WELLINGTON HOUSE
Petty France
London SW1

City of Westminster

Geoarchaeological evaluation report

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MUSEUM OF LONDON ARCHAEOLOGY

REGISTERED ORGANISATION IfA

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Petty France
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City of Westminster

Geoarchaeological evaluation report

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Summary (non-technical)

This document reports on the potential for further analysis of five geoarchaeological auger holes undertaken at Wellington House, Buckingham Gate, City of Westminster. Museum of London Archaeology (MOLA) were commissioned by Wates Construction, to record and evaluate the alluvial floodplain stratigraphy at the request of the Local Planning archaeologist. All archaeological deposits that may have been present at the site have been severely truncated by the existing basement and none of the alluvial sequence deposited by the River Tyburn has survived.

The site does not contain any nationally designated (protected) sites, such as Scheduled Ancient Monuments, Listed Buildings or Registered Parks and Gardens. It is within the Thorney Island Area of Special Archaeological Priority, as defined by Westminster City Council.

The auger hole evaluation has shown that no alluvial deposits of archaeological interest survive on site. The high gravels found on site would have formed an island (eyot) in the floodplain, which would have been attractive to early Mesolithic settlers roaming the landscape along channel margins in search of resources. Ephemeral soils would have formed on the surface of the island and have potential for finds of Mesolithic age within these Early Holocene landsurfaces, but due to truncation no evidence of Early Holocene landsurfaces are recorded. Whilst the topographic evidence of a past eyot in the floodplain preserved on the site is undoubtedly of local and possibly regional significance when combined with other data from the Tyburn valley, there is nothing to suggest that it is of national importance and it is recommended that no further work is needed.

Contents

List of figures

List of tables

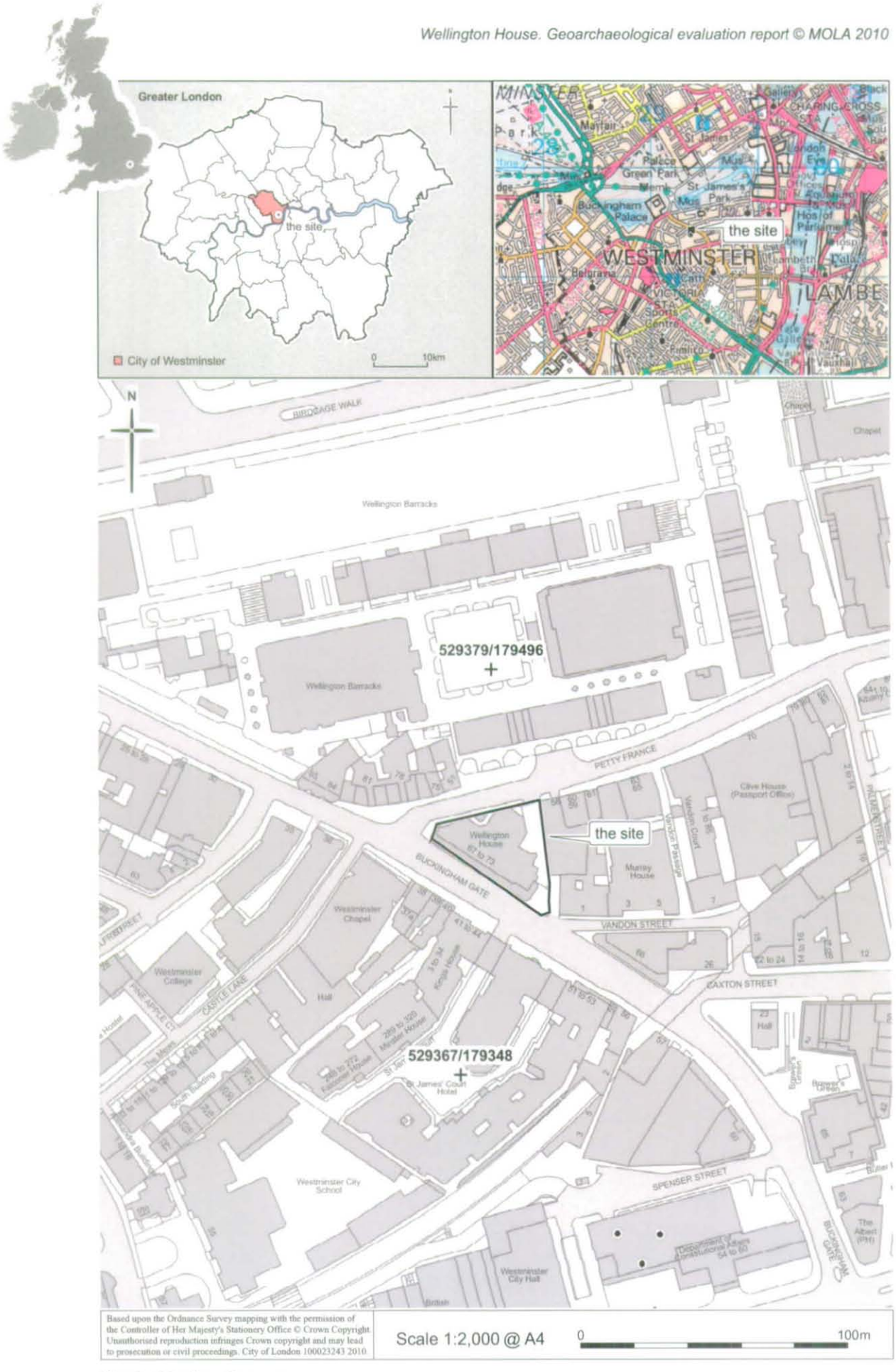

Fig 1 Site location map

1 Introduction

1.1 Site Background

This report on a geoarchaeological investigation on the site of Wellington House has been commissioned from Museum of London Archaeology (hereinafter MOLA) by Wates Construction.

