

# LAND AT UFFORD STREET, LONDON BOROUGH OF SOUTHWARK

## Geoarchaeological Deposit Model Report

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## 1. NON-TECHNICAL SUMMARY

A programme of geoarchaeological fieldwork and deposit modelling was carried out at the Ufford Street site in order to (1) clarify the nature of the sub-surface stratigraphy, and (2) clarify the nature, depth, extent and possible date of any alluvium and organic/peat deposits. The results of the deposit modelling indicate that the sediments recorded at the site are similar to those recorded elsewhere in the Lower Thames Valley, particularly those overlying the Gravel at the interface between the Shepperton Gravel ('Lower Floodplain') and Kempton Park Gravel ('Upper Floodplain') Terraces. The surface of the Gravel in the area of the site is recorded at between 1.0 and -3.23m OD, although across the majority of the site it lies at between -0.11 and 1.0m OD, and here it is most likely equivalent to the Kempton Park Gravel (the 'Upper Floodplain' terrace). Just to the northeast of the site the surface of the Gravel falls steeply to between -2.3 and -3.23m OD, and to the east it falls to -1.0m OD; here the Gravel is equivalent to the Late Devensian Shepperton Gravel (the 'Lower Floodplain' terrace).

Overlying the Kempton Park Gravel across the majority of the site is a sequence of predominantly silty, clayey alluvium, generally present in thicknesses of between 0.5 and 2.0m and with an upper surface lying at between ca. 1 and 2m OD. Just to the northeast of the site and overlying the lower Shepperton Gravel, a much thicker sequence (up to 5m) of Holocene Alluvium is recorded, containing a peat horizon in one borehole at between -0.93 and -2.33m OD (as described by MoLA, 2002). No peat or organic sediments were recorded during the geoarchaeological investigations within the area of the present site. On this basis, no further environmental archaeological assessment is recommended. With regards to its archaeological potential, the Gravel recorded across the majority of the site is likely to have represented an area of higher, drier ground during the prehistoric period adjacent to the floodplain, and as such would have represented an attractive location for human activity. The potential for archaeological remains is therefore considered to be high.

## 2. INTRODUCTION

### 2.1 Site context

This report summarises the findings arising out of the geoarchaeological fieldwork and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of land at Ufford Street, London Borough of Southwark (National Grid Reference: centred on TQ 3155 7990; Figures 1 & 2). Quaternary Scientific were commissioned by CgMs Consulting to undertake the geoarchaeological investigations. The area of investigation at Ufford Street is located towards the edge of the floodplain of the estuarine Thames, ca. 600m south of the modern waterfront, and close to the higher, drier ground of the earlier Kempton Park Gravel terrace (30-80,000 BP). The site is an irregular-shaped plot, covering an area of 0.367 hectares with a modern surface elevation of around 3.75m OD (MoLAS, 2002). It is bounded to the north by The Cut, to the south by Ufford Street, to the west by Short Street and to the east by Murrows Mews. The British Geological Survey (BGS) shows the site underlain by London Clay bedrock overlain by superficial deposits of Alluvium, described as 'Clay, Silt, Sand and Peat'. In fact, the alluvial deposits of the Lower Thames and its tributaries are almost everywhere underlain by Late Devensian (MIS 2; 10-15,000 BP) Late Glacial Gravels (in the Thames valley, the Shepperton Gravel of Gibbard, 1985, 1994), and this gravel is widely recorded in boreholes in the vicinity of the site. The majority of the site, with the exception of a small area to the east, is projected as lying within the area of the Bankside Channel, a large and well documented palaeochannel that is aligned broadly NE to SW from Bankside towards Waterloo (see Cowan *et al.*, 2009).

Two geoarchaeological boreholes (AH2 and AH3) were put down just to the northeast of the site during archaeological investigations by MoLAS (2002; see Figure 2), along with a series of watching brief observations of the stratigraphic sequence within the western area of the site. In boreholes AH2 and AH3 the Shepperton Gravel surface was recorded at -2.3 and -3.23m OD respectively, overlain by a sequence of alluvial deposits including interbedded peat/organic silty clay between -3.23 and -0.57m OD in AH3, and largely inorganic alluvium in AH2, capped by Made Ground. A total of eight boreholes were put down within the site itself during geotechnical investigations at the site in June/July 2017 (Clarkebond, 2017). In these boreholes the Gravel surface was recorded at between 0.60 and -1.20m OD, overlain by largely inorganic (sandy clay) alluvium with the exception of one borehole (WS5) in which peat was recorded between 3.5 and 3.8m below ground level.

The Ufford Street site thus appears to lie on the southern margins of the Bankside Channel, with the northern limb of the site extending towards its main axis (see Figure 1). At St Christopher House (London Archaeologist, 2004; see Figure 1) radiocarbon dating indicated that the channel dated from at least 10,650-10,250 cal BP (early Holocene), whilst historic records indicate it had infilled by the Late 17<sup>th</sup> Century (Turner, 2009). The Holocene sediment sequence within this Channel includes in most places a peat horizon; in the axis of the channel a thickness of over 3.0m of peat has been recorded (Branch *et al.*, 2002), but towards the edges of the channel the peat thins to less than 0.5m, for example at the northern end of the Bear Lane site (Young *et al.*, 2010), where 0.45m was recorded.

## 2.2 Palaeoenvironmental and archaeological significance

Significantly, the peat and the organic alluvium that may be present at the Ufford Street site represents a period of semi-terrestrial conditions that may date to the Mesolithic through to Iron Age periods, and the palaeoenvironmental potential of the sequences at the site is considered to be high. In addition, the existing records from the nearby area indicate a variable sequence of Holocene alluvial deposits, resting on a highly variable Shepperton Gravel surface. The different deposits recorded are significant as they represent different environmental conditions that would have existed in a given location. For example: (1) variations in the topography of the River Terrace Gravels could contribute to our understanding of the relief associated with the Bankside Channel; (2) the presence of soils and peat represent former terrestrial or semi-terrestrial land-surfaces, and (3) the less organic alluvial deposits of sands/silts/clays represent periods of varying hydrological conditions on the floodplain. At present, our understanding is that the Ufford Street site lies within or on the margins of the Bankside Channel; by studying the sub-surface stratigraphy across the site in greater detail, it will be possible to build a greater understanding of the former landscapes and environmental changes that took place over space and time at this site.

Organic-rich sediments (in particular peat) also have high potential to provide a detailed reconstruction of prehistoric environments on both the wetland and dryland. In particular, there is the potential to increase knowledge and understanding of the interactions between hydrological change, human activity, vegetation succession and climate in this area of the Middle Thames Valley. Significant vegetation changes include the early Holocene/early Mesolithic transition from pine-dominated to mixed-deciduous dominated woodland; the late Mesolithic/Neolithic decline of elm woodland, the Neolithic colonisation and decline of yew woodland; the late Neolithic/early decline of wetland and dryland woodland. Such investigations are carried out through the assessment/analysis of palaeoecological remains (e.g. pollen, plant macrofossils & insects) and radiocarbon dating.

