoil brought out of the test pit by machine bucket.

2.1.2 The geoarchaeological borehole survey

The geoarchaeological borehole survey was undertaken by PJ Drilling Ltd with a Dando 500 Terrier Rig fitted with a windowless core sampler under the supervision of a MOLA Senior Geoarchaeologist. The work was undertaken on the 17th August 2010. Five boreholes were undertaken in the footprint of geotechnical test pits on the western part of the site. The boreholes were placed to give a roughly north to south running transect. Continuous perspex core samples, 1m in length, were retrieved through the made ground deposits through to the Late Pleistocene/Early Holocene floodplain deposits. The cores were opened on site, cleaned and provisionally logged. Further detailed recording was undertaken at the MOLA geoarchaeological laboratory.

2.1.3 Deposit recording

All the soils, sediments and anthropogenic deposits observed within the geotechnical works and geoarchaeological boreholes were described according to standard sedimentary criteria, as outlined in Jones *et al* (1999) and Tucker (1982). This attempts to characterise the visible properties of each deposit, in particular relating to its colour, compaction, texture, structure, bedding, inclusions, clast-size, and dip. For each profile recorded in the boreholes and test pits, every distinct unit was given a separate number (e.g. for BH4A: 4A.1, 4A.2 etc from the top down) and the depth and nature of the contacts (where possible) between adjacent distinct units was noted. The geotechnical test pits and boreholes were given the prefix USC (derived from the site code USC10). The geoarchaeological boreholes were given the additional prefix MoL (Museum of London) i.e. USCMoLBH1 etc.

2.1.4 Deposit model construction

2.1.4.1 Geoarchaeological background

In order to understand the context of the deposits existing on the site, information has been examined from:

- Past archaeological and palaeo-environmental work undertaken in the area
- British Geological Survey maps and other sources describing the characteristics of the bedrock, soils and substrate in the area
- Ordnance Survey and other mapping illustrating the modern landscape characteristics and topography of the area
- Historic maps and other sources suggesting the past landscape characteristics of the area (taken from Geotechnical desk study, Arups 2010)

2.1.4.2 The stratigraphic data

The data from the boreholes and test pits was logged in table format and entered into a digital (Rockworks 2006) database. Previous geotechnical/geoarchaeological data held in the MOLA 'Silvertown and Greenwich' Rockworks database was also added, along with data from a site investigation report supplied by Arups (Symonds, 2002). The 'Silvertown and Greenwich' database contains useful comparative data taken from investigations undertaken on West Silvertown Urban Village (WSUV, Wilkinson *et al* 2000). The distribution of the data points is illustrated on Fig 2. The recent geotechnical ground investigation work carried out by Ian Farmers Associates Ltd and the geoarchaeological boreholes undertaken by MOLA are highlighted in red on this figure. Previous data points are shown in light blue.

Each lithological component in a recorded sequence (gravel, sand silt etc) was given a colour and a pattern and, as a result, the two major variables of any deposit were stored in the RW2006 database and used to construct the deposit model. A series of working cross-sections (transects: vertical slices through the sub-surface stratigraphy) were drawn through the data points to examine the relationship laterally and vertically between each sedimentary sequence. By examining the relationship of the lithological units within each sedimentary sequence correlations can be made between soils and sediments, and associations grouped together on a site-wide basis. The grouping of these deposits is based on the lithological descriptions, grain size and formation process. Thus a sequence of stratigraphic units or 'facies' can be reconstructed both laterally and through time for the site. Facies are defined as laterally equivalent bodies of sediment with distinctive characteristics representative of certain depositional environments and landforms. Six distinct facies were identified on or adjacent to the site. These are discussed in detail in section 3.

The transects drawn through the borehole profiles form a major means of illustrating the buried stratigraphy in this report, and two transects (see Fig 3 and Fig 4) were selected to illustrate the stratigraphic sequence and distribution of deposits across the site. A key to the lithostratigraphy and the facies associations is provided with the transect figures. Where possible, landscape features (such as palaeochannels, and 'islands') have been identified and their changing morphology, or influence on the pattern of deposit accumulation inferred.

The Rockworks data was transferred to Arc GIS v.9.3 where the Spatial Analyst module was used to create a number of surface and thickness plots using the inverse distance weighted modelling function. These are included as illustrations in the report and include the:

- 'Early Holocene surface' (Fig 5), which plots the surface topography of the Pleistocene gravels, and the Early Holocene fine grained deposits. This gives an approximation of the topography of the site as it existed at the beginning of the Holocene period (i.e. the early Mesolithic, *c* 10 000 years ago). The development of the Holocene floodplain is likely to have been influenced by the gravel topography inherited from the Pleistocene period. This surface would have dictated the course of later channels, with gravel high points forming areas of dry land within the wetlands, and lower lying areas forming the main threads of later channels. Only data which extended to the level of the floodplain gravel was used to create this surface plot.

- 'Surface of floodplain deposits' (Fig 6), which indicates the depth at which deposits of palaeoenvironmental significance will be impacted upon.

- 'Thickness of made ground' (Fig 7) which indicates the extent of the anthropogenic deposits which currently overlies the floodplain deposits. These deposits may contain evidence of historic structures associated with Royal Victoria Docks. Only geotechnical data points which extended to the base of the made ground were used to calculate the thickness.

2.2 Results

The lithological units recorded within each borehole and test pit are presented in tabulated form below. The facies numbers refer to the discussion of the deposits in section 3.

2.2.1 Geotechnical test pits

Table 1: Deposits recorded in USCTP1A

Ground level: 4.55m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.12	1A.1	Loose light brown **topsoil**	Modern made ground	**6**
0.12–0.8	1A.2	Loose mid brown **silty clay** with frequent brick and concrete rubble and occasional small to medium gravel		
0.8–3	1A.3	Loose dark grey **silty sand** with occasional brick fragments and frequent small to large slate fragments		

Table 2: Deposits recorded in USCTP2A

Ground level: 3.24m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.1	2A.1	Loose light brown **topsoil**	Made ground with redeposited alluvium (unit 2A.4)	**6**
0.1–1.4	2A.2	Loose mid brown **silty clay** with occasional sand. Occasional fine to medium angular, sub-angular and sub-rounded gravel. Frequent small to large concrete and brick rubble. Occasional slag, plastic and pot fragments		
1.4–1.65	2A.3	**Concrete** slab		
1.65–2	2A.4	Loose dark grey/black **silty clay** with lenses of mid bluish grey clay. Occasional clinker		

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
		and fine to medium sub-rounded, sub-angular gravel with occasional clinker.		
1.24m OD				
2–2.75	2A.5	Very firm mid bluish grey **clay** with frequent light to mid greenish grey mottling. Frequent manganese (Mn) staining in upper part.	Overbank flooding forming acrretionary gleyed alluvial soils	**5**

Table 3: Deposits recorded in USCTP3A

Ground level: 4.77m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.12	3A.1	Tarmac	Made ground	**6**
0.12–2.7	3A.2	Loose heterogeneous deposit consisting of light grey **silt** with fine **sand**, with frequent small to large brick and concrete rubble. Occasional lenses of light yellowish brown fine sand.		

Table 4: Deposits recorded in USCTP4A

Ground level: 2.62m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.1	4A.1	Loose light brown **topsoil**	Made ground	**6**
0.1–1.05	4A.2	Loose light brown **silty clay** with occasional fine to medium angular, sun-angular and sub-rounded gravel. Occasional glass, pot and brick fragments		
1.05–1.35	4A.3	Concrete slab		
1.35–2	4A.4	Firm mid bluish grey **clay** with occasional Mn staining. Occasional small to medium rounded, sub-rounded gravel. Metal pipe observed at c 2m bgl	Redeposited alluvium	

Table 5: Deposits recorded in USCTP5A

Ground level: 1.74m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.10	5A.1	Friable light brown **topsoil**	Made ground	**6**
0.10–3	5A.2	Loose heterogeneous deposit consisting of **clayey gravels** and **sand** with frequent brick and concrete fragments		

Table 6: Deposits recorded in USCTP6A

Ground level: 5.98m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.3	6A.1	Concrete slab	Made ground above partially demolished structure	**6**
0.3–1.5	6A.2	Loose mid brown **silty clay** with frequent small to large brick fragments		
1.5–2	6A.3	Loose dark grey **silty sandy clay** with frequent small to large angular, sub-angular and sub-angular gravel. Frequent whole brick fragments. Wall observed at c 1.8m bgl. Forms a curvilinear structure towards northern part of trench, consisting of two courses of un-frogged bricks. Bricks measures 225mm x 110mm x 80mm. Structure sits on concrete base at c 2m bgl		

Note concrete slab c 1.1m in depth exists on east facing side of trench.

Table 7: Deposits recorded in USCTP7A

Ground level: 5.54m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.2	7A.1	Concrete	Made ground	**6**
0.2–2.6	7A.2	Loose mid to light brown **silty clay** with occasional sand, with occasional small to medium rounded, sub-rounded and sub-angular gravel		
2.6–3	7A.3	Loose small to medium rounded, sub-rounded and sub-angular **gravel**		

Table 8: Deposits recorded in USCTP8A

Ground level: 5.66m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.2	8A.1	Concrete slab	Modern made ground	**6**
0.2–0.7	8A.2	Mid to dark brown loose **silty clay** with occasional fine sand within the matrix. Frequent red/yellow large brick fragments. Occasional concrete, occasional fine gravel, occasional pot fragments		
0.7–1.3	8A.3	Loose black gritty clinker in a **silty clay** matrix. Occasional small to large brick and stone fragments	Industrial waste	
1.3–1.7	8A.4	Soft mixed deposit of light to dark bluish grey **clay** with dark brown detrital humified peaty clay. Lenses of light brown iron stained silty clay	Redeposited peat and alluvium	
1.7–3.2	8A.5	Soft dark brown **clayey peat** with frequent large wood (alder and oak) fragments. Frequent detrital humified plant fragments. Occasional lenses of light blue clay		

Table 9: Deposits recorded in USCTP9A

Ground level at: 5.67m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.1	9A.1	Concrete slab	Modern made ground	6
0.1-1.5	9A.2	Dark greyish brown friable **silty clay** with moderate small to medium brick/tile fragments. Moderate rounded, sub-rounded fine to medium gravel. Frequent large yellow and red brick fragments in upper 0.3m of unit		
1.5–3.2	9A.3	Soft mid to dark grey **clay silt** with frequent pockets of dark brown humified **clayey peat**. Occasional large lignified wood fragments. Lenses of yellowish brown fine silty sand. Occasional fine to medium rounded gravel in lower 0.2m of unit	Redeposited alluvium and peat	