The site is situated at 67-73 Buckingham Gate, London, SW1E 6BE in the City of Westminster (see Fig 1). The modern ground level in the vicinity of the study area lies at *c* 3.9m Ordnance Datum (OD) on Buckingham Gate directly south of the site, *c* 3.7m OD at the junction of Buckingham Gate and Petty France and *c* 3.5m OD on Petty France directly to the north of the site.

The site lies within an Areas of Special Archaeological Priority as defined by local authority covering Thorney Island.

The proposed development involves the redevelopment of the existing office building. The new building would reuse the existing basement and raft foundation. Additional piled foundations would be used in certain load bearing positions which would entail the breaking–out of localised areas of the basement slab. A previous *Archaeological desk-based assessment* (MoLAS/Featherby 2008) recommended the need for archaeological monitoring on the site.

The works which required archaeological investigation consisted of a geoarchaeological evaluation of five boreholes in the existing single basement. These were situated in the core locations recently drilled through the substantial basement slab.

1.2 Planning background and proposed development

The planning and legislative background to the site has been adequately summarised in the previous *Archaeological desk-based assessment* (MoLAS/Featherby 2008).

1.3 Origin and scope of the report

Wates Construction has commissioned the MOL Archaeology (MOLA) to carry out a geoarchaeological evaluation in advance of proposed development at Wellington House, in Westminster, London SW1 (National Grid Reference 529380 179432: Fig 1). The scheme is for the redevelopment of the existing office building with residential accommodation at levels 1–9 and a retail unit plus residential entrance/ancillary services at ground floor level. The new building will reuse the existing 4m-deep single-level basement. Additional piled foundations would be used at certain load bearing positions.

This document reports on the findings of the initial borehole probing undertaken (five auger holes) at the proposed location of the works.

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 Evaluations 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.

A geoarchaeological borehole or window sample survey is 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 geoarchaeological evaluation. The objectives of a geoarchaeological evaluation are:

- to report in detail on the nature of a site's 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 *report* provides information about the archaeological and palaeoenvironmental resource by examining the sediments retrieved through borehole core samples. 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. From this the likely potential for the preservation of a range of proxy environmental indicators (i.e. pollen, plant macro fossils, ostracods, diatoms and foraminifera) are evaluated.

Recommendations for assessment of the potential of these remains to address the objectives of the watching brief, as set out in the written scheme of investigation (MOLA 2010) are made. In particular there might be potential:

- To chronicle the development of the environment, in particular related to the period of peat deposition; and to
- Interpret the palaeoecological history and succession of the site.

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

1.5 Palaeoenvironmental and Archaeological background

A description of the geology, archaeology and history of the site was provided in the previous *Archaeological desk-based assessment* (MoLAS/Featherby 2008). A brief resume is provided here:

The geological map of the area (British Geological Survey map sheet 270) shows the underlying geology of the site as alluvium. The site is within a channel of the ancient River Tyburn near its confluence with the River Thames. The site lies *c* 1km west of a broad 'delta' on the Thames into which the Tyburn flowed, *c* 1.3km to the south–west of the site. Records from previous work in the area indicate that localised survival of raised areas of sand and gravel are likely to occur below later fine-grained alluvium. The sand and gravel highs may mark the position of former islands or eyots. The surface of these islands typically lies at over 1.00m OD (Corcoran 2006, 6). The best known of these eyots, Thorney Island, lies in the vicinity of Westminster Abbey, *c* 770m to the east of the site. Ard marks found at the surface of the Thorney Island eyot (Sidell et al 2000) indicate it was suitable for agriculture in the Neolithic and Bronze Age periods.

The topography of the study area has changed considerably. The level of the Thames at the end of the Ice Age was much lower than in more recent times and as a consequence lower lying areas adjacent to the river were not immediately flooded, but became progressively more waterlogged as water levels rose. From pollen and diatom analysis it has been inferred that the Thames was probably tidal as far upstream as Bermondsey during the Neolithic but by the Late Bronze Age the tidal head had probably reached Westminster. Thus it is likely that the lower-lying areas adjacent to the rivers became increasingly waterlogged during the prehistoric period, as water levels rose. During this period peat is likely to have developed along channel margins as marshland spread across the valley floor. Eventually, but perhaps during the Iron Age, it appears that these areas and even the sandy eyots had become inundated by tidal mudflats. The date of any final inundation is not known at present due to later truncation of the deposits on Thorney Island - although the presence of an Iron Age structure below the alluvium at Richmond Terrace, Whitehall, *c* 1km to the east of the site gives a possible indication (GLSMR 081461).

Data from surrounding sites also suggests that while the site may lie within the River Tyburn floodplain, relatively low sand and gravel eyots can be identified within the deeper channel to the east and south-east near Vincent Square. The current levels for

the top of the alluvium and the top of the underlying gravel are not known within the site but based on the archaeological investigations in the vicinity are predicted to lie directly below the basement and between *c* –1.5m and *c* –2.0m OD respectively.