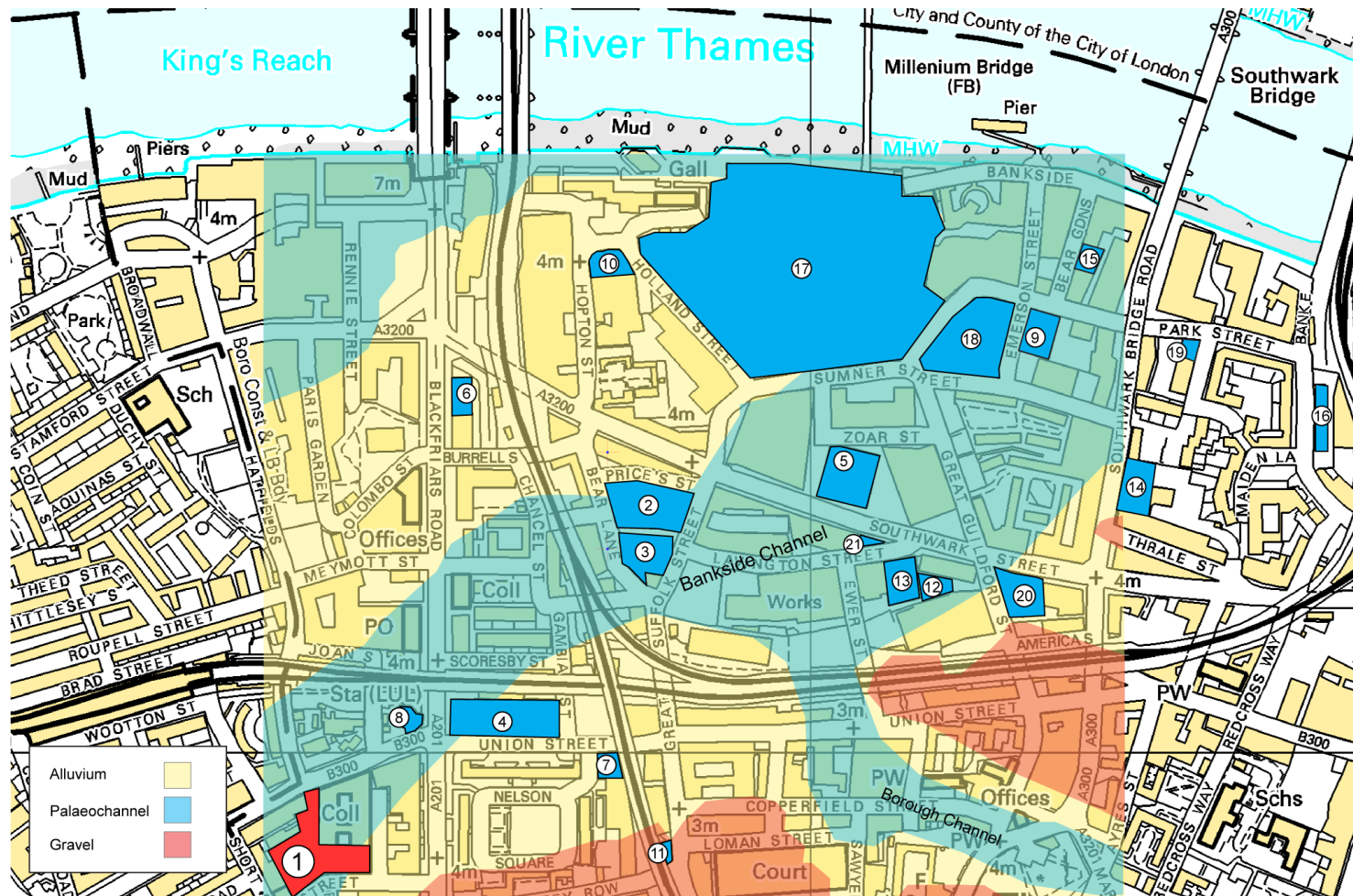
Finally, areas of high gravel topography, soils and peat represent potential areas that might have been utilised or even occupied by prehistoric people, evidence of which may be preserved in the archaeological (e.g. features and structure) and palaeoenvironmental record (e.g. changes in vegetation composition). Such evidence was identified not far from the present site at St Christopher's House (London Archaeologist, 2004), where three timber structures dated to 3450-3240 cal BP (2 structures) and 2750-2350 cal BP (1 structure) were recorded within the channel's sedimentary sequence, whilst at two sites located on a gravel eyot further to the north of the site (44-47 Hopton Street, London Archaeologist, 2001; 245 Blackfriars Road, Thompson *et al.*, 2008), various artefacts reflective of occupation dating from the Neolithic cultural period onwards have been recorded. The sedimentary sequence at Ufford Street therefore also has good potential to provide evidence of prehistoric and historic human activity on both the wetland and dryland surfaces adjacent to the site, which should be compared with existing evidence. The archaeological finds within the area of the site are outlined in more detail in CgMs (2017).

## 2.3 Aims and objectives

Further borehole records are required in order to enhance our understanding of the sub-surface stratigraphy of the Ufford Street site, and to assess its palaeoenvironmental potential. Five significant research aims relevant to the geoarchaeological investigations at the site were outlined within the Written Scheme of Investigation (Young, 2017):

1. To clarify the nature of the sub-surface stratigraphy across the site;
2. To clarify the nature, depth, extent and date of any alluvium and organic/peat deposits;
3. To investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity;
4. To investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland), including those related to sea level change;
5. To integrate the new geoarchaeological record with other recent work in the local area for publication in an academic journal.

In order to address the first two of these aims, two boreholes were put down at the site and a programme of geoarchaeological deposit modelling undertaken, incorporating existing geotechnical and geoarchaeological data from the site and the wider area.



- |   |  |   |  |
|---|--|---|--|
| ① Ufford Street, Southwark                                    | ⑥ 231-241 Blackfriars Rd (BFX08; Batchelor <i>et al.</i> , 2008) | ⑩ 44-47 Hopton St (HNT94; London Archaeologist, 2001)           | ⑬ 28 Park Street (PKZ07; Turner, 2007)             |
| ② Bear House (BJH10; Batchelor <i>et al.</i> , 2011a)         | ⑦ Jubilee Line, Union St (UNL08; Sidell <i>et al.</i> , 2000)    | ⑪ Great Suffolk Street (GUF10; Batchelor <i>et al.</i> , 2011c) | ⑭ Transforming Tate Modern (TMB09; Daykin, 2009)   |
| ③ Bear Lane (BLZ07; Batchelor <i>et al.</i> , 2011a)          | ⑧ Joan St (JOA91; Sidell <i>et al.</i> , 2000)                   | ⑫ 65 Southwark Street (SOU11; Batchelor <i>et al.</i> , 2011b)  | ⑮ 185 Park Street (PKE14; Batchelor & Young, 2014) |
| ④ South Point (BAK02; Branch <i>et al.</i> , 2002)            | ⑨ 135 Park Street (PKP09; Batchelor and Young, 2009)             | ⑬ Surrey House (LV111; Batchelor <i>et al.</i> , 2012)          | ⑯ Anchor Terrace (Thompson <i>et al.</i> , 2008)   |
| ⑤ St. Christopher's House (SCH03; London Archaeologist, 2004) |  | ⑭ Southwark Rose Hotel (SDZ11; Young <i>et al.</i> , 2011)      | ⑰ 61 Southwark Street (Young, 2015)                |
|   |  | ⑮ Empire Warehouse (EWH08; Mackinder, 2008)                     | ⑱ Isis House, 67-69 Southwark Street (Young, 2016) |