Table 10: Deposits recorded in USCTP10A

Ground level at: 5.55m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.2	10A.1	Loose pale yellowish brown fine **sand**	Made ground with lower redeposited alluvium and peat (units 10A.5, 10A.6)	6
0.2–0.5	10A.2	Concrete slab over fine light grey **sand** with frequent brick fragments		
0.5–1	10A.3	Dark brown **silty clay**, with occasional small to large brick and concrete fragments		
1–1.5	10A.4	Loose black **silty clay** with occasional brick fragments		
1.5–1.7	10A.5	Mid brown **peaty clay**. Appears disturbed		
1.7–2	10A.6	Firm light grey **sand silt** with occasional small wood fragments		

Table 11: Deposits recorded in USCTP11A

Ground level: 4.95m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.6	11A.1	Tarmac over loose orangey brown **gravel** and **sand** hardcore	Made ground with redeposited alluvium (unit 11A.4)	**6**
0.6–1.4	11A.2	Loose light brown **sandy silty clay** with frequent small to large concrete and brick fragments		
1.4–1.8	11A.3	Loose dark grey gravelly si**lty sandy clay** with frequent ash		
1.8–2	11A.4	Firm dark blue to brown **silty clay** with frequent large wood fragments		

Table 12: Deposits recorded in USCTP12A

Ground level: 4.83m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.5	12A.1	Tarmac over loose orangey brown **gravel** and **sand** hardcore	Made ground	**6**
0.5–0.8	12A.2	Concrete slab		
0.8–1.65	12A.3	Loose dark brown **sandy silty clay**, with frequent gravel and ash		
1.65–2.2	12A.4	Firm dark brown **sandy silty clay** with frequent brick fragment, slate and glass		

Table 13: Deposits recorded in USCTP13A

Ground level: 2.17m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.4	13A.1	Loose light brown **silty clay** with frequent fine to coarse rounded, sub-rounded and sub-angular gravel. Moderate large brick rubble fragments	Made ground with redeposited alluvium	**6**
0.4–0.9	13A.2	Concrete slab over light yellowish pink sand and hardcore		
0.9–1.5	13A.3	Loose ash and clinker fill		
1.5–1.8	13A.4	Firm mid brown **silty clay** with occasional fine gravel and brick fragments		
0.37m OD				
1.8–2.2	13A.5	Firm bluish grey **silty clay**	Gleyed alluvial soil	**5**

Table 14: Deposits recorded in USCTP14A

Ground level: 2.97m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–1.1	14A.1	Loose light brown **silty clay** with frequent fine to coarse rounded, sub-rounded and sub-angular gravel. Moderate large brick rubble fragments	Modern made ground	**6**
1.1–1.2	14A.2	Compacted brick/concrete rubble in a light brown silty clay matrix. Moderate small to medium rounded and sub-rounded gravel		
1.2–1.5	14A.3	Concrete slab		
1.5–1.9	14A.3	Loose dark ashy clinker fill		
1.9–2.2	14A.4	Firm dark bluish grey **silty clay**, with occasional grit	Redeposited alluvium	
0.77m OD				
2.2–3	14A.5	Firm bluish grey **silty clay**	Gleyed alluvial soil	**5**

Table 15: Deposits recorded in USCTP15A

Ground level: 2.36m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.9	15A.1	Loose light brown **silty clay** with frequent fine to medium rounded, sub-rounded and sub-angular gravel, occasional brick fragments	Modern made ground	**6**
At 0.9	15A.2	Concrete slab		

Table 16: Deposits recorded in USCTP16B

Ground level: 2.72m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0-0.1	16A.1	Loose light brown **topsoil**	Modern made ground	**6**
0.1-1.2	16A.2	Loose light greyish brown **silty clay** with frequent rounded, sub-rounded, sub-angular fine to coarse gravel. Moderate brick fragments, and occasional large concrete fragments		
1.2–1.5	16A.3	Concrete slab		
1.5–2	16A.4	Loose light brownish yellow **sandy silty clay** with occasional brick and gravel. Cable observed in western end		

Table 17: Deposits recorded in USCTP17A

Ground level: 2.58m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0-0.1	17A.1	Loose light brown **topsoil**	Modern made ground	**6**
0.1-1	17A.2	Loose light greyish brown **silty clay** with frequent rounded, sub-rounded, sub-angular fine to coarse gravel. Moderate brick fragments, and occasional large concrete fragments		
At 1m	17A.3	Concrete slab		

Table 18: Deposits recorded in USCTP18A

Ground level: 2.44m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0-0.1	18A.1	Loose light brown **topsoil**	Made ground	6
0.1–1.05	18A.2	Loose mid to light grey **silty clay** with moderate small to medium sub-rounded, sub-angular and rounded gravel. Occasional slag, glass, and pot fragments		
1.05–1.4	18A.3	Concrete slab over pale brownish yellow **sand** and hardcore		
1.4–1.9	18A.4	Loose black ashy fill with frequent brick and gravel		
1.9–3	18A.5	Soft slightly **sandy clay** with frequent ash		
-0.56m OD				
3–3.2	18A.5	Firm mid brown **silty clay** with blocky ped structure and frequent Fe staining	Possible *in situ* alluvium, forming weathered accretionary soil	5

Table 19: Deposits recorded in USCTP19A

Ground level: 2.23m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.75	19A.1	Loose light brown **silty clay** with frequent rounded, sub-rounded, and sub-angular gravel. Occasional small to medium brick and concrete fragments	Modern made ground	6
At 0.75	19A.2	Concrete slab		

Table 20: Deposits recorded in USCTP20A

Ground level: 2.15m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.7	20A.1	Loose light brown **silty clay** with frequent fine to medium rounded, sub-rounded and sub-angular gravel. Frequent brick and concrete rubble, occasional pot, glass and slag	Modern made ground	**6**
0.7–0.9	20A.2	Concrete slab		
0.9–2	20A.3	Dark grey gravelly **sand** with ash and clinker		

Table 21: Deposits recorded in USCTP21A

Ground level: 1.98m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.1	21A.1	Loose light brown **topsoil**	Modern made ground	**6**
0.1–1.3	21A.2	Loose light brown **silt clay** with frequent rounded, sub-rounded and sub-angular fine to coarse gravel. Moderate brick and concrete fragments, occasional slag, plastic. Tends towards a dark brown friable silty clay with depth		
1.3–1.7	21A.3	Loose concrete and brick rubble		
0.28m OD				
1.7–2	21A.4	Firm dark bluish grey **clay** with Mn staining. Upper part displays weathering and mid orangey brown Fe staining along root channels and ped faces	Gleyed alluvial soil	**5**

Table 22: Deposits recorded in USCTP22A

Ground level: 5.57m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.45	22A.1	Loose frequent angular, sub-angular small to medium stone in a light grey **silt** matrix	Modern made ground	**6**
0.45–0.55	22A.2	Tarmac		
0.55–0.85	22A.3	Loose light brown **silty clay** with frequent small to large yellow brick fragments.		
0.85–1.15	22A.4	Firm dark grey gravelly **silty clay** with frequent brick and tile fragments		
At 1.15	22A.5	Concrete slab		

Table 23: Deposits recorded in USCTP23A

Ground level: 5.04m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.20	23A.1	Concrete	Modern made ground	**6**
0.20–1.5	23A.2	Loose dark greyish brown **gravelly sand** with occasional concrete and brick fragments		

Hand augured pit down to 1.5m bgl. Obstruction hit.

2.2.2 Geotechnical boreholes

Table 24: Deposits recorded in USCBH1A

Ground level: 2.68m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–1.5	1A.1	Loose light brown **silty clay** with frequent rounded, sub-rounded and sub-angular fine to medium gravel	Made ground	6
1.5–1.7	1A.2	Concrete		
1.7–2.5	1A.3	Firm heterogeneous deposit of dark bluish grey **clay** with manganese (Mn) oxide flecks. Mixed with mid brown **sandy silt**. Occasional to moderate small to medium rounded, sub-rounded and sub-angular gravel. Occasional brick and concrete fragments	Redeposited alluvium and made ground	
0.18m OD				
2.5–3	1A.4	Firm dark bluish grey **silty clay**. Blocky ped structure with Mn staining on ped faces	Gleyed alluvium. Accretionary floodplain soil, with evidence of pedogenesis	5
3–3.5	1A.5	Firm mid grey **silty clay**, with frequent mid orangey brown mottling (Fe staining) on ped faces		
-0.82m OD				
3.5–5.5	1A.6	Soft mid grey finely laminated **clay silt**, with mica flecks. Occasional detrital plant fragments	In channel fluvial sediments	3
-2.82m OD				
5.5–10	1A.7	Dark grey lose coarse **sand** with fine rounded and sub-rounded **gravel**. Gravel content increase with depth. London clay at 10m bgl	Shepperton Gravels	1

Table 25: Deposits recorded in USCBH2A

Ground level: 4.95m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–1.2	2A.1	Crushed concrete rubble	Modern made ground derived from demolition material and ground make up	6
1.2–1.5	2A.2	Soft mid grey **sandy silt** with occasional fine to medium rounded, sub-rounded gravel		
1.5–2.5	2A.3	Firm heterogeneous deposit consisting of mid brown/mid greyish brown **clay silt** and **sandy clay**, with frequent fine to medium rounded, sub rounded and sub-angular gravel. Occasional brick fragments		
2.5–4.5	2A.4	Soft mixed deposit consisting of dark brown humified **organic clay**, with occasional detrital plant fragments. Contains lenses of pale bluish grey clay silt.	Redeposited peat and alluvium	
0.42m OD				
4.5–5.5	2A.5	Firm pale bluish grey **clay** with fine whitish calcareous flecking. Occasional Mn flecking. Fine ped structure	In channel fluvial deposits	3
5.5–8	2A.6	Soft very finely laminated **clay silt**. Occasional detrital organics and phragmities stems. Contains increasing quantities of fine to medium sand with depth		
-3.05m OD				
8–8.6	2A.7	Soft mid grey fine **silty sand**	Fluvial sands	2
-3.65m OD				
8.6–13.6	2A.8	Loose mid to dark greenish grey **sandy gravel**. Gravel rounded, sub-rounded and sub-angular	Shepperton Gravels	1
-8.65m OD				
At 13.6	2A.9	Stiff grey fissured **clay**	Eocene London Clay	N/a