In 1994, an archaeological evaluation at 21–29 Victoria Street (site code VXW94), *c* 340m to the south-east of the site identified a band of peat, indicating a partial drop in water level, at *c* 0.00m OD. An archaeological investigation at Caxton Hall (site code CXH04), *c* 166m to the east of the site, in 2004 recorded a possible eyot at between *c* 1.60m and *c* 1.81m OD. The natural terrace gravel was recorded at *c* –1.5m OD.

There is potential for archaeological remains dating to the prehistoric period in the form of alluvium and possibly peat horizons across the site. Silts and peats dating to the Mesolithic/Neolithic and Bronze Age periods have been recorded in the area. Buried and well-preserved archaeological horizons have been recorded beneath peat deposits. Alluvium offers a high potential for palaeoenvironmental information as these deposits may also preserve organic material from plants and animals if such deposits survive beneath the substantial slab at basement level.

The study area is located in an area historically referred to as Tothill. The name is generally associated with a place of high ground suitable for observation or defence. The area of Tothill Fields, *c* 300m to the south of the site, appears to form a plateau or peninsular of higher drier land between two tributary systems of the Tyburn. The area directly to the south of the site in 17th and 18th centuries was known as the 'Marshy Ground'. The ground in the immediate vicinity of the study area appears to slope down gently towards the Thames, but the natural ground contours may well have been masked by human activity over the last 200 years.

During the prehistoric period, much of the area around the site will have been wet and marshy, with pools of water separated by boggy ground. Small channels will have surrounded higher sandy islands. Areas such as this will have been exploited by the prehistoric population for food and building materials. Prehistoric finds have been made within the site vicinity including a Neolithic axe to the south of the site (GLSMR 081135).

Some scattered Roman finds have been made in the site vicinity, including Roman coins recovered to the north-east (GLSMR 0811371), but there is little evidence for significant Roman activity.

Limited archaeological evidence for Saxon occupation has been found close to the site. However, a possible Saxon mound is recorded in the Tothill Road area and the name Tothill is thought to have a Saxon origin.

The site fell within the liberty of Westminster within the Ossultone Hundred (an old administrative division). The site was situated in a low lying marshy district, prone to flooding. The Tyburn streams were gradually canalised and covered over, and the land reclaimed and developed during the medieval period, although drainage and reclamation works may have begun much earlier. Edward the Confessor established his palace at Westminster in the 11th Century. The site lies *c* 600m to the west of the Abbey and the nucleus of the Palace of Westminster. To the north an unclassified medieval settlement was located in the area of Petty France. Petty France was documented from the mid-14th century, and ribbon development along Tothill Street may have been continuous by the end of the medieval period.

In the 16th century there were houses on both sides of Petty France with those on the north side having large gardens reaching to St. James's Park. The area retained its foreign connections, being the residence of a number of French and Dutch merchants. Due to the proximity of a number of religious institutions that had existed there prior to the Reformation, in particular Westminster Abbey, a large number of almshouses (housing provided by charities to enable people who could no longer live in a particular community) and hospitals were built along the south side of Petty France. According to Stow's survey of London (1603), in 1577, a merchant from Brabant, Van Dun, had built an almshouse on the site, which remained in use for several centuries (Stow 1603, 425).

Faithorne and Newcourt's map of 1658 shows that the site was occupied by a building on the corner of Petty France and what would become Buckingham Gate, which could be Van Dun's almshouse, and an adjoining property. The site also includes a small section of formal gardens which fronts onto what would become Buckingham Gate. Morgan's map of 1682 shows an alley leading from Petty France southwards to St James Street (now known as Buckingham Gate). This lane forms the eastern boundary of the site. The map shows that the site contains one strip building in the northern half of the site, probably Van Dun's almshouse, and two smaller ancillary buildings along the eastern edge of the site. The rest of the site is comprised of open ground. The low-lying nature of the area is evident by the number of channels that Morgan has noted on this map.

Rocque's map of 1746 shows the site within a triangular piece of land. The almshouse covers the entire north side of the site, and is now named Hills and Kitfords Almshouses. The building was taken over by Mrs Kitford in the mid-17th century and modernised (Watson 1993). The almshouse has a new eastern wing along the eastern side of the site. The remainder of the site, that is the central and south-western areas is open ground. It also shows that many of the channels noted on Morgan's map have been filled. Horwood's map of 1799 shows the almshouse in the northern part of the site as a terrace of eleven small houses. The eastern wing is no longer shown other than a large building in the south-east corner of the site which may originally have formed the south part of the wing. This is joined to another building by an internal courtyard. Between these two and the almshouses is open ground.

Greenwood's map of 1824–6 shows the southern half of the site developed with a row properties fronting onto James Street (now Buckingham Gate). Stanford's map of 1864, shows no change in the layout of the buildings on the site except that it is labelled 'workhouse'. The Ordnance Survey 1st edition 25":mile map of 1896 is a detailed map and shows considerable change within the site. The former almshouses and properties along the edges of the site have been demolished and a large workhouse building has been constructed on this site named St Margaret's and John's workhouse. The workhouse appears to be based upon the 'corridor plan' workhouse, a design common between about 1840 and 1870.

The Ordnance Survey 3rd edition 25": mile map of 1914–16 shows that the workhouse has been demolished and a new building now covered the whole site. The Ordnance Survey 3rd edition revised 25": mile map of 1938 shows a courtyard in the middle of the existing building, a detail that may have been omitted form the original map. The Ordnance Survey 1:1250 scale map of 1951 shows no changes, but the site is now called Wellington House. The Ordnance Survey 1:1250 scale map of 1983 also shows

that the existing Wellington House. At some point between 1967 and 1983, the original Wellington House was remodelled, possibly demolished, to form the existing building.