**Figure 1: Location of Ufford Street, Southwark, London SE1 and other nearby geotechnical investigations.**

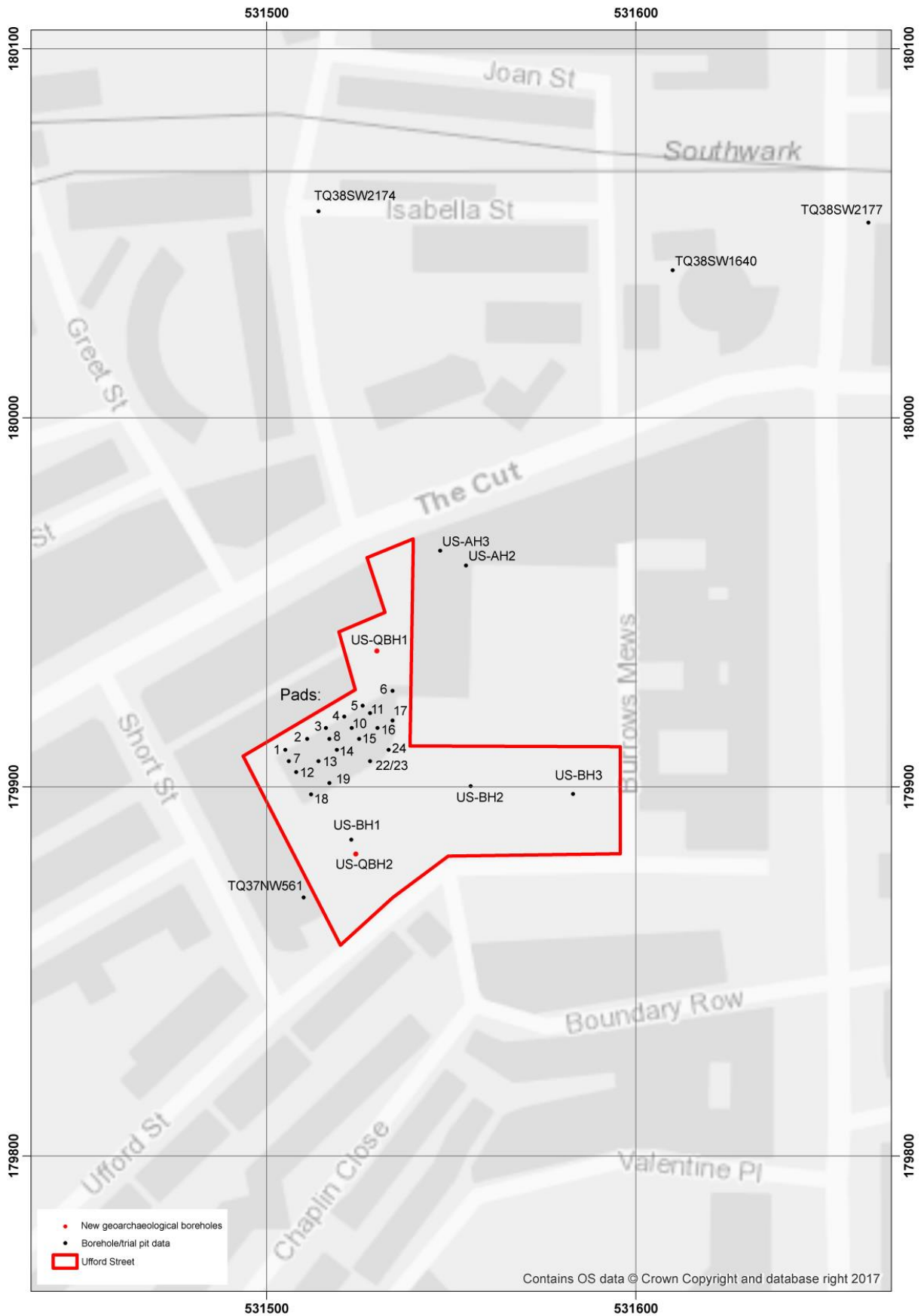


Figure 2: Location of the new geoarchaeological boreholes at Ufford Street, London Borough of Southwark and existing geotechnical/geoarchaeological data used in the deposit model (see Table 1).



## 3. METHODS

### 3.1 Field investigations

Two geoarchaeological borehole (boreholes US-QBH1 and US-QBH2) were put down at the site in December 2017 (Figure 2). The borehole core samples were recovered using an Eijkelkamp window sampler and gouge set using an Atlas Copco TT 2-stroke percussion engine. This coring technique is a suitable method for the recovery of continuous, undisturbed core samples and provides sub-samples suitable for not only sedimentary and microfossil assessment and analysis, but also macrofossil analysis. The borehole locations were obtained using a Leica Differential GPS (see Table 1).

### 3.2 Lithostratigraphic descriptions

The lithostratigraphy of the core samples was described in the field using standard procedures for recording unconsolidated sediment and organic sediments, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter) and inclusions (e.g. artefacts) (Tröels-Smith, 1955). The procedure involved: (1) cleaning the sample using a scalpel; (2) recording the physical properties, most notably colour using a Munsell Soil Colour Chart; (3) recording the composition; gravel (*Grana glareosa*; Gg), fine sand (*Grana arenosa*; Ga), silt (*Argilla granosa*; Ag) and clay (*Argilla steatoides*); (4) recording the degree of peat humification and (5) recording the unit boundaries e.g. sharp or diffuse. The results of the geoarchaeological description of the boreholes are displayed in Tables 2 and 3.

### 3.3 Deposit modelling

The deposit model, incorporating the present site and a limited number of available boreholes from the wider area, was based on a review of 31 geotechnical and geoarchaeological records, incorporating the two new geoarchaeological boreholes, 22 existing geoarchaeological records (MoLAS, 2002), three geotechnical logs provided by Clarkebond (2017) and four British Geological Survey (BGS) archive boreholes (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>) (see Figure 2 and Table 1). In the absence of elevation data for the window sample boreholes provided by Clarkebond (2017) these were not included in the deposit model. Sedimentary units from the boreholes were classified into five groupings: (1) Gravel, (2) Lower Alluvium, (3) Peat, (4) Upper Alluvium and (5) Made Ground. The classified data for groups 1-5 were then input into a database with the RockWorks 16 geological utilities software. A two-dimensional, north-south stratigraphic profile across the site was generated (Figure 3), along with models of surface height for the Gravel (Figure 4) and Upper Alluvium (Figure 6) using an Inverse Distance Weighted (IDW) algorithm. Thickness of the Peat (Figure 5), combined Holocene alluvial sequence (Figure 7) and Made Ground (Figure 8) were also modelled (also using an IDW algorithm). Although the boreholes at the present site are well distributed over the area of investigation, the reliability of the models generated using RockWorks is variable for the wider area. In general, reliability improves from outlying areas where the models are largely supported by scattered archival records, towards the core area of commissioned boreholes within the site itself. In addition, because of the 'smoothing' effect of the modelling procedure, the modelled levels of stratigraphic contacts may differ slightly from the levels recorded in borehole logs and section drawings. As a consequence of this the modelling procedure

has been manually adjusted so that only those areas for which sufficient stratigraphic data is present will be modelled. In order to achieve this, a maximum distance cut-off filter equivalent to a 50m radius around each record is applied to all deposit models. Finally, it is important to recognise that multiple sets of boreholes are represented, put down at different times and recorded using different descriptive terms and subject to differing technical constraints in terms of recorded detail including the exact levels of the stratigraphic boundaries.

**Table 1: Spatial data for the new geoarchaeological boreholes and existing geotechnical records used in the deposit model at Ufford Street, London Borough of Southwark.**

Name	Easting	Northing	Elevation
<i>New geoarchaeological boreholes</i>			
US-QBH1	531,529.71	179,936.78	4.00
US-QBH2	531524.03	179881.74	3.59
<i>Existing geoarchaeological data (MoLAS, 2002)</i>			
US-AH2	531554.00	179960.00	3.20
US-AH3	531547.00	179964.00	3.27
Pad 1	531505.00	179910.00	3.69
Pad 2	531511.00	179913.00	3.69
Pad 3	531516.00	179916.00	3.69
Pad 4	531521.00	179919.00	3.69
Pad 5/5A	531526.00	179922.00	3.69
Pad 6	531534.00	179926.00	3.69
Pad 7	531506.00	179907.00	3.69
Pad 8	531517.00	179913.00	3.69
Pad 10	531523.00	179916.00	3.69
Pad 11	531528.00	179920.00	3.69
Pad 12	531508.00	179904.00	3.69
Pad 13	531514.00	179907.00	3.69
Pad 14	531519.00	179910.00	3.69
Pad 15	531525.00	179913.00	3.69
Pad 16	531530.00	179916.00	3.69
Pad 17	531534.00	179918.00	3.69
Pad 18	531512.00	179898.00	3.69
Pad 19/20	531517.00	179901.00	3.69
Pad 22/23	531528.00	179907.00	3.69
Pad 24	531533.00	179910.00	3.69
<i>Existing geotechnical records (Clarkebond, 2017)</i>			
US-BH1	531522.97	179885.66	4.00
US-BH2	531555.27	179900.21	4.00
US-BH3	531582.96	179898.08	4.00
BGS archive boreholes ( <a href="http://mapapps.bgs.ac.uk/geologyofbritain">http://mapapps.bgs.ac.uk/geologyofbritain</a> )			
TQ37NW561	531510.00	179870.00	3.73
TQ38SW1640	531610.00	180040.00	3.23
TQ38SW2174	531514.00	180056.00	3.30
TQ38SW2177	531663.00	180053.00	3.29

## 4. RESULTS, INTERPRETATION & DISCUSSION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS & DEPOSIT MODELLING

The results of the lithostratigraphic description of boreholes US-QBH1 and US-QBH2 are shown in Tables 2 and 3, with the results of the deposit modelling displayed in Figures 3 to 8. Figure 3 is a two-dimensional stratigraphic profile across the site and the wider area to the north, whilst Figures 4 to 8 are surface elevation and thickness models for each of the main stratigraphic units recorded at the site. The results of the deposit modelling indicate that the number and spread of the logs is sufficient to permit modelling with a reasonable level of certainty across the entire area of site (see Figure 2).