Table 26: Deposits recorded in USCBH3A

Ground level: 1.98m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.6	3A.1	Loose light brown **gravelly sand** with occasional brick fragments	Modern made ground	6
0.6–0.9	3A.2	Concrete		
0.9–1.3	3A.3	Loose black **sandy** ash fill with frequent small to medium brick fragments		
1.3–2	3A.4	Soft black **sandy silty clay** with frequent small to large brick fragments		
-0.02m OD				
2–3.9	3A.5	Soft mottled mid brown/mid grey slightly sandy **silty clay**	Partially weathered accretionary alluvial soils	5
-1.92m OD				
3.9–5.10	3A.6	Soft mid grey finely laminated very fine **clay silt** with occasional sand	In channel fluvial deposits	3
-3.12m OD				
5.10–10.3	3A.7	Loose mid greyish brown **sandy gravel**. Sand fine to coarse, gravel fine to medium rounded, sub-rounded and sub-angular	Shepperton Gravels	1
-8.32m OD				
At 10.3	3A.8	**Stiff** fissured ,mid grey **clay**	Eocene London Clay	N/a

Redrillled as 3B 2m east for geotech purposes. Not observed

Table 27: Deposits recorded in USCBH4B

Ground level: 4.81m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–0.4	4B.1	Concrete slab	Made ground	6
0.4–4	4B.2	Loose heterogeneous deposit consisting of black/brown gravelly **silty clay** and **sand**, with frequent brick fragments and frequent small to medium rounded, sub-rounded and sub-angular gravel		
4–4.3	4B.3	Firm bluish grey **clay** with frequent Mn flecking. Occasional small brick	Redeposited alluvium	

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
		fragments		
0.51m OD				
4.3–5	4B.4	Firm mottled light grey/greenish grey **clay**. Occasional orangey brown Fe staining along fine root channels and on ped faces	Partially weathered alluvial accretionary soil	**5**
-0.19m OD				
5–7.5	4B.5	Soft finely laminated dark grey very fine **silty sand**	In channel fluvial sediments	**3**
-2.69m OD				
7.5–12.7	4B.6	Loose dark grey **sandy gravel**. Gravel fine to medium rounded and sub-rounded clasts	Shepperton Gravels	**1**
-7.89m OD				
At 12.7	4B.7	Mid grey **stiff** fissured **clay**	Eocene London clay	**N/a**

4A abandoned at 3m bgl due to obstruction

Table 28: Deposits recorded in USCBH5A

Ground level: 5.24m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–2.8	5A.1	Loose mid brown silty clay with frequent small to medium brick fragments, freq small to medium rounded, sub-rounded and sub-angular gravel. Occasional light yellowish brown fine silty sand. Obstruction hit a 2.8m bgl.	Made ground	**6**

Redrilled as BH5B
Obstruction hit at *c* 3.5m bgl. Upper fills same as BH5A

BH5C drilled in same location as USCMoLBH5. Not observed

Table 29: Deposits recorded in USCBH6A

Ground level: 3.40m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–1.5	6A.1	Loose light brown **silty clay** with frequent small to medium rounded, sub-rounded and sub-angular gravel, with occasional brick fragments occasional concrete rubble. Occasional clay pipe, pot and slag fragments	Made ground	**6**
1.5–5	6A.2	Loose dark brown **silty clay** with occasional small to medium rounded, sub-rounded and sub-angular gravel.		
-1.6m OD				
5–6.1	6A.3	Firm dark grey/mid orangey brown **clay** with occasional small to medium rounded and sub-rounded gravel	In channel fluvial deposits	**3**
6.1–7	6A.4	Soft slightly laminated **clay silt** with frequent detrital plant remains and phragmities stems		
7–7.6	6A.5	Soft dark grey finely laminated fine **sandy silt**		
-4.2m OD				
7.6–11.4	6A.6	Loose dark grey **sandy gravel**. Gravel fine to medium rounded, sub-rounded and sub-angular. Coarsens upwards with depth	Shepperton Gravels	**1**
-8m OD				
At 11.4	6A.7	Stiff fissured grey **clay**	Eocene London Clay	**N/a**

2.2.3 Geoarchaeological boreholes

Table 30: Deposits recorded in USCMoLBH1

Undertaken within footprint of USCTP14A

Ground level: 2.97m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–2.24	1.1	Test pit backfill	Made ground	**6**
Sharp				
0.73m OD				
2.24–2.48	1.2	Firm dark bluish grey **clay** with frequent Mn staining and fine blocky ped structure	Lower unit 1.3 derived from intertidal muds. Grades into accretionary floodplain soils	**5**
Diffuse				
2.48–3.92	1.3	Firm mid bluish grey **clay** with occasional light greenish mottling. Fairly homogenous, with occasional Mn staining. Occasional calcareous flecking with depth. Backfill between 3–3.56m bgl		
Diffuse				
-0.95m OD				
3.92–5.96	1.4	Soft mid grey **clay silt**. Very finely laminated, wavy, parallel, discontinuous boundaries. Occasional discreet lenses of dark brown organic silt. Occasional detrital plant fragments. Occasional fine sand, increasing frequency with depth. Wood fragment observed at base	In channel fluvial deposits	**3**
Sharp				
-2.99m OD				
5.96–6.6	1.5	Loose mid grey medium **sand**. Massive and well sorted. Occasional wood fragments and detrital plant fragments observed.	Fluvial sands	**2**
Sharp				
-3.63m OD				
6.6–7	1.6	Loose mid grey fine to medium rounded, sub-rounded and sub-angular **gravel**. Moderately well sorted. Occasional reworked/rip up clasts of mid brown organic clay silt	Shepperton floodplain gravels	**1**

Table 31: Deposits recorded in USCMoLBH2

Undertaken in footprint of USCTP13A
Ground level: 2.17m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–2.5	2.1	Test pit backfill	Made ground	**6**
Sharp				
-0.33m OD				
2.5–2.7	2.2	Firm mottled mid grey/light orangey brown **clay** with frequent Fe staining	Partially weathered alluvial soil	**5**
Diffuse				
2.7–3	2.3	Firm pale bluish grey gleyed **clay** with occasional Fe staining		
Contact not visible				
-0.83m OD				
3–4.38	2.4	Core backfilled btw 3–3.3m bgl. Very soft very finely laminated **clay silt**, with occasional thin discontinuous mid brown organic silt lenses. Occasional detrital organics, occasional fine sand	In channel fluvial deposits	**4**
Contact not visible				
4.38–4.95	2.5	Soft finely laminated **clay silt** with occasional discontinuous thin lenses of fine pale grey silt		
Diffuse				
-2.78m OD				
4.95–5	2.6	Loose mid grey well sorted medium **sand**	Fluvial sands	**2**

Table 32: Deposits recorded in USCMoLBH3

Undertaken within footprint of USCTP16A
Ground level: 2.72m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–2.4	3.1	Test pit backfill	Made ground	**6**
Sharp				
0.32m OD				
2.4–3	3.2	Firm mottled mid greyish green/light brown **silty clay** with blocky ped structure.	Partially weathered alluvial soil	**5**
Contact not observed				
-0.28m OD				
3–5.6	3.3	Soft bluish grey finely laminated **clay silt**. Occasional discontinuous lenses of fine silt laminar. Occasional detrital organics. Slight mid brown Fe mottling in upper part. Core backfilled between 3–3.57, 4–4.5 and 5–5.47 m bgl	In channel fluvial deposits	**3**
Diffuse				
5.6–5.77	3.4	Soft interbedded fine light grey silts and **clay silts** with occasional detrital organics		
Sharp				
-3.05m OD				
5.77–5.93	3.5	Loose well sorted pale grey **sand** with rip-up clasts of mid grey clay silt and mid brown organics	Fluvial sands	**2**
Sharp				
-3.21m OD				
5.93–6	3.6	Loose dark grey moderately well sorted small to medium rounded, sub-rounded and sub-angular **gravel**	Shepperton floodplain gravels	**1**

Table 33: Deposits recorded in USCMoLBH4

Undertaken within footprint of TP18A
Ground level: 2.44m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–3.6	4.1	Test pit backfill	Made ground	**6**
Sharp				
-1.16m OD				
3.6–5.9	4.2	Very soft black/dark grey very finely laminated **clay silt** with occasional detrital organics. Core backfilled between 5–5.6m bgl	In channel fluvial sediments	**3**
Sharp				
-3.46m OD				
5.9–6	4.3	Consolidated dark grey well sorted medium **silty sand**. Occasional small wood fragments present	Fluvial sands.	**2**

Table 34: Deposits recorded in USCMoLBH5

Undertaken within footprint of USCTP20A
Ground level: 2.15m OD

Depth below ground level (m)	Unit No.	Description	Interpretation	Facies
0–3.85	5.1	Test pit backfill and made ground	Made ground	**6**
Sharp				
-1.7m OD				
3.85–4.97	5.2	Soft dark grey finely laminated **clay silt** with occasional lenses of very fine silty sand	In channel fluvial sediments	**3**
Sharp				
-2.82m OD				
4.97–5	5.3	Loose dark grey well sorted fine medium **sand**	Fluvial sands	**2**

3 Discussion on site stratigraphy

The deposits are discussed in terms of the defined facies associations, from the oldest to the most recent. The facies units and lithology recorded within the boreholes are illustrated in the transects drawn across the site (see Fig 3 and Fig 4). A key to the facies associations and the individual lithology is provided with the transect. Dates in BP (before present, i.e. before 1950) are quoted in calendar years. Where specific radiocarbon dates are referred to lab references are given along with the publication and/or report reference. Definitions for the geoarchaeological terms highlighted in bold are given in section 7.

3.1 Facies 1: Late Pleistocene Shepperton floodplain gravels c 18 000–15 000 BP

The basal deposits across the site consist of predominately mid greyish brown moderately sorted sandy gravels. These deposits are associated with the **Shepperton Gravel** formation and accumulated within a cold climate **braided** river environment during the **Last Glacial Maximum** of the Late Devensian (Gibbard, 1985, 1994). The accumulation of these gravels occurred during a final phase of floodplain incision and aggradation before the present temperate **Holocene** epoch.