In summary there is unlikely to be survival of archaeological remains in the area of the existing basement. However there is limited potential for archaeological remains dating to the prehistoric period in the form of alluvium and/or peat horizons to possibly survive beneath substantial slab.

2 Geoarchaeological Borehole Evaluation

2.1 Methodology

All geoarchaeological on-site and off-site work, was carried out in accordance with the Written scheme of investigation (MOLA 2010), and where appropriate the MOLA Archaeological Site Manual (MoLAS 1994).

2.1.1 On site

The geoarchaeological investigation involved the augering of five boreholes by MOLA geoarchaeologist, using a petrol driven power auger. The location of the auger holes is shown on Fig 2. The spread of five geoarchaeological auger holes were drilled with a power auger fitted with a windowless core sampler. The auger holes formed a configuration predetermined by the location of five core samples previously drilled through the basement slab for geotechnical investigations as the depth of the basement slab restricted the location of boreholes to those accessible areas.

These provided a site-wide picture of the surviving past topography and buried deposit sequence. The boreholes were drilled from the base of the core holes into the surface of the gravels to record the alluvial stratigraphy if present. The positions for the boreholes are shown on Fig 2; this also shows the positions of the drilled cores samples through the basement slab. The thickness of the basement slab has necessitated the boreholes to be located at the base of these core areas. Previous investigations in the area suggest that the alluvial sequence may have already been truncated, given the level of the basement slab; the cores revealed probable gravel beneath the slab.

The geoarchaeology work was guided by the recommendations outlined in the English Heritage Guidelines for Environmental Archaeology and Geoarchaeology (EH 2002; 2004 respectively).

The five boreholes were drilled by a team of two MOLA geoarchaeologists with a power auger. The boreholes were drilled through the Quaternary sequence. The geoarchaeologists kept a field log of the boreholes and a photographic record of the cores.

The sequence of deposits recovered in the auger holes was described and preliminarily interpreted on site and the nature and depths of the interfaces between the different deposits noted. The deposits were described using 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, every distinct unit was given a separate number (e.g. for BH4: BH4.1, BH4.2 etc from the top down) and the depth and nature of the contacts between adjacent distinct units was noted. The boreholes were given the additional prefix WIJ10 which denotes the site code.

No samples were cut from the cores for future off site examination. No samples were taken for pollen, radiocarbon dating, ostracods, molluscs and plant macro remains.

The borehole locations were tied in to the Ordnance Survey Grid and the ground level at each location was levelled in to Ordnance Datum.

2.1.2 Off site

The auger holes were logged in table format and entered into a digital (Rockworks 2006) database. Each deposit component (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 Rockworks database and used to compare and correlate the lithostratigraphy across the site.

Cross-sections (transects: vertical slices through the sub-surface stratigraphy) were drawn through the data points and correlations were made between key deposits. Interpretation of the data is based to a large extent on examining these transects. Individual lithostratigraphic units with related characteristics within a borehole/window sample were grouped together and then linked with similar deposits, which may be made up of a number of individual lithostratigraphic units in adjacent boreholes/window samples.

Linking deposits between the data points produced a series of site-wide deposits (facies), which are representative of certain environments. Thus a sequence of environments both laterally and through time has been reconstructed for the site. Two facies associations were identified and are discussed in detail in section 1.5**Error! Reference source not found.**. The transect drawn through the data points forms a major means of illustrating the buried stratigraphy and facies associations within this report (**Error! Reference source not found.**). A key to the lithostratigraphy and its interpretation is provided with the transect. The transect location is indicated on **Error! Reference source not found.**.

2.2 Results

The sedimentary units recorded in the auger holes are presented below in tabulated form.

Table 1: Lithostratigraphy recorded in AH1

Wellington House AH1			**Location:** 529382.88/179431.94	
Unit	**Depth of unit m bgl (Height of unit m OD)**	**Description**	**Interpretation**	**Facies**
1.2	**3.90 m OD**	**Ground level adjacent to auger hole**		
	0.0 - 1.30	Inspection pit and concrete slab	Modern Made Ground	Facies 2
1.1	**2.60 m OD**			
	1.30-4.00	Fine to medium sized gravel, subangular, sandy, mid brown, wet, occasional plastic and metal inclusions, penetration to 4m and poor retrieval.	Kempton Park Gravels	Facies 1

	-0.01 m OD	**Base of auger hole**

Table 2: Lithostratigraphy recorded in AH2

Wellington House AH2			**Location:** 529375.14/179441.67	
Unit	**Depth of unit m bgl (Height of unit m OD)**	**Description**	**Interpretation**	**Facies**
1.2	**3.90 m OD**	**Ground level adjacent to auger hole**		
	0.0 - 1.30	Inspection pit and concrete slab	Modern Made Ground	Facies 2
1.1	**2.60 m OD**			
	1.30-4.00	Large to small sized gravel, subrounded to sub angular, mid brown sand, slightly wet, no visible modern inclusions, penetration to 4m bgl but poor retrieval.	Kempton Park Gravels	Facies 1
	-0.01 m OD	**Base of auger hole**		