The full sequence of sediments recorded in the boreholes comprises:

*Made Ground* – widely present

*Upper Alluvium* – widely present

*Peat* – only locally present to the northeast of the site

*Lower Alluvium* – present to the northeast of the site

*Pleistocene Gravel* – widely present

### 4.1 Pleistocene Gravel

Overlying the London Clay bedrock at the site was a unit of sandy, in places clayey gravel, reached in all boreholes and in the pad foundations (MoLAS, 2002). On the basis of the elevation and topography of the Gravel, it is likely that two distinct Gravel units are represented in the deposit model: along the northern margins of the site and to the north, the 'Lower Floodplain' terrace of the Late Devensian Shepperton Gravel (15-10,000 years before present) is present, whilst across the majority of the site itself it most likely represents the 'Upper Floodplain' terrace of the Kempton Park Gravel (Gibbard, 1994), deposited during the Early to Middle Devensian (80-30,000 years before present). Both Gravel units comprise the sands and gravels of high-energy braided river systems which, while active, would have been characterised by longitudinal gravel bars and intervening low-water channels in which finer-grained sediments might have been deposited. The deposits of the Kempton Park Gravel that underlie the majority of the site would most likely have represented an area of higher, drier ground during the early Holocene, although given their relatively low elevation towards the edge of the terrace, are likely to have been inundated by floodplain sediments during the Middle-Late Holocene.

The surface of the Gravel in the area of the site (see Figures 3 and 4) is recorded at between 1.0 and -3.23m OD. Across the majority of the site it lies at between -0.11 (Pad 14) and 1.0m OD (Pad 6), and in the two new geoarchaeological boreholes it was recorded at 0.3 (US-QBH1) and 0.34m OD (US-QBH2). At these levels the Gravel is most likely equivalent to the Kempton Park Gravel; however, on the northern margins of the site in the area of US-AH2/AH3 it falls steeply to between -2.3 and -3.23m OD respectively, and to the east it falls to -1.0m OD in US-BH3. Here the Gravel is equivalent to the Shepperton Gravel that underlies the Holocene floodplain of the River Thames, the

topography indicating that the site lies at the interface between the Shepperton Gravel ('Lower Floodplain' terrace) and the Kempton Park ('Upper Floodplain') terrace (see Figure 3).

The levels for the Gravel surface are consistent with the location of the site on the margins of the Bankside Channel. The relief of this Channel has been identified in several investigations to the northeast of the present site (see Figure 1), including at 61 Southwark Street (Young, 2015), Surrey House (Young, 2015) and Isis House (Young, 2016), where the Shepperton Gravel surface falls as low as -4.55m OD. At the 65 Southwark Street site (Batchelor *et al.*, 2011b) (see Figure 1), the gravel surface was recorded at -1.60m OD and below -1.99m OD, whilst at Surrey House (Batchelor *et al.*, 2012) the Gravel was recorded at between ca. -2.6 and -4.5m OD. At the South Point site on Blackfriars Road, towards the presumed axis of the Bankside Channel, the surface of the Gravel falls to -3.49m OD (Branch *et al.*, 2002) and at nearby sites in Joan Street and Union Street (Sidell *et al.*, 2000) this surface is recorded at between -2.00m and -3.00m OD. However at Great Suffolk Street (Green & Young, 2011), only ca. 75m to the south and east of the Union Street site, the gravel surface is recorded at +1.10m OD, and to the north of this locality in sites beside Bear Lane (Young *et al.*, 2010), the gravel surface rises northward from -2.70m to -0.60m OD. Further north again in Blackfriars Road (Batchelor *et al.*, 2008), the gravel surface rises northward from 0.00m to +2.67m OD.

#### **4.2 Lower Alluvium**

The deposits of the Lower Alluvium were recorded overlying the Shepperton Gravel in boreholes US-AH2 (-2.33 to -3.23m OD) and US-AH3 (-1.20 to -2.30m OD), just outside the northeastern boundary of the site. The Lower Alluvium is described as predominantly silty or clayey, tending to become increasingly sandy downward in most sequences. The Lower Alluvium frequently contains detrital wood or plant remains, and in many cases is described as organic or humic and with occasional Mollusca remains. In borehole US-AH3 it contained a thin peat unit containing sand laminae between -2.98 and -3.08m OD, perhaps indicative of localised semi-terrestrial conditions but with frequent flood events, perhaps on the margins of a channel (see MoLAS, 2002).

The sediments of the Lower Alluvium are indicative of deposition during the Early to Mid-Holocene, when the main course of the Thames was probably confined to a single meandering channel. During this period, the surface of the Shepperton Gravel was progressively buried beneath the sandy and silty flood deposits of the river. The richly-organic nature of the Lower Alluvium suggests that this was a period during which the valley floor was occupied by a network of actively shifting channels, with a drainage pattern on the floodplain that was still largely determined by the relief on the surface of the underlying Shepperton Gravel.

#### **4.3 Peat**

A distinct unit of peat was recorded overlying the Lower Alluvium in one borehole just outside the north-eastern boundary of the site (US-AH3), at between -0.93 and -2.33m OD. However, peat was not identified in the adjacent borehole (US-AH2) or within US-QBH1, ca. 30m to the southeast and within the area of the present site. Peat was identified in one geotechnical borehole (WS5) at

between 3.5 and 3.8m below ground level, close to US-QBH2 (not included in the deposit model in the absence of elevation data). No peat was identified in US-QBH2.

This unit is indicative of a transition towards semi-terrestrial (marshy) conditions, supporting the growth of either saltmarsh, sedge fen/reed swamp and/or wetland woodland communities. Such semi-terrestrial conditions may have represented former land surfaces that might have been utilised by prehistoric communities. Assuming that 1m of peat represents 1000 years of peat formation (a typical figure in fen peatlands), the peat could represent up to about 1500 years of accumulation in these conditions. In the absence of data to the north of US-AH3 it is unclear how widespread peat formation was on the floodplain at this location, but on the basis of its absence in US-QBH1 and US-AH2, it does not appear to have extended southwards across the northern part of the Ufford Street site.

Peat is often recorded within the alluvial deposits infilling the Bankside Channel. As described above, towards the main axis of the channel a thickness of over 3.0m of peat has been recorded (Branch *et al.*, 2002), but towards the edges of the channel the peat thins to less than 0.5m, for example at the northern end of the Bear Lane site (Young *et al.*, 2010), where 0.45m was recorded. Investigations at Bear House (Young *et al.*, 2010) and Bear Lane (Tan, 2008) indicate that towards the northern edge of the Bankside Channel the peat deposits accumulated from at least 4820-4570 to 3140-2870 cal BP (Late Neolithic to Late Bronze Age). At 65 Southwark Street (Batchelor *et al.*, 2011) peat was identified within the alluvium in thicknesses of up to 0.84m and present at elevations between -0.62 and -1.46m OD. Subsequent radiocarbon dating demonstrated that the peat accumulated from at least to 5610-5480 to 4290-4090 cal BP (Middle to Late Neolithic). At Surrey House (Batchelor *et al.*, 2012) up to 2m of peat was recorded at elevations between ca. -4 and -1m OD, either lying directly on the gravel surface or separated by a thin layer of alluvium. Here, radiocarbon dating demonstrated that peat accumulation began earlier at 7410-7250 cal BP (Mesolithic) and continued until at least 4840-4640 cal BP (Neolithic). At Isis House (Young, 2016) peat accumulation occurred during the late Mesolithic/early Neolithic transition, at between 4685-4495 cal BC (6635-6445 cal BP) and 4325-4055 cal BC (6275-6005 cal BP).