The surface of these gravels essential form the base line topography of the early Holocene surface (Fig 5), and formed in response to the fluvial conditions prevalent in such braided riverine environments. The morphology of braided river systems consists of high relief longitudinal bedforms (or channel bars) interspersed with lower lying channel threads infilled with gravel lag deposits or finer grained sands (Miall 1985, 1996). These environments are characteristically unstable and are constantly subjected to rapid channel shift and bank erosion (Gibbard & Lewin, 2002). This results from a high sediment supply coupled with high discharges and stream power occurring during the seasonal melts of the periglacial landscape.

With the amelioration of the climate during the **Late Glacial**/Early Holocene transition discharge rates began to stabilise leaving behind a relict gravel topography consisting of these gravel highs and low points. This gravel topography dictated the course of later channels and influenced patterns of fluvial activity and sediment accumulation through to the mid Holocene period. Across the site itself the gravel topography occurs at *c* -2.7m OD towards the north sloping gently down in the centre to *c* -3.2m OD. On the southern periphery of the site a marked drop occurs to *c* -4.6m OD in the south.

The plot of the Early Holocene surface places this topography into a wider landscape setting. Beyond the north east of the site in the vicinity of Victoria Dock station the gravel topography rises to c -1 to -0.5m OD. Beyond the south east a similar level of raised gravel topography exists. When considered with this landscape the site itself appears to lie within a former channel thread which may be associated with a former course of the Lea rather than the Thames. The present course of the Lea flows c 400m to the west of the Lea, and it is therefore likely that the site fell within the wider braidplain of the Lea during the late Pleistocene period. The gravel low which exists on the southern periphery of the site is projected from the geotechnical data to roughly form a main channel thread flowing on a north east to south west axis. This channel thread probably forms a remnant of the braidplain surface although partially incision into the relict braidplain surface during the Late Glacial/Early Holocene transition may have enhanced this feature.

3.2 Facies 2: Late Glacial/Early Holocene (Late Upper Palaeolithic, Mesolithic) fluvial sands *c* 15000–12000 BP

In a small number of the boreholes a well sorted pale grey fine to medium sand was noted above the gravels. This sand appeared to be infilling slightly lower lying areas in the gravel topography. It was not recorded in all the geotechnical boreholes in similar topographic locations although this in part is probably due to the coring method (cable percussion, which retrieves unconsolidated loose sand and gravel aggregate), or because previous geotechnical investigations across the site were not geoarchaeologically monitored. The deposit was fairly ephemeral measuring no more than a few 10's of centimetres in thickness. This facies does represent a marked change in fluvial style and may be associated with stabilised flow conditions occurring during more temperate episodes, with a transition from a braided to multi threaded channel environment.

Gravel deposition associated with the Shepperton gravels is thought to have ceased at c 15 500 BP (Sidell, et al, 2000). The cessation of gravel sedimentation is often associated with the transition into the Late Glacial **Windermere/Allerød** interstadial (*c* 15 500 to 13 000 BP). This temperate period saw rapid climate amelioration resulting in a reduction in discharge rates and a drop in the capacity of the river to carry coarse grained sediment. A stabilisation in flow conditions coupled with lower stream power results in the accumulation of such well sorted sand deposits (Miall 1996). Transitions from gravel to sand bedloads are often correlated with the temperate climate of the Windermere interstadial, with many low land rivers experiencing changes in behaviour and style as a result of this climatic oscillation (Gao *et al*, 2007).

However, attributing these deposits to the Windermere interstadial is problematic for two reasons. Firstly, in the London area the Windermere interstadial proves to be elusive in the fluvial record. The channels of the Windermere interstadial are thought to have respected the braided form of the preceding Devensian, and may even have incised into the braidplain in some cases (Sidell *et al*, 2000). This incision resulted from the stabilising affect of bankside vegetation reducing sediment input. Where accumulation did occur, subsequent erosion may have been caused by the rejuvenated, and highly destructive fast flowing braided rivers of the subsequent **Younger Dryas/Loch Lomond** Stadial (*c* 13–11 500 BP, Rose 1995). These sand deposits may be of a later early Holocene date, and simply represent the reduction of stream power occurring during the transition form the Younger Dryas to the Early Holocene period.

Of particular note is the presence of eroded rip clasts of organic sediment within the sand matrix. These organic deposits are likely to represent material eroded from backswamp or channel marginal areas and could provide radiocarbon dateable material to establish a rough chronology for the sand deposition.

3.3 Facies 3: Late Glacial to Mid Holocene (Mesolithic to Iron Age?) fluvial fine grained deposits with lenses of organic silts and clays *c* 12 000–2000 BP

The most laterally consistent deposit recorded across the site consisted of a series of very finely laminated fine clay silts and very fine sands interspersed with discontinuous very fine lenses of organic silts and clays. Detrital organics were observed throughout the deposits. The majority of the organic lenses occurred within the lower part of the deposit, tending towards a more minerogenic unit at the top of the profile. The top of this facies (when observed geoarchaeologically) occurred at a fairly consistent level of *c* -1m OD, and measured *c* 2m in thickness.

Previous work undertaken on West Silverton Urban Village (WSUV, Wilkinson *et al* 2000) gives an indication of the depositional environment of this facies and also provides a possible chronology through radiocarbon dating. One of the boreholes undertaken on this site (see borehole WSUVBH8 Fig 3 and Fig 4) recorded a series of similar thickly laminated minerogenic deposits interspersed with organics which occurred between *c* -2.5m to -1.4m OD. The deposits were thought to represent phases of in channel fluvial activity, separated by episodes of channel cut-off and the formation of partially vegetated backswamp environments. This activity was thought to be associated with a single thread palaeochannel, the position of which correlates with the low lying gravel topography as suggested by the topographic plot of the early Holocene surface. A number of radiocarbon dates taken from the base of this deposit at between *c* -2.5 to -2.2m OD indicated a date of *c* 12 800–10 300 BP, which corresponds with the Late Glacial/Early Holocene transition. A palynological analysis of these deposits indicated the transition from the open tundra scrub land of the cold climate Late Glacial, to the colonisation of more thermophilious species such as pine and birch reintroduced from their glacial refugia.

Given the similarity of the deposits and the level at which these occur a correlation with the laminated deposits on USC and the WSUV site can be tentatively made. Given that these laminated deposits on USC occur at *c* -3m OD, these deposits may preserve a longer record of environmental change than those observed on WSUV. In addition to this these deposit extend to a height of -1m OD which corresponds with a level of peat formation observed on the WSUV site (see section 3.4). This points to continued channel activity on site while the alder carr wet woodlands developed on the higher interfluves towards the south east of the site.

A degree of caution should also be taken when cross correlating these deposits with those observed on WSUV. As discussed above the site does lie within an area of low lying topography which possibly formed an active part of a channel belt associated with the Lea throughout most of the Holocene period. This environment is likely to have been highly dynamic with episodes of not only deposition but also erosion. It is therefore possibly that the lower lying laminated deposits observed on the site may be of an older or later date than those observed on WSUV. The upper part of the facies may date to the Iron Age as inferred from radiocarbon dating undertaken on WSUVBH8 (see section 3.5).

3.4 Facies 4: Mid Holocene peat formation (Neolithic to Early Iron Age) c 6000–3000 BP

This facies was not recorded on the USC site itself, but was recorded during the investigations on WSUV across the raised gravel topography towards the south east of the site. However, consideration is given here to this facies as it aids in understanding the sedimentary sequence recorded on the USC site and its landscape position within the wider floodplain.

Across WSUV this facies consisted of a sequence of humified and woody peats indicative of sedge fen and alder **carr** wet woodland environments (Wilkinson *et al* 2000). Its upper surface occurred at *c* 1m OD across the majority of the site. Within WSUVBH8 the initiation of the peat formation was dated to *c* 5900–5600 BP ceasing at around *c* 2700–2350 BP (i.e. early Neolithic to Early to Middle Iron Age). The peat formation is related to increases in Relative Sea Level (RSL) further down the Thames estuary which caused 'ponding' back in the upper freshwater reaches of the channel. This impeded drainage and thus caused waterlogging of previously dry terrestrial landsurfaces across the gravel high points, leading to peat formation. A palynological analysis of these sediments revealed evidence of the elm decline at c 5900–5600 BP (Beta-120960, Wilkinson *et al* 2000) and the lime decline at c 3400-3080 BP (Beta-120959, *ibid*), as well as woodland clearance due to agricultural intensification during the Bronze Age.

Across the WSUV site there was found to be a hiatus between the peat formation and the underlying fills of the palaeoechannel (facies 3) of c 4000 years. This raises important questions for the sediments recorded across the USC site. The altitude of the peat corresponds with the laminated clays, silts and organic deposits associated with the underlying facies 3. This could suggest that prior to the alder carr wetlands forming across the areas of higher ground towards the south east, channel activity and sedimentation may have continued across the USC site and therefore preserve a record of palaeoenvironmental change lost on the WSUV site, most notably evidence of the Boreal and early Atlantic pollen zones. In addition to this the cross correlation of these deposits in terms of altitude also shows that the USC site remained an area of fluvial activity while these peats formed in adjacent areas.

3.5 Facies 5: Late Holocene (Iron Age to Medieval) intertidal deposits forming mudflat and salt marsh environments *c* 2000 BP

The upper alluvial floodplain deposits recorded across the USC site consisted of massive '**gleyed**' clays and silts. The upper part of this facies often displayed a blocky ped structure and manganese staining indicative of accretionary gleyed floodplain soils formed by overbank flooding. In rare instances this gleyed alluvium graded gradually into a weathered, iron stained unit. Within the geoarchaeologically monitored investigations this deposit appeared at a fairly consistent level of -1m OD. The upper level varied considerably due to the level of modern truncation.

As with the underlying facies units 3 and 4, the investigations at WSUV also provide useful comparative data in order to define the depositional environment and chronology. Although these deposits appear massive, X-radiography carried out on the lower part of these sediments at WSUV showed very fine micro laminations indicative of episodic sedimentation associated with regular tidal inundation. These sediments accrued as a result of the upstream migration of the tidal head and a switch from freshwater to brackish/saltwater conditions. As sedimentation continued the floodplain surface was gradually raised protecting the surface from frequent inundation. Consequently accretionary soils, indicative of semi-terrestrial grassy floodplains, developed across the floodplain surface as evidenced by the blocky ped structure and partially weathered nature of the upper alluvial sequence. Therefore these sediments represent a gradual transition from mudflats, to saltmarsh to accretionary floodplain soil environments, all related to tidal inundation to a lesser degree up through the profile.