Table 3: Lithostratigraphy recorded in AH3

Wellington House AH3			**Location:** 529378.09/179423.38	
Unit	**Depth of unit m bgl (Height of unit m OD)**	**Description**	**Interpretation**	**Facies**
1.2	**5.50 m OD**	**Ground level adjacent to auger hole**		
	0.0 - 1.55	Inspection pit and concrete slab	Modern Made Ground	Facies 2
1.1	**3.95 m OD**			
	1.30-2.00	Sands and gravel, occasional gravel medium sized, subangular coarse sand, mid yellow brown.	Kempton Park Gravels	Facies 1
	3.50 m OD	**Base of auger hole**		

Table 4: Lithostratigraphy recorded in AH4

Wellington House AH4			**Location:** 529376.24/179424.61	
Unit	**Depth of unit m bgl (Height of unit m OD)**	**Description**	**Interpretation**	**Facies**
1.2	**5.50 m OD**	**Ground level adjacent to auger hole**		
	0.0 - 1.40	Inspection pit and concrete slab	Modern Made Ground	Facies 2
1.1	**4.10 m OD**			

	1.40-2.00	Gravelly sand, occasional small to medium gravel, yellowish mid brown, sub angular gravel, medium to coarse sand, wet.	Kempton Park Gravels	Facies 1
	3.50 m OD	**Base of auger hole**		

Table 5: Lithostratigraphy recorded in AH5

Wellington House AH5			**Location:** 529386.85/179416.53	
Unit	**Depth of unit m bgl (Height of unit m OD)**	**Description**	**Interpretation**	**Facies**
1.2	**5.5 m OD**	**Ground level adjacent to auger hole**		
	0.0 - 1.30	Inspection pit and concrete slab	Modern Made Ground	Facies 2
1.1	**4.20 m OD**			
	1.30-1.55	Brownish grey gravelly sand medium gravel coarse sand.	Kempton Park Gravels	Facies 1
	1.55-3.00	Yellowish brown gravelly sand, fine to medium gravel, subangular, coarse sand, penetration to 3m poor retrieval.		
	2.50 m OD	**Base of auger hole**		

3 Discussion on site stratigraphy

The tabulated sedimentary units (section 2.2) have been grouped into sediment packages or facies with key markers in the sequence, which denote major events, used as points of correlation. These principally comprise the change from clast supported gravels to made ground deposits (c. 2.6 to 4.2m OD). The facies associations are discussed below in stratigraphic order from the oldest to the most recent with reference to a cross section of the sub-surface deposits (see **Error! Reference source not found.**).

3.1 Facies 1: Sands and gravels

The sand and gravel units are predominantly yellow brown subangular gravels and sands with a surface between c. 2.6 to 4.2m OD. The sands and gravels across much of this area belong to the Shepperton Gravel (see LZ2, **Error! Reference source not found.**), and were deposited in a cold climate fast flowing braided river environment towards the end of the last glacial period (*c* 15 000 to 10000 BP). The Shepperton Gravel forms the buried channel and floodplain of the River Thames. However, the elevation of the gravels is much too high for the Shepperton Gravel.

In light of their elevation the gravels on site may relate to a Late Glacial/early Holocene sandy eyot (see LZ1, **Error! Reference source not found.**). Data from surrounding sites suggests that while the site may lie within the River Tyburn floodplain, relatively low sand and gravel eyots can be identified within the deeper channel and have been found nearby at Vincent Square. The best known of these eyots, Thorney Island, lies in the vicinity of Westminster Abbey, *c* 770m to the east of the site. Ard marks found at the surface of the Thorney Island eyot (Sidell et al 2000) indicate it was suitable for agriculture in the Neolithic and Bronze Age periods.

The study area is located close to an area historically referred to as Tothill. The name indicates an area of high ground (see Section 1.5) and may help to explain the high ground found onsite. However, the area directly to the south of the site in 17th and 18th centuries was known as the 'Marshy Ground' and there is a slight possibility the gravel may have been dumped here in order to raise the ground level.

The surface of the gravel (c. 2.6 to 4.2m OD, see **Error! Reference source not found.** and LZ1 in **Error! Reference source not found.**) found within the auger holes is higher than would normally be expected for low eyots formed by banked Early Holocene sands and gravels. The gravels are most likely a remnant of the nearby gravel terrace (Kempton Park Gravels) c. 50m to the north and would therefore have been higher drier ground for much of the Holocene and ideally situated for wetland exploitation by past humans. Ephemeral soils would form on the surface of such eyots but no evidence of this was recorded in the auger holes. The truncation of the overlying alluvial deposits is likely to have also truncated the surface of the gravels and any evidence of soil formation. There is some possibility that the gravels may be historic to modern levelling deposits. However, the absence of any modern inclusions in the gravels does not indicate this.

3.2 Facies 2: Modern made ground deposits

These deposits consisted of a thick concrete slab with a small amount of underlying hardcore. These deposits were uniform in depth across the site measuring between 1.3 and 1.4m in thickness. Any surviving alluvial material had been truncated before the dumping of these made ground deposits.

4 Archaeological and Palaeoenvironmental potential

4.1 Realisation of original research aims

The extent to which the geoarchaeological borehole survey has addressed the research aims is discussed below.

- What are the earliest deposits identified?

The earliest deposits were identified as a remnant of possible Pleistocene terrace gravels, which may have formed an island in the floodplain. Such an island would have been high dry ground for much of the Holocene and would have provided and ideal location for the exploitation of the rich floodplain and wetland environment by past humans.

- Do alluvial, or other deposits of archaeological interest survive on the site and what are their characteristics in terms of depth/elevation, thickness, sediment type and likely date?

All surviving Holocene or alluvial deposits have been truncated to the surface of the gravel.