#### **4.4 Upper Alluvium**

The silty clay Upper Alluvium was recorded in the majority of sequences across the site and the wider area, directly overlying the Kempton Park Gravel across the majority of the Ufford Street site. The surface of the Upper Alluvium (Figure 6) is relatively even, generally lying at between ca. 1 and 2m OD. In the new geoarchaeological boreholes it was recorded at 1.0 (US-QBH1) and 1.39m OD (US-QBH2). The sediments of the Upper Alluvium are indicative of deposition within low energy fluvial and/or semi-aquatic conditions during the Holocene, such as mudflats or seasonally flooded floodplain soils. The high mineral content of the sediments may reflect increased sediment loads resulting from intensification of agricultural land use from the later prehistoric period onward, combined with the effects of rising sea level.

The combined Holocene alluvial sequence, incorporating the Lower Alluvium, Peat (where recorded) and Upper Alluvium, is generally recorded in thicknesses of between ca. 0.5 and 2m across the site (Figure 7). The Holocene alluvial sequence increases in thickness significantly just to the north of the site, where up to 5.1m of alluvium is recorded in US-AH3.

#### **4.5 Made Ground**

Between ca. 1.5 and 3m of Made Ground caps the sequence across the site (Figure 8).

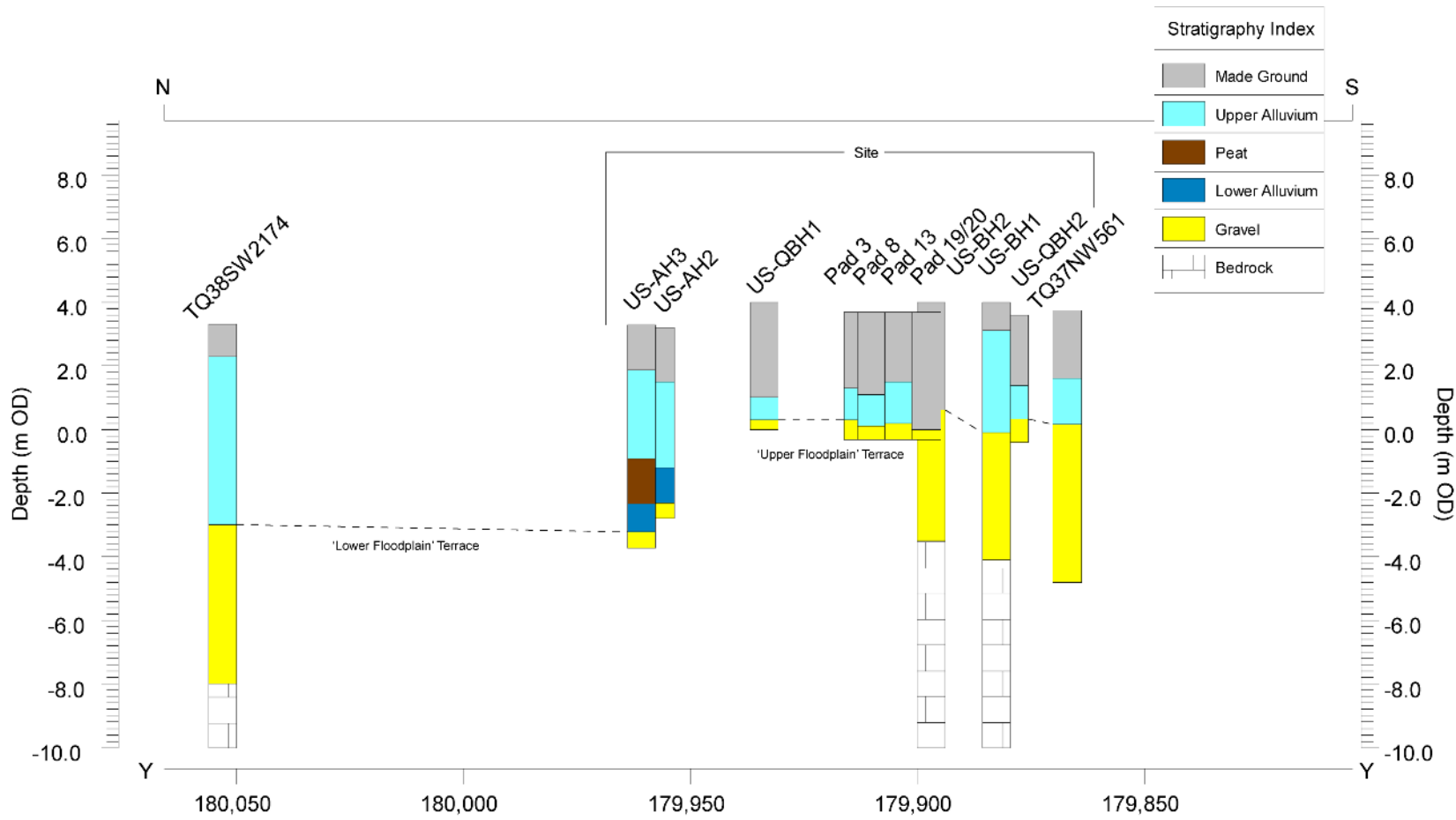


Figure 3: North-south transect of records across the Ufford Street site and the wider area.