On the WSUV site (see WSUVBH8, Fig 3 and Fig 4) an organic clay at *c* 1m OD, associated with the upper part of the underlying facies 4 was dated to *c* 2700–2340 BP, indicating a switch to estuarine environments during the middle Iron Age. It is likely that this tidal influence continued across the site into the Medieval period, by which time the construction of drainage channels across the marshes managed the level of flooding. These intertidal deposits occur at a lower elevation across the USC site due to the lower lying ‘dip’ associated with the channel belt. It is therefore likely that the site experienced tidal inundation earlier than across the higher ground of WSUV.

3.6 Facies 6: Anthropogenic deposits of a possible Post-medieval to modern date.

An indication of the depth and extent of the anthropogenic deposits is given by Fig 6**Error! Reference source not found.** and Fig 7. Fig 6 gives an indication of the base level of made ground and consequently the surface level of the alluvial sequence, while Fig 7 indicates the thickness of the anthropogenic deposits. Across the eastern part of the site currently occupied by the water sports centre the base of made ground occurs at between *c* 1.5 to 0 m OD, and measures between 5 to 1.5m in thickness. Only three of the data points (USCBH2A, USCBH28 and USCBH30), show a high surviving elevation of the floodplain sequence at *c* 2.5 to 3.5m OD, although the made ground in these locations still measures between 2.5 to 5m in thickness. Across the lower lying western part of the site adjacent to the watersports centre the base of the made ground occurs at a much lower elevation of *c* 0 to -1.7m OD. The made ground varies to an equal thickness of that on the watersports centre, ranging between 5 to 1.5m in thickness.

A difference can be made between the deposits observed on the eastern part of the site and the western part. Towards the lower lying western part, the majority of the made ground consists of a heterogeneous deposit consisting of predominately orangey/greyish brown fine-grained units which contain moderate quantities of building material and concrete rubble. This made ground represents dumping across the site and accounts for the irregular surface topography present on this part of the site today.

This made ground rests upon a concrete slab which occurred at a fairly regular level of between *c* 1.8 to 1.5m OD across the majority of the western part. This concrete slab is likely to be associated with the yard of the transport depot shown on the 1973 OS map. Buildings associated with this yard and a former paint works (shown on the 1968 OS map) were located on the north western periphery of the site, although no evidence of these was found during the geotechnical investigations. Below this slab existed a small proportion of made ground consisting of dumped demolition and industrial material with a small component of redeposited alluvium probably related to ground disturbance associated with the industrial usage of the site. A number of residential buildings existed on the western fringe of the site as shown on the 1869 OS map. No evidence was found of these structures survival.

The made ground on the eastern part of the site fronting the Victoria docks, predominately consists of black gritty clinker rich industrial waste mixed with thick deposits of demolition material containing brick and concrete rubble. Some of the geotechnical investigations also encountered redeposited peat and alluvium probably redeposited as upcast from the construction of the docks. Only within test pit 6A were deposits observed which may be of some archaeological significance.

Within this test pit a brick structure was encountered at *c* 1.8m bgl (4.2m OD). It consisted of a curvilinear wall, surviving to two courses of unfrogged bricks (see Fig 8). The bricks measured *c* 225mm x 110mm x 80mm, and were observed to be sitting on a concrete base.

The historical maps show extensive use of this part of the site from at least 1869. The 1869 historic maps show a small number of warehouse and sheds fronting onto the docks. By 1896 these had been replaced by a large goods and coal depot. By 1910 this was now being used as a Midlands Railway depot. In 1968 this structure was replaced by a large warehouse which existed up until the 1990's. Railway sidings are shown running adjacent to this structure.

The significance of the curvilinear wall observed in test pit 6A is difficult to assess. It may be associated with any one of the buildings mentioned above. However, it should be noted that on all the historic maps no curvilinear or circular structure is recorded to have existed on the site.

4 Archaeological and Palaeoenvironmental potential

4.1 Introduction

The geoarchaeological evaluation of the sub-surface stratigraphy has produced a model that can be used to help predict where archaeological remains might be found and where palaeoenvironmental deposits with potential for the reconstruction of the past landscape and human activity are likely to exist.

Although the model is considered a useful means of gaining a preliminary idea of the likely buried stratigraphy on the site and the archaeological and palaeo-environmental potential, by no means should it be taken as the full or correct interpretation of the past environments that formerly existed here. The deposit model is intended only to act as a working tool to assist in identifying areas of archaeological interest and does not constitute a definitive statement of the environments and human activity that existed on the site in the past.

The palaeo-environmental and archaeological potential of the site sequence is discussed in the sections below.

4.2 Realisation of original research aims

The extent to which the geoarchaeological borehole survey and archaeological evaluation has addressed the research aims is addressed below.

- *What is the extent of the archaeological resource on this site and are they typical of the general area.*

The investigations have revealed extensive survival of floodplain stratigraphy beneath the anthropogenic made ground deposits. These deposits indicate that the site lies in an area of fluvial activity possibly related to a former course of the River Lea. This is a part of the floodplain which has undergone very few geoarchaeological investigations. The anthropogenic deposits revealed little evidence of the previous industrial usage of the site, or evidence of the residential structures located on the western periphery. One surviving structure was identified within test pit 6A.

- *What is the nature of the archaeological preservation conditions on site?*

The floodplain stratigraphy is generally well preserved and likely to preserve a range of palaeoenvironmental proxy indicators (i.e. **ostracods**, **foraminifera**, **diatoms**, and pollen) which can be used to reconstruct changes in the fluvial regime, the impact of relative sea level rise and to reconstruct the palaeoecology of the wider landscape during the prehistoric period. There was little evidence to suggest good preservation of any historic structures within the upper made ground, apart from the surviving structure observed in test pit 6A.

- *Is there any evidence of prehistoric settlement activity on the site?*

There is no evidence of prehistoric settlement activity on the site. The site lies within a former channel belt, which later became an estuarine environment probably from the Iron Age period.

- *Can it be demonstrated that there was continuous land utilisation between the Mesolithic and Iron Age eras, or was it intermittent and selective?*

There is no evidence to suggest the area was utilised between the Mesolithic to Iron Age periods for any form of occupation. However, the channel identified across the site, may have provided an important means of access and transport across the floodplain environments.

- *What, if any, is the nature of Roman activity on the site and how does it help in defining the character of the roman landscape to the east of Roman Londinium?*

There is on evidence for Roman activity across the site.

- *What, if any, is the nature of mid- to late-Saxon and Medieval activity on the site and how does it help in defining the character of topography then evidence in maps and documents?*

There was no evidence of Saxon to Medieval activity across the site. The very upper part of alluvial sequence does consist of weathered accretionary floodplain soil, which may be of a medieval date and representative of grassland pasture.

- *What is the character of Post-medieval to mid 19th century agricultural activities?*

There was no evidence of post-medieval to mid 19th century agricultural usage of the land. The upper part of the alluvial sequence, which may have contained evidence of such activity, has been truncated by the made ground.

- *What remain on site of the mid - late 19th century to mid 20th century dock side facilities including of the sheds, internal features and external railway infrastructure?*

There was little evidence within the upper made ground deposits to suggest survival of industrial and railway features associated with the Royal Victoria Docks. A curvilinear wall was noted in test pit 6A.

- *What remains on site of the mid - late 19th century to early-mid 20th century light commercial and residential area and what potential do the remains offer to be related to historical documents about the habitants and living conditions?*

There was no evidence for the residential structures noted from historic maps to exist on the western periphery of the site, or the light commercial buildings.

- *How does the archaeology on this site change our perception of the archaeological resource of this part of Newham?*

The observations of the upper anthropogenic deposits offer little insight into revising the perception of the industrial usage of the land during the 19th to 20th century. The lower floodplain stratigraphy does provide an opportunity to reconstruct this part of the Thames floodplain sequence, and reconstruct the wider prehistoric landscape.

4.3 General discussion of potential

The archaeological and geoarchaeological investigations have not identified with any certainty 19th or 20th century structures of industrial significance. This in part is due to the small number of interventions of limited size, which have only offered a small window onto the archaeological resource of the site. The curvilinear structure identified within test pit 6A was difficult to assess in terms of its significance. It does however form an unusual structure which does not appear to be located on any of the historic maps. It should be noted that this structure does not survive to any high degree only existing as two courses of brick work.

The archaeological and palaeoenvironmental potential of the buried floodplain stratigraphy is easier to comment upon and assess. A large number of previous geotechnical investigations have been undertaken across the site and its immediate vicinity. This spread of data with good spatial resolution has enabled the floodplain sequence across the site to be reconstructed with confidence. This is also aided by the detailed work carried out on the floodplain sequence on the WSUV site located to the south east which provides a possible chronology to the sequence

The site clearly lies within an area of fluvial activity possibly associated with a former course of the Lea. There is no evidence that semi terrestrial land surfaces suitable for any form of prehistoric occupation existed across the site. Despite this the floodplain sequence offers an opportunity to reconstruct the immediate prehistoric landscape and address questions concerning the changes in river regimes and the response of the Thames basin to climatic fluctuations, and the response of basin fluvial architecture to allogenic and autogenic forcing.

This is particularly relevant for the sand deposits (facies 2) observed to overlie the Shepperton gravels. It has been suggested within this report that these sands may represent either Late Glacial or Early Holocene fluvial sediments. The responses of the Thames during the climatic fluctuations of the Late Glacial are presently poorly understood, and the sands that are often found to overlie the floodplain gravels are poorly dated. The organic sediments present as lenses within these sands provide an opportunity to address these questions.

In addition to this the upper part of the sequence (facies 3) does show similarities to the palaeochannel fills identified on the WSUV site. These were dated to the Late Glacial/ Early Holocene and provided a rare insight in to the changing palaeoecology occurring during this transition from a cold temperate episode. The cross correlation of these deposit with those on USC suggests that the deposits on USC may represent a longer sequence of fluvial deposition which continued into the Bronze Age period when wet alder woodland was developing across the higher interfluves of the WSUV site.

The WSUV recorded a hiatus between the accumulation of the palaeochannel fills and the development of the Bronze Age peats. A part of the palaeoenvironmental record representing almost 4000 years was therefore missing. The USC site may preserve this missing part of the sequence and could potentially provide rare evidence (for this part of the Thames basin) of the landscape change taking place during the Boreal and Early Atlantic pollen stages.