- Is it possible to map more accurately the course of the Tyburn from investigation of any alluvial deposits?

If the gravel surface is a Kempton Park Gravel remnant then the Tyburn river would not have run through the site.

- What is the potential of the deposits surviving on the site taken from them to preserve indirect evidence of past human activity?

There is little potential for the survival of indirect evidence of past human activity in the gravel deposits and no surviving evidence of soil formation on the proposed eyot was recorded.

- What is the potential of the deposits on the site to contain *in situ* archaeological remains?

The surface of the gravels may also have been truncated but there may be slight potential for the recovery of artefacts or Ard marks as found at the surface of the Thorney Island eyot (Sidell et al 2000) indicating it was suitable for agriculture in the Neolithic and Bronze Age periods.

- What is the potential of the deposits surviving on the site and the samples taken from them to preserve evidence for the past environment, landscape and river regime?

There is little potential for the survival of palaeoenvironmental remains in the gravel deposits and no surviving evidence of soil formation on the proposed eyot was recorded.

- What is the potential for dating the deposits surviving on the site?

There is no potential for dating at present but future work in this area should include OSL dating of the gravel deposits to confirm their age.

- To what extent might the deposits surviving on the site contribute to a better understanding of prehistoric activity or the prehistoric landscape of Westminster in the vicinity of the site?

The proposed eyot as a remnant of possible Pleistocene terrace gravels would have formed an island in the floodplain. Such an island would have been high dry ground for much of the Holocene and would have provided an ideal location for the exploitation of the rich floodplain and wetland environment by past humans. Shallow eyots have been identified nearby at Vincent Square but not in this location.

4.2 General discussion of potential

4.2.1 Facies 1

The sand and gravel units are all likely to represent a remnant of the Kempton Park Gravel, in-channel fluvial deposition dating from the Late Devensian through to the Late Glacial period (i.e. 18 000–10 000 BP). The high gravels would have formed an island in the floodplain, which would have been attractive to early Mesolithic settlers roaming the landscape along channel margins in search of resources. Ephemeral soils would have formed on the surface of the island and have potential for finds of Mesolithic age within these Early Holocene landsurfaces, but due to truncation no evidence of Early Holocene landsurfaces are recorded. The environmental potential of this facies is low. These deposits are unlikely to yield any palaeoenvironmental information as any biological remains present within them are likely to be highly abraided by the fluvial action of the sand and gravel bedload.

4.2.2 Facies 2

The made ground deposits within this facies are of a modern date and contain no archaeological or palaeo-environmental potential.

5 Recommendations

The auger hole evaluation has shown that no alluvial deposits of archaeological interest survive on site. Whilst the topographic evidence of a past eyot in the floodplain preserved on the site is undoubtedly of local and possibly regional significance when combined with other data from the Tyburn valley, there is nothing to suggest that it is of national importance. It is recommended that no further work is needed.

6 Acknowledgements

MOLA would like to thank Jordan Williams of Wates Construction for commissioning this work. The author would also like to thank Graham Spurr for undertaking the auger hole survey, Jane Corcoran and Gordon Malcolm for their advice and managerial work.

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.

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.

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).

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'.

Kempton Park Terrace: (previously 'Upper Floodplain Terrace') comprises river gravels mapped at approximately +5m OD. Kempton Park gravels are thought to have been deposited during the Devensian and incorporate Ipswichinan Interglacial (MIS5e).

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)

OSL: optically stimulated luminescence. A dating technique allowing age determination of sediments deposited within the last glacial-interglacial cycle. The OSL signal builds up over time in quartz and feldspar minerals through naturally occurring ionizing radiation. This signal is 'reset' by exposure to light. If the signal can be measured, the time since sediment burial can be determined.

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)

Soliflucted sediment: In periglacial environments, surface thawing results in a saturated surface layer overlying a frozen substrate. Where this occurs on valley sides it can result in the surface layers sludging down-slope over the frozen subsoil.