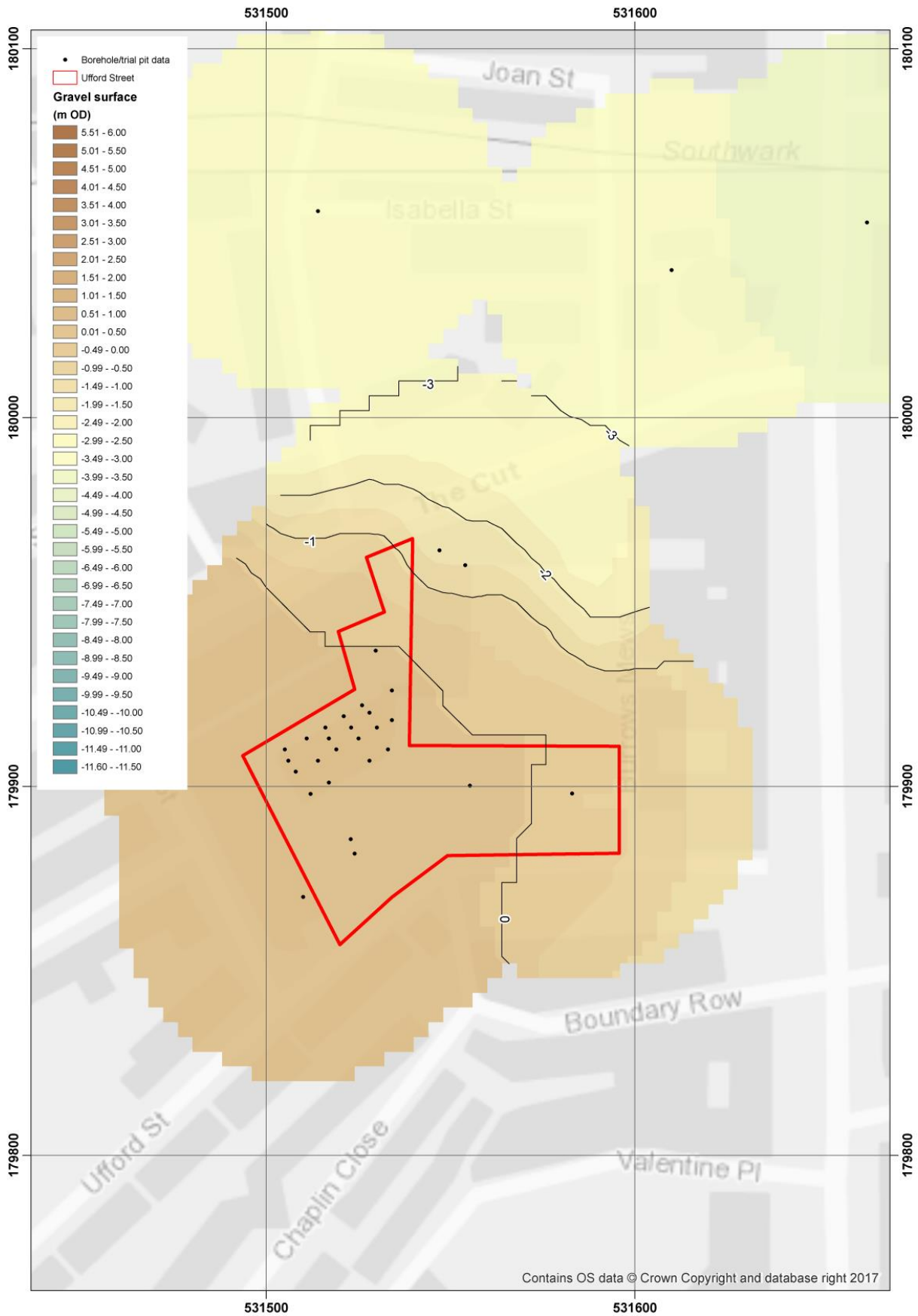


Figure 4: Top of the Gravel (m OD) (site outline in red).



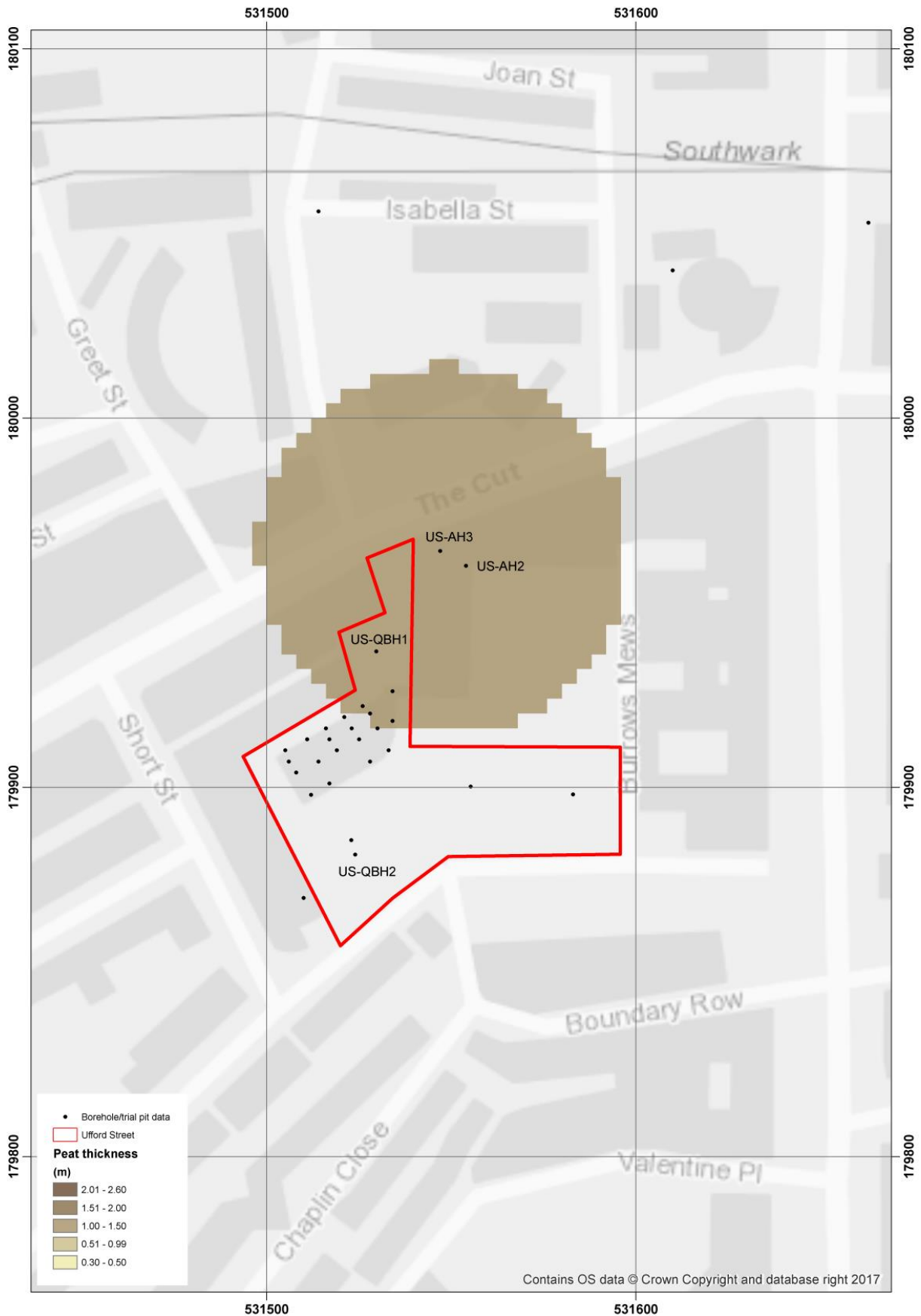


Figure 5: Thickness of the Peat (m) (site outline in red). The model exaggerates the extent of the peat in the northern area of the site due to the 50m radius attributed to each borehole; here, it is limited to US-AH3.