5 Recommendations

The proposed development scheme involves the construction of an exhibition centre resting on a number of piled foundations. Additional landscaping work is also proposed. The major impact on the archaeological and palaeoenvironmental resource results from discrete pile locations which will extend through the made ground into the floodplain sequence. The landscaping work may impact on the made ground deposits but will not extend to any significant depth into the floodplain stratigraphy. The geoarchaeological boreholes undertaken on the western part of the site will mitigate against any impact on the floodplain sequence caused by the piling.

The palaeoenvironmental sequence recorded and sampled within the geoarchaeological boreholes is of great enough significance to warrant further study. The fluvial sands overlying the gravels (facies 3) can be radiocarbon dated to provide a chronology of deposition. The overlying laminated organic and clay silts (facies 4) will also preserve ostracods, foraminifera and diatoms suitable to reconstruct the fluvial conditions and channel morphology represented by deposit sequence. Pollen may also be preserved which can reconstruct the surrounding prehistoric landscape. The organic lenses within these sediments may provide material suitable for radiocarbon dating. It is unlikely that these sediments will contain any identifiable organic remains suitable for high precision AMS dating. However, bulk radiometric dates on the total carbon within these sediments will still provide useful radiocarbon date.

At present the level of palaeoenvironmental preservation and chronology of these deposits is unknown. A first stage of assessment work needs to be undertaken in order to consider the significance of the deposit sequence, especially with comparison to the previous work carried out on WSUV. It is recommended that any assessment work should be carried out on the retained cores samples from geoarchaeological borehole USCMoLBH1. This provides the best preserved sequence through the floodplain sequence with good levels of core retention. Organic clasts within the sand deposits in USCMoLBH3 and 4 may provided material suitable for dating the sand accumulation. Once an assessment is carried out the potential and significance of the deposits the need to carry out further analysis and publication can be ascertained.

The alluvial sequence has no potential to contain evidence of prehistoric settlement activity. However, artefacts such as fish traps, boats and other equipment used to exploit the channel may occur within these deposits.

The archaeological potential of the upper anthropogenic made ground deposits is at present difficult to assess. None of the geotechnical investigations, apart from test pit 6A uncovered structural remains of any archaeological significance. The piled foundations may impact on archaeologically sensitive deposits which have not been identified in the present study. However given the small, well spaced footprint of these foundations, the impact across the area as a whole is likely to be discreet and minimal.

Any further assessment of the palaeoenvironmental sequence and/or additional archaeological field work would need to be agreed by the local planning authority and the relevant parties. This would be dependant on the impact of the development on the buried archaeological and palaeoenvironmental resource. Consideration should be given to the extent and depth of any ground works undertaken, including piling, lift shafts, ground beams and any other works which extend to a significance depth below the present ground level.

6 Acknowledgements

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7 Geoarchaeological Glossary

Alluvium: a broad term referring to material deposited in a river channel or floodplain. Alluvial sediments are usually fine-grained and well-sorted although there is no diagnostic particle size as deposition depends on the energy of the water transport (i.e. from sands and gravels deposited by fast flowing water to clays that settle out of suspension during overbank flooding). Alluvium is frequently laminated or exhibits bedding structures, will often oxidise and change colour following exposure and may be rich in environmental remains such as molluscs or pollen. Impeded drainage leads to peat development and can also be considered to be alluvium, while tufa accumulates where calcium carbonate-saturated water issues from springs.

Braided channel: river channel pattern with multiple channels separated by shoals, bars and unstable islands that migrate and change frequently. Braided channels have high sediment loads and are typical of arctic regions today.

Carr: a north European wetland, a fen overgrown with trees

Devensian: the last glacial complex in Britain (MIS4-2) equivalent to the northern European Weichselian and the Alpine Wurmian (c 120–10 000 BP).

Diatoms: microscopic siliceous algae sensitive to environmental conditions (such as salinity and temperature) used in palaeoenviromental reconstruction.

Facies: Reading's (1996) definition follows 'A *facies* is a body of rock with specified characteristics... A facies should ideally be a distinctive rock that forms under certain conditions of sedimentation, reflecting a particular process or environment.' In sedimentology, lithofacies are defined, based on characters such as grain size and mineralogy that reflect depositional processes.

Fen: a type of wetland often marshy and low-lying, deriving most of their water from groundwater rich in calcium and magnesium, and characterised by a distinctive flora. Fens will ultimately become a terrestrial community such as woodland through the process of ecological succession. Fens are often confused with bogs, which are fed primarily by rainwater and often inhabited by sphagnum moss, making them acidic.

Foraminfera: testate (possessing a shell) protozoa (single celled organisms characterised by the absence of tissues and organs) found in all marine environments. Foraminifera may be planktic or benthic (bottom dwelling).

Gley: greenish grey and bluish waterlogged soil or sediment. The greenish colour indicates the presence of iron phosphates or secondary iron alumino-silicates, and bluish tints are caused by the formation of vivianite (ferrous phosphate). Groundwater gleys are influenced from underneath by groundwater, surface water gleys are water-saturated from above, often with water ponding on the surface.

Holocene: or 'Postglacial' is the most recent epoch (part) of the Quaternary, covering the past 10,000 years, characterised by an interglacial climate. The Holocene in Britain is often referred to as the 'Flandrian'.

Lateglacial: or Devensian Lateglacial, the period following the Last Glacial Maximum lasting until the start of the Holocene. This period is subdivided into a warm interstadial episode (called the Windermere Interstadial in Britain), followed by a cold snap (the Loch Lomond Stadial/**Younger Dryas**) in which local ice re-advance occurred.

Last Glacial Maximum: the peak of the most recent glaciation (Devensian), from between approximately 22,000 to 18,000 years ago. In Britain this is referred to as the Dimlington Stadial.

Lateglacial Interstadial: an episode of climatic improvement, called the Windemere interstadial in Britain, that occurred during the Devensian from *c* 13 500 to 11 000 yrs BP (equivalent to the European Bølling/Allerød)

Ostracods: bivalve crustacea common to almost all fresh and marine aquatic environments including semi-terrestrial settings living within the water column on and in the substrate

Periglacial: characteristic of a region close to an ice sheet but not covered in ice. In such a region, the ground may be frozen all year, thawing and waterlogging the surface in summer because it cannot drain away through the sub-surface ice. Geomorphological and sedimentological features characteristic of periglacial environments include tors, patterned ground and involutions.

Pleistocene: referring to the part of the Quaternary pre-dating the climatic amelioration at the start of the Holocene (approximately 2.6 million years ago to 10,000 BP).

Quaternary: the most recent major sub-division (series) of the geological record, extending from around 2.6 million years ago to the present day and characterised by climatic oscillations from full glacial to warm episodes (interglacial), when the climate was as warm as if not warmer than today. The observed pattern is of long glacial stages with cold and warm perturbations (stadials and interstadials) and short interglacials (usually less than 10,000 years). Human evolution has largely taken place within the Quaternary period.

Shepperton Gravel: or ‘buried channel’ infill (previously ‘Lower Floodplain Terrace’) on the floodplain of the Thames deposited during glacial outwash following the last Glacial Maximum (approximately 18–15 ka BP)

Younger Dryas: an end Pleistocene cold climate period (named after the alpine / tundra wildflower *Dryas octopetala*) at approximately 12,800 to 11,500 years Before Present. The Younger Dryas followed the Bölling/Allerød interstadial and preceded the Preboreal of the early Holocene.

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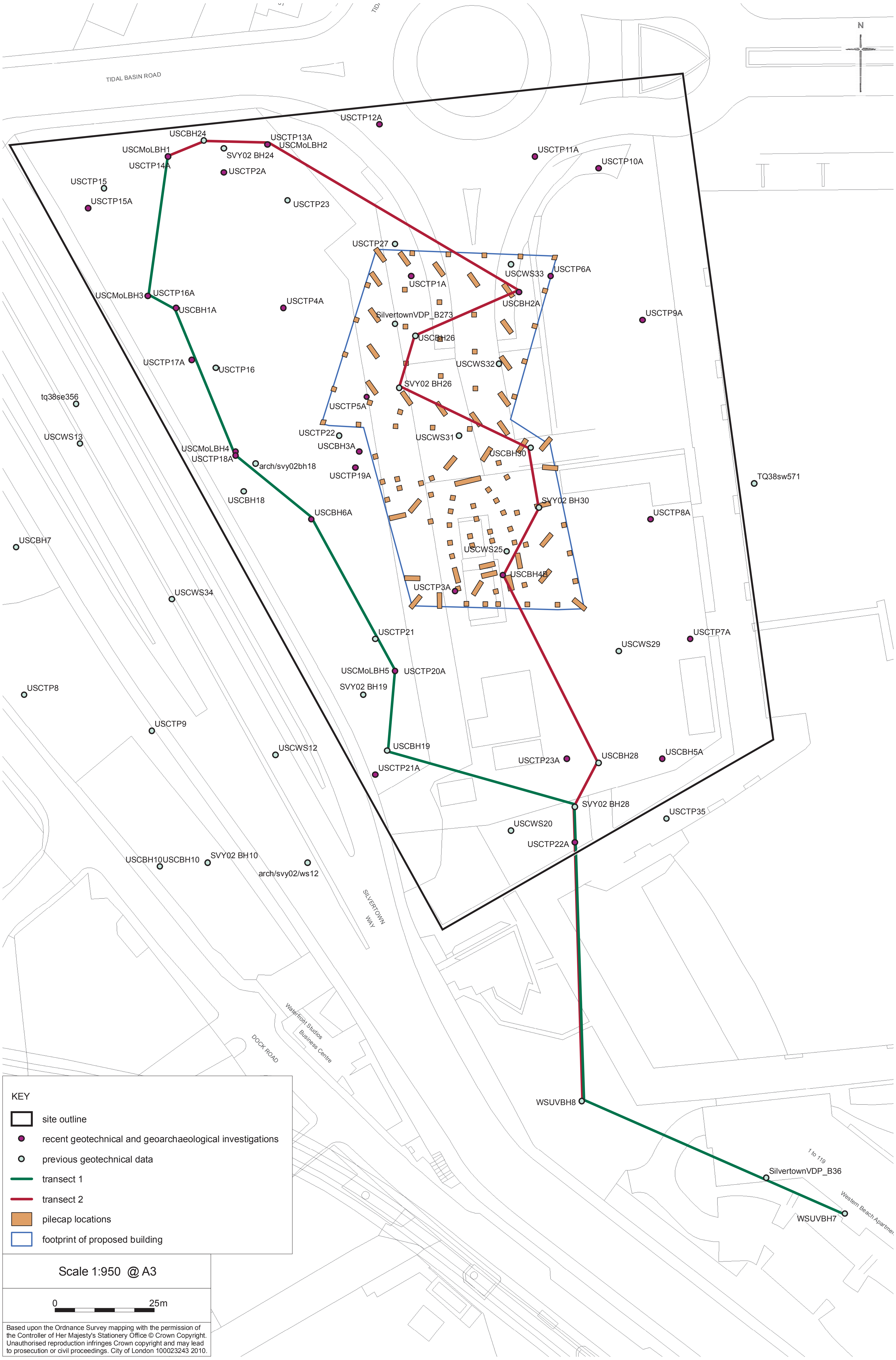