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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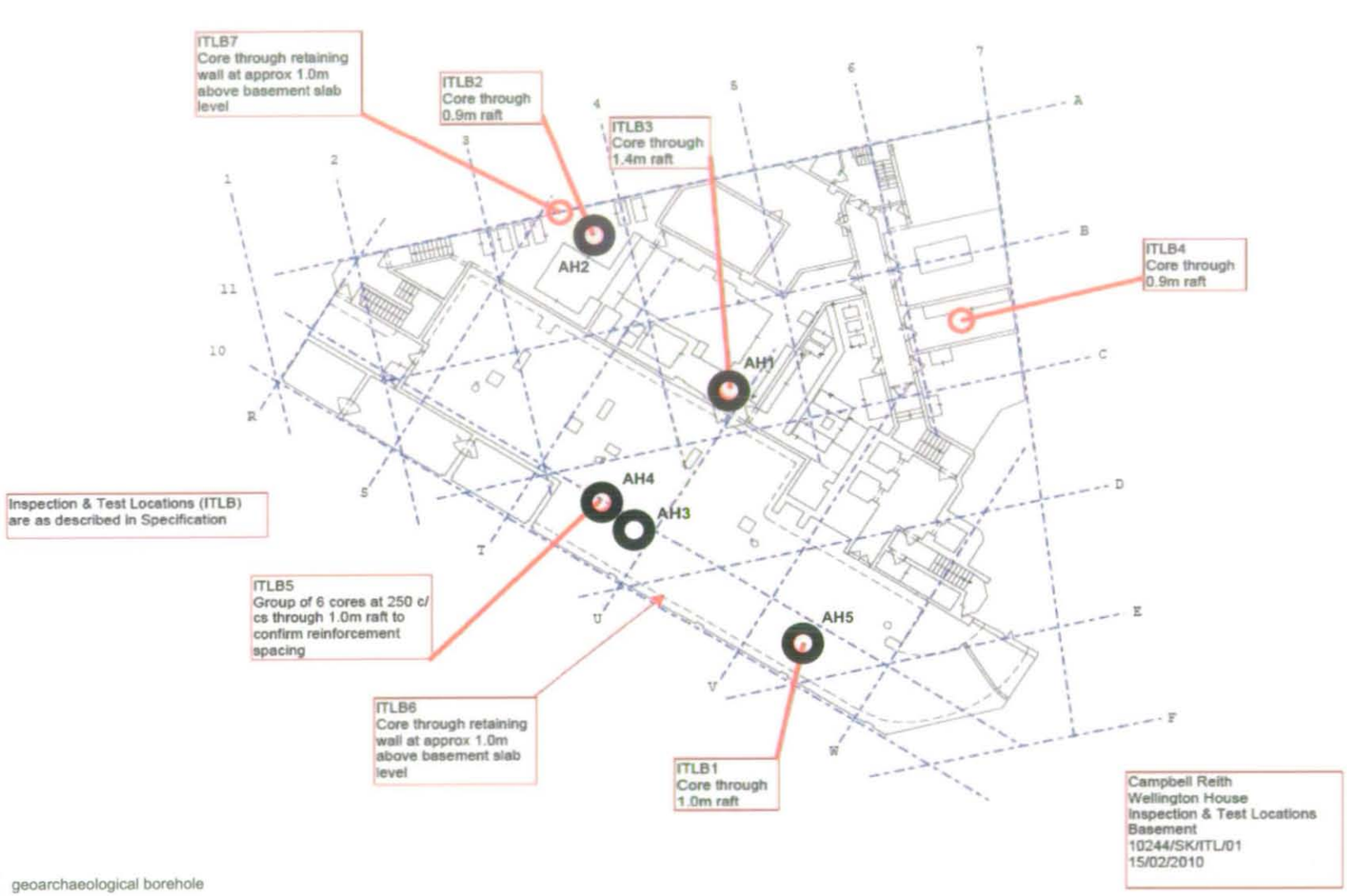