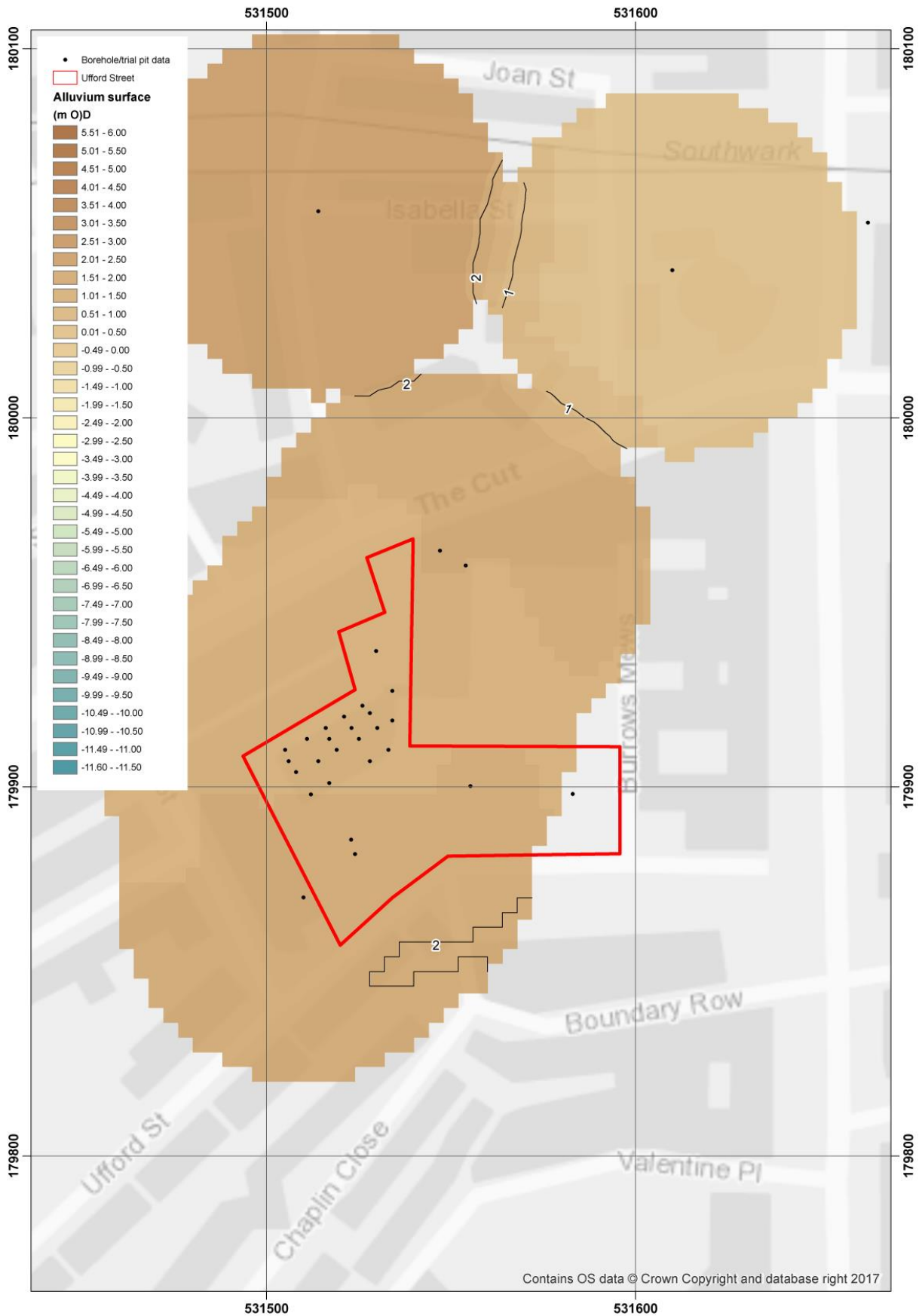


Figure 6: Top of the Upper Alluvium (m) (site outline in red).

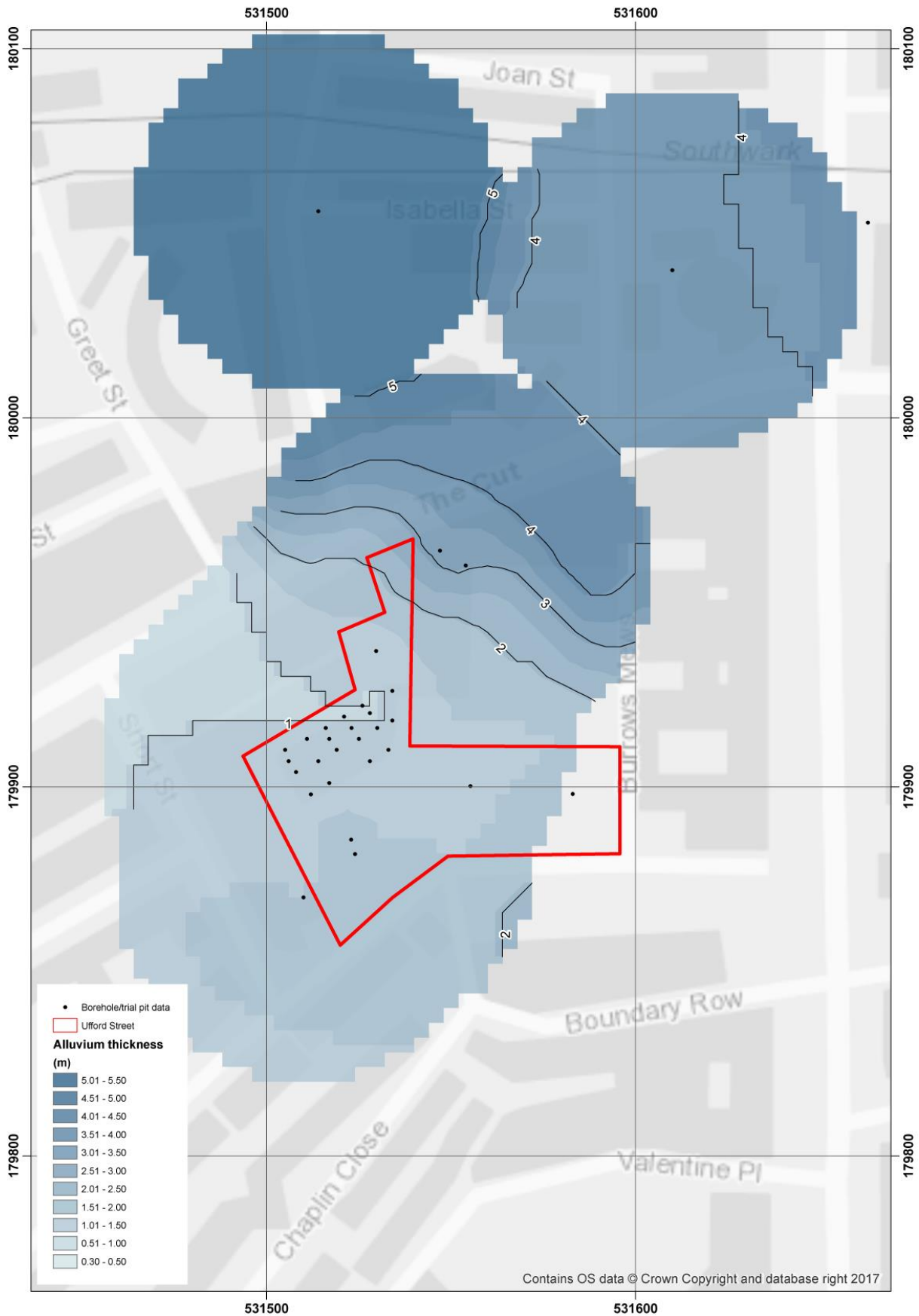


Figure 7: Thickness of the Holocene alluvial sequence (Lower Alluvium, Peat and Upper Alluvium) (m) (site outline in red).