Fig 2 Location of data points (Geotechnical and Geoarchaeological testpits and boreholes), transects across the site and location of building footprint with pile locations

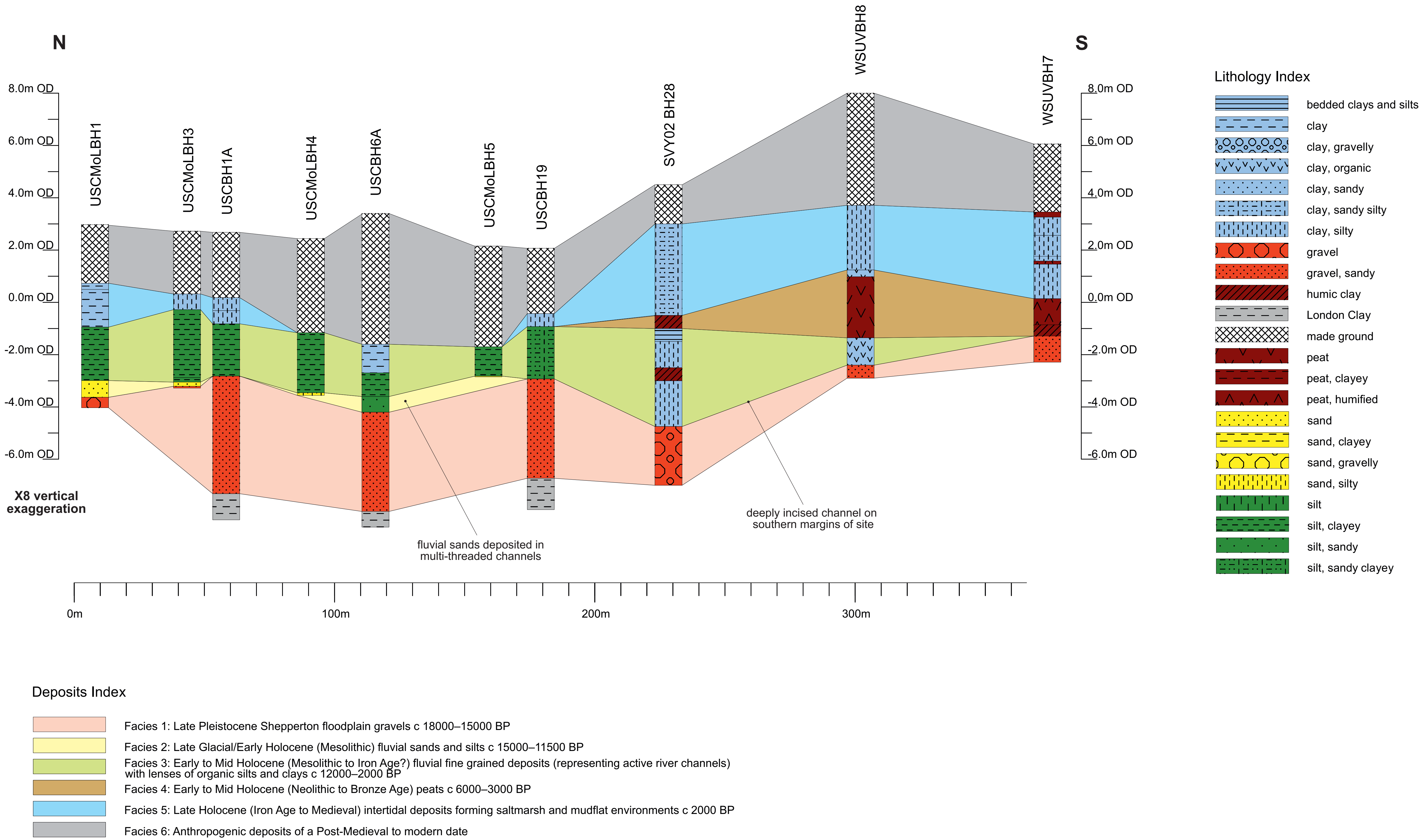
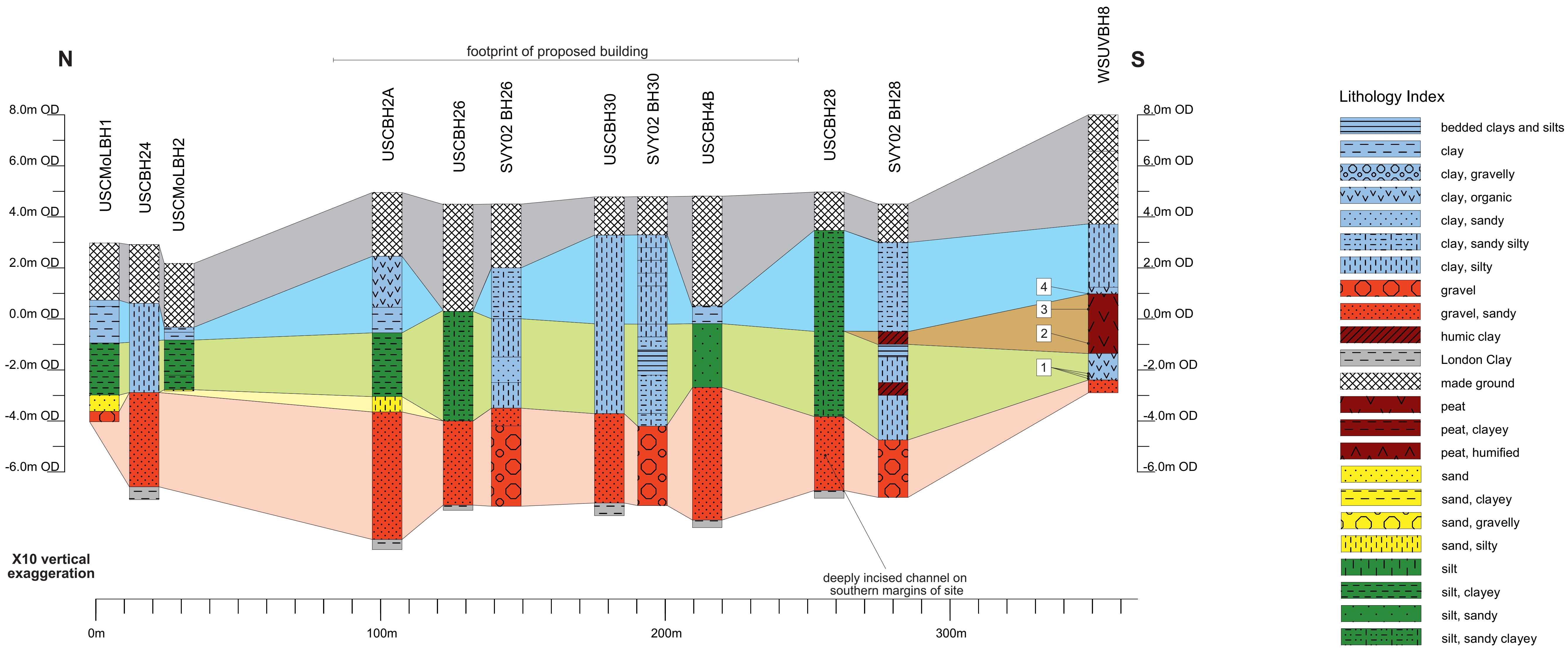


Fig 3 Transect 1



Deposits Index

- Facies 1: Late Pleistocene Shepperton floodplain gravels c 18000–15000 BP
- Facies 2: Late Glacial/Early Holocene (Mesolithic) fluvial sands and silts c 15000–11500 BP
- Facies 3: Early to Mid Holocene (Mesolithic to Iron Age?) fluvial fine grained deposits (representing active river channels) with lenses of organic silts and clays c 12000–2000 BP
- Facies 4: Early to Mid Holocene (Neolithic to Bronze Age) peats c 6000–3000 BP
- Facies 5: Late Holocene (Iron Age to Medieval) intertidal deposits forming saltmarsh and mudflat environments c 2000 BP
- Facies 6: Anthropogenic deposits of a Post-Medieval to modern date

Radiocarbon Dates

	m OD	14C age BP	calibrated 2σ
1	-2.56 -2.40 -2.20	10310±90 10010±70 9360±70	12799-11694 cal BP 12075-11229 cal BP 11035-10290 cal BP
2	-1.00	5010±70	5914-5600 cal BP
3	+0.42	3070±60	3438-3080 cal BP
4	+0.95	2430±50	2726-2345 cal BP