Fig 2 Location of geoarchaeological augerholes

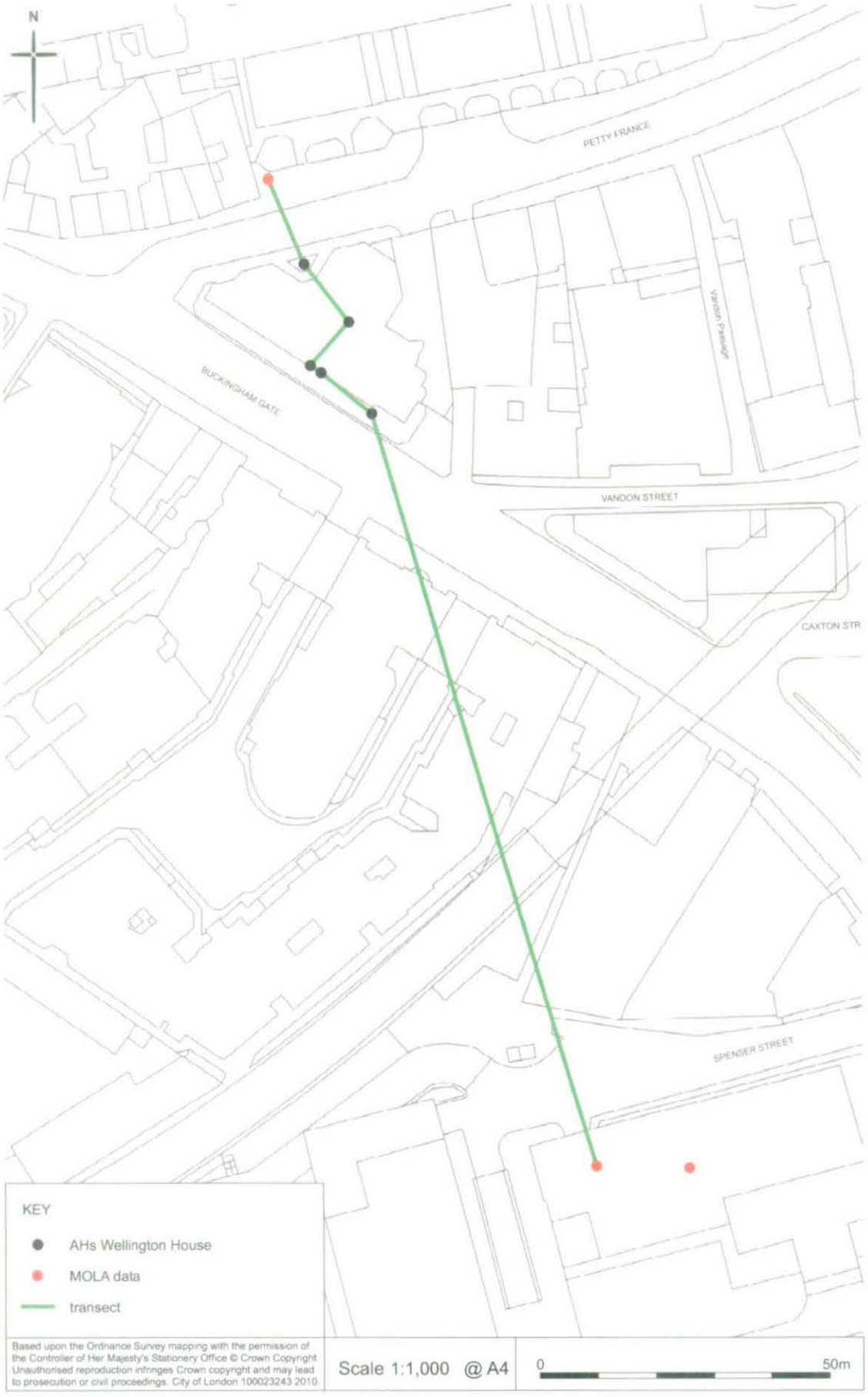
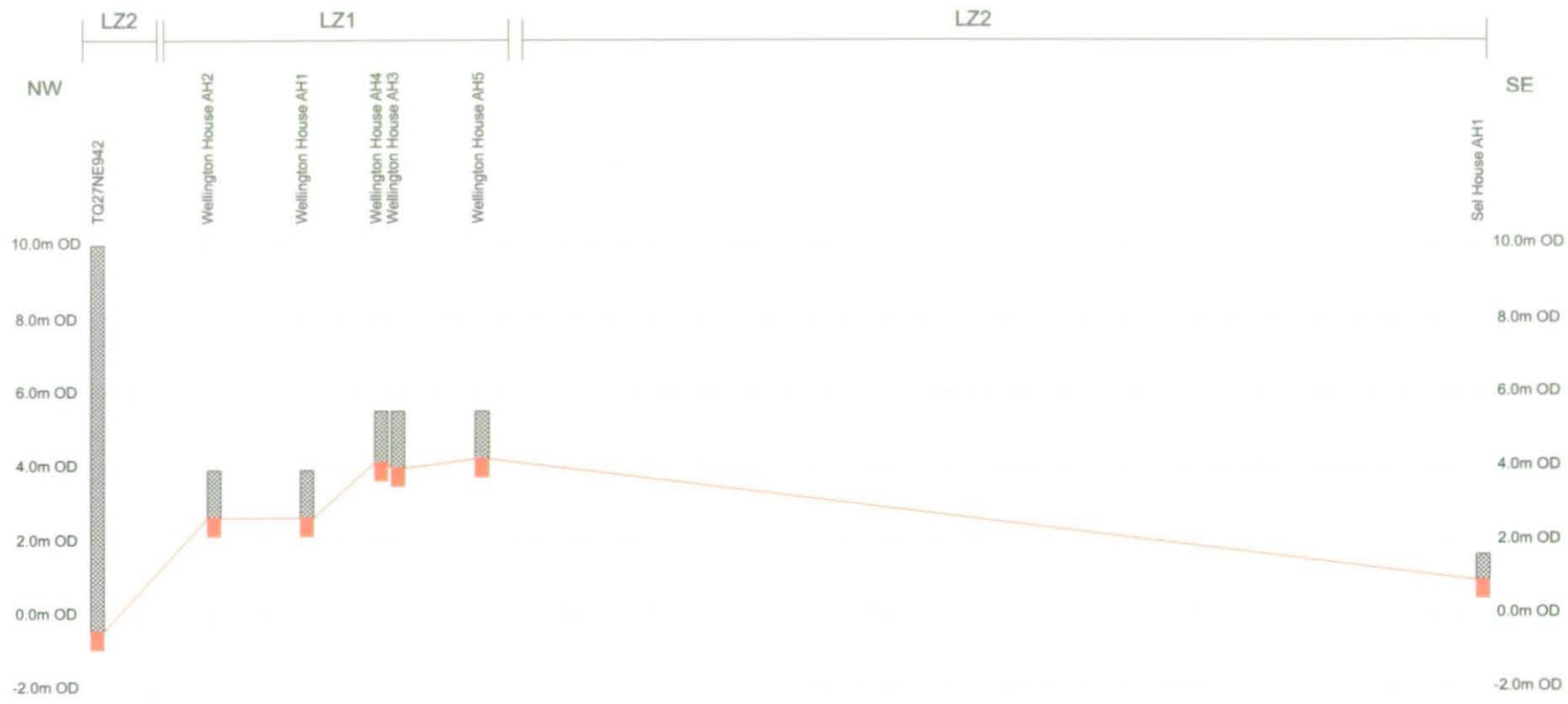


Fig 3 Transect location



Stratigraphy

Facies 1: Sands and Gravels
Late Pleistocene to Early Holocene sands and gravels part of the floodplain gravels (Shepperton gravels) with possible remnants of the terrace gravels (Kempton Park Gravels)

Facies 2: Made Ground
Modern made ground. Onsite this mostly constitutes concrete

Early Holocene Surface
The basic topography for the development of the landscape from the Early Holocene onwards

LZ1 Landscape Zone 1: Gravel Eyot
Late Pleistocene to Early Holocene sands and gravels. A possible remnant of the Kempton Park Gravels providing dry surfaces for ephemeral soil formation and potential Early Mesolithic human activity/ocupation

LZ2 Landscape Zone 2: Floodplain Gravels
'Buried channel' infill (previously 'Lower Floodplain Terrace') on the floodplain of the Thames deposited during glacial outwash folllwing the last Glacial Maximum (approximately 15-20 ka)

Fig 4 Transect