Fig 4 Transect 2

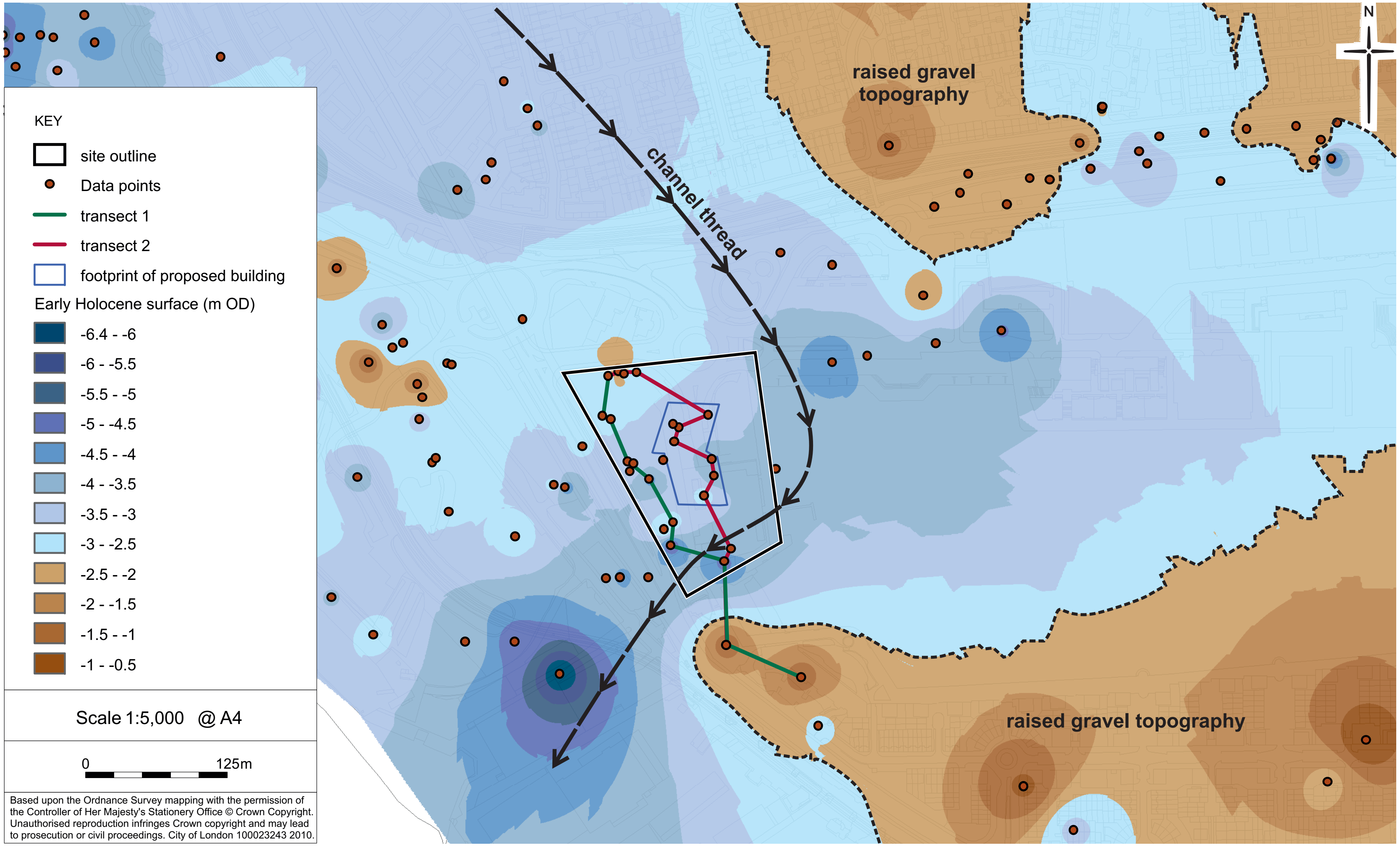
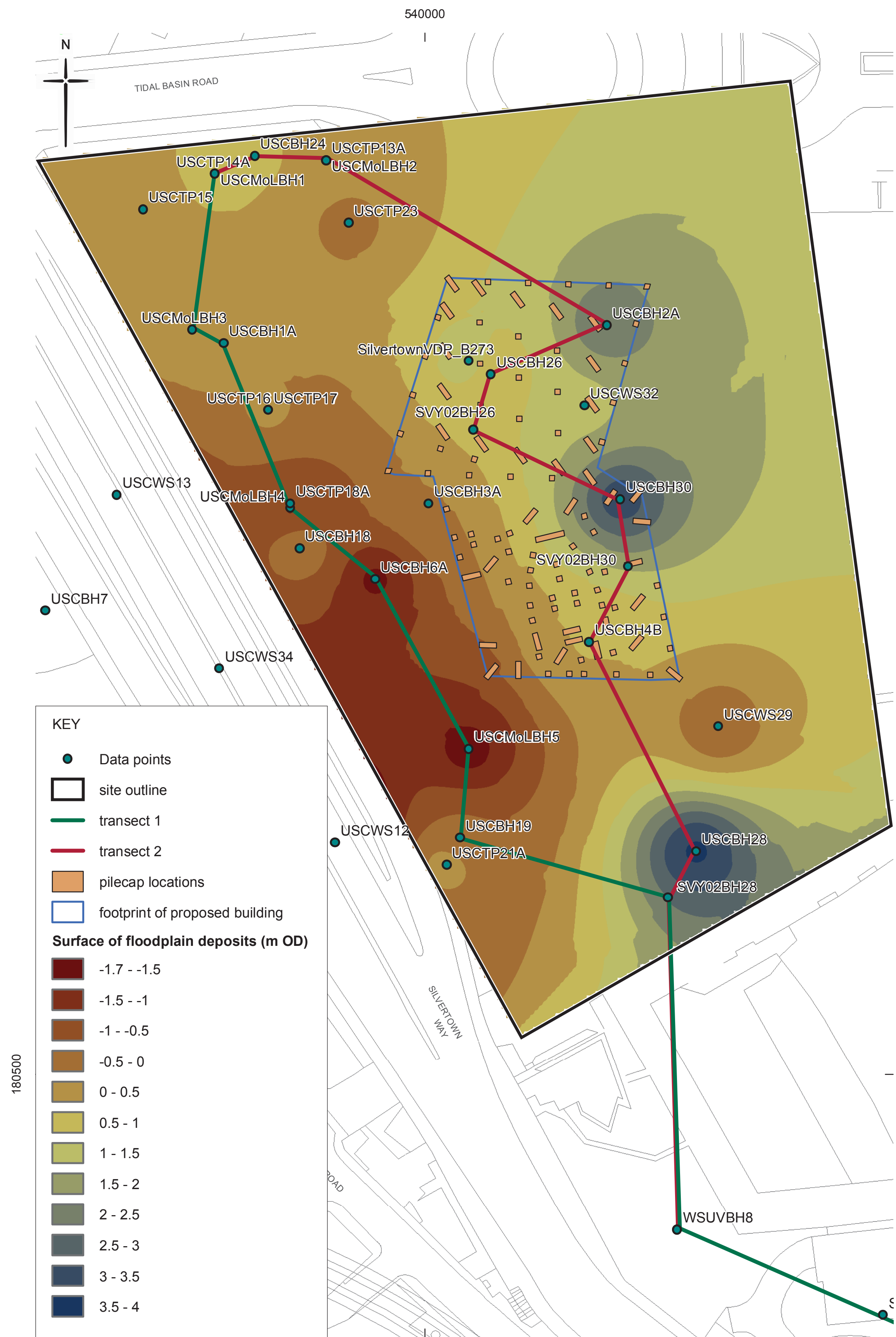


Fig 5 Early Holocene topography

NEWH1172GEO10#05



Scale 1:1,300 @ A4

0 50m

Fig 6 Surface of floodplain deposits

Fig 7 Thickness of made ground

Fig 8 Photograph of Test pit 6A showing curvilinear wall.

9 NMR OASIS archaeological report form

9.1 OASIS ID: molas1-84951

Project details	
Project name	Urban Sustainabilty Centre
Short description of the project	The investigations consisted of geotechnical monitoring and a geoarchaeological borehole survey. The site occupies a low lying part of the Thames floodplain which formed an active channel belt throughout most of the Holocene epoch (i.e. the last 10 000 years). Late Pleistocene gravels were overlain by sands deposited in a partially braided, multi threaded channel. These deposits may date from the Late Glacial or Early Holocene period (c 15 000-10 000 years ago). Above these sands occurred a series of finely laminated clay silts and fine sands interspersed with thin lenses of organics. These were deposited within a wide, single threaded lower energy fluvial environment. The accumulation of the thin organics may relate to episodic channel cut off, which allowed partial vegetation to develop in backswamp areas. These deposits are likely to have accumulated between 10 000 to 2000 years ago (i.e. the Mesolithic to Iron Age period). By the Iron Age the effects of relative sea level rise began to influence the site. The freshwater river transformed to an estuarine environment, resulting in the deposition of intertidal muds within marginal mudflats and salt marsh. The tidal inundation caused aggradation across the floodplain surface raising up the topography significantly. This protected the site from frequent flooding allowing accretionary alluvial soils to develop. These would have consisted of semi terrestrial grasslands, episodically flooded.
Project dates	Start: 27-07-2010 End: 17-08-2010
Previous/future work	No / Not known
Any associated project reference codes	USC10 - Sitecode
Type of project	Field evaluation
Site status	Area of Archaeological Importance (AAI)
Current Land use	Other 14 - Recreational usage

Current Land use	Other 13 - Waste ground
Monument type	PALAEOCHANNEL Early Mesolithic
Monument type	PALAEOCHANNEL Late Bronze Age
Methods & techniques	'Augering','Environmental Sampling','Test Pits'
Development type	Exhibition Centre
Prompt	Direction from Local Planning Authority - PPG16
Position in the planning process	After full determination (eg. As a condition)

Project location

Country	England
Site location	GREATER LONDON NEWHAM CANNING TOWN Urban Sustainabilty Centre
Postcode	E16 1AF
Study area	3.00 Hectares
Site coordinates	TQ 540020 180640 50.9408482741 0.192247282381 50 56 27 N 000 11 32 E Point
Height OD / Depth	Min: -3.65m Max: 0.56m

Project creators

Name of Organisation	MOLA
Project brief originator	Arup

Project design originator	Arup
Project director/manager	Sophie Jackson
Project supervisor	Craig Halsey
Type of sponsor/funding body	Siemens plc

Project archives

Physical Archive recipient	LAARC
Physical Contents	'Environmental'
Digital Archive recipient	LAARC
Digital Contents	'Stratigraphic'
Digital Media available	'Database','GIS'
Paper Archive recipient	LAARC
Paper Contents	'Stratigraphic'
Paper Media available	'Report'

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)

Title	Urban Sustainability Centre, Royal Victoria Docks, Newham. A geoarchaeological and archaeological evaluation report
Author(s)/Editor(s)	Halsey, CJ
Date	2010
Issuer or publisher	MOLA
Place of issue or publication	London
Description	A4 bound report, with evaluation results and a geoarchaeological deposit model
Entered by	Craig Halsey (chalsey@museumoflondon.org.uk)
Entered on	22 October 2010