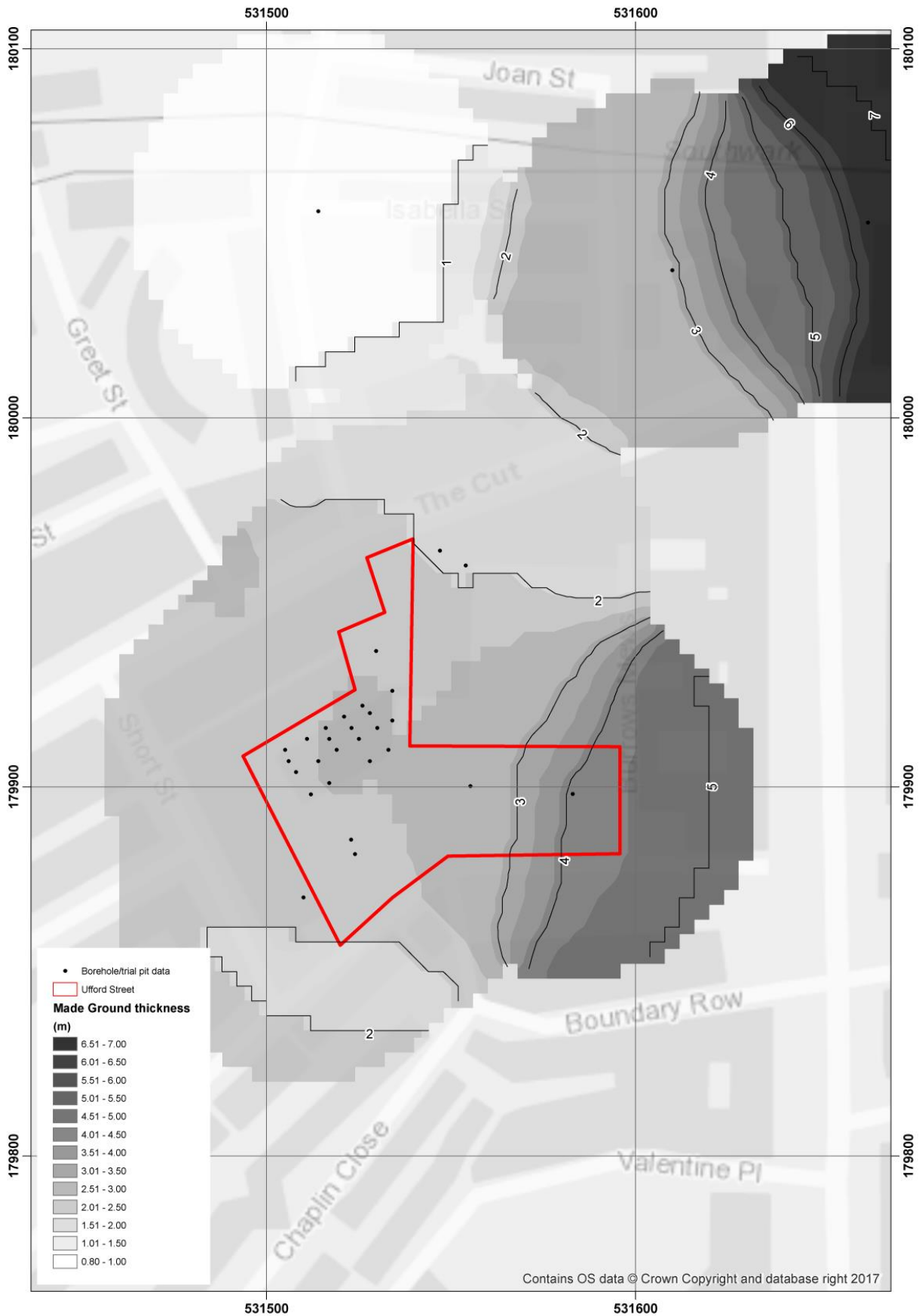


Figure 8: Thickness of Made Ground (m) (site outline in red).

Table 2: Lithostratigraphic description of borehole US-QBH1, Ufford Street, London Borough of Southwark.

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
4.00 to 1.25	0.00 to 2.75	Topsoil over Made Ground of frequent brick and concrete fragments in brown silty clay matrix.	MADE GROUND
1.25 to 1.00	2.75 to 3.00	As3 Ag1; stiff, greyish brown silty clay with charcoal and brick fragments. Redeposited alluvium. Diffuse contact in to:	
1.00 to 0.30	3.00 to 3.70	As3 Ag1; firm, greyish brown silty clay. Sharp contact in to:	UPPER ALLUVIUM
0.30 to 0.00	3.70 to 4.00	Gg2 Ga2; orange sand and gravel. Gravel clasts are flint, up to 30mm in diameter, sub-angular to well-rounded.	KEMPTON PARK GRAVEL

Table 3: Lithostratigraphic description of borehole US-QBH2, Ufford Street, London Borough of Southwark.

Depth (m OD)	Depth (m bgl)	Description	Stratigraphic group
3.59 to 1.59	0.00 to 2.00	Topsoil over concrete hardstanding and concrete and brick rubble in dark grey silty clay matrix. Some redeposited alluvium towards base.	MADE GROUND
1.59 to 1.39	2.00 to 2.20	Redeposited alluvium with gravel and brick fragments. Diffuse contact in to:	
1.39 to 0.79	2.20 to 2.80	Ag2 As1 Ga1; reddish brown clayey, sandy silt. Some orange mottling. Diffuse contact in to:	UPPER ALLUVIUM
0.79 to 0.34	2.80 to 3.25	As3 Ag1; orangey grey silty clay. Orange mottling. Sharp contact in to:	
0.34 to -0.41	3.25 to 4.00	Ga2 Gg2; orange sand and gravel. Gravel clasts are flint, up to 30mm in diameter, sub-angular to well-rounded.	KEMPTON PARK GRAVEL

## 5. CONCLUSION & RECOMMENDATIONS

The aim of the geoarchaeological investigations at the site were: (1) to clarify the nature of the sub-surface stratigraphy, and (2) to clarify the nature, depth, extent and possible date of any alluvium and organic/peat deposits. In order to address these aims, two geoarchaeological boreholes were put down at the site, and the stratigraphic data from existing geotechnical and geoarchaeological records from the site and the wider area used to produce a deposit model of the major depositional units.

The results of the deposit modelling indicate that the sediments recorded at the site are similar to those recorded elsewhere in the Lower Thames Valley, particularly those overlying the Gravel at the interface between the Shepperton Gravel ('Lower Floodplain') and Kempton Park Gravel ('Upper Floodplain') Terraces. The surface of the Gravel in the area of the site is recorded at between 1.0 and -3.23m OD, although across the majority of the site it lies at between -0.11 and 1.0m OD, and here it is most likely equivalent to the Kempton Park Gravel (the 'Upper Floodplain' terrace). Just to the northeast of the site the surface of the Gravel falls steeply to between -2.3 and -3.23m OD, and to the east it falls to -1.0m OD; here the Gravel is equivalent to the Late Devensian Shepperton Gravel (the 'Lower Floodplain' terrace).

Overlying the Kempton Park Gravel across the majority of the site is a sequence of predominantly silty, clayey Holocene alluvium, generally present in thicknesses of between 0.5 and 2.0m and with an upper surface lying at between ca. 1 and 2m OD. Just to the northeast of the site and overlying the lower Shepperton Gravel, a much thicker sequence (up to 5m) of Holocene Alluvium is recorded, containing a peat horizon in one borehole at between -0.93 and -2.33m OD (as described by MoLA, 2002). No peat or organic sediments were recorded during the investigations within the area of the present site, with the exception of a previous geotechnical borehole (WS5; not included in the deposit model). However, this borehole was located within ca. 5m of US-QBH2, in which no peat was identified. On this basis, no further environmental archaeological assessment is recommended on the sequences at the Ufford Street site; however, it is recognised that the palaeoenvironmental potential of the area just to the north and northeast of the site is likely to be significantly higher.

With regards to the archaeological potential of the site, it is highlighted that the Kempton Park Gravel recorded across the majority of the site is likely to have represented an area of higher, drier ground during the prehistoric period adjacent to the floodplain, and as such would have represented an attractive location for human activity. The potential for archaeological remains is therefore considered to be high.

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## 7. APPENDIX: OASIS

**OASIS ID: quaterna1-306584**

### Project details

Project name	Ufford Street, London Borough of Southwark
Short description of the project	<p>A programme of geoarchaeological fieldwork and deposit modelling was carried out at the Ufford Street site. The sediments recorded are similar to those recorded elsewhere in the Lower Thames Valley, particularly those overlying the Gravel at the interface between the Shepperton and Kempton Park Gravel Terraces. The Gravel in the area of the site is recorded at between 1.0 and -3.23m OD, although across the majority of the site it lies at between -0.11 and 1.0m OD, and here it is most likely equivalent to the Kempton Park Gravel (the 'Upper Floodplain' terrace). Just to the northeast of the site the surface of the Gravel falls steeply to between -2.3 and -3.23m OD, and to the east it falls to -1,0m OD; here the Gravel is equivalent to the Late Devensian Shepperton Gravel (the 'Lower Floodplain' terrace). Overlying the Kempton Park Gravel across the majority of the site is a sequence of predominantly silty, clayey alluvium, generally present in thicknesses of between 0.5 and 2.0m and with an upper surface lying at between ca. 1 and 2m OD. Just to the northeast of the site and overlying the lower Shepperton Gravel, a much thicker sequence (up to 5m) of Holocene Alluvium is recorded, containing a peat horizon in one borehole at between -0.93 and -2.33m OD (as described by MoLA, 2002). No peat or organic sediments were recorded during the investigations within the area of the present site. On this basis, no further environmental archaeological assessment is recommended on the sequences at the Ufford Street site. With regards to its archaeological potential, the Gravel recorded across the majority of the site is likely to have represented an area of higher, drier ground during the prehistoric period adjacent to the floodplain, and as such would have represented an attractive location for human activity. The potential for archaeological remains is therefore considered to be high.</p>
Project dates	Start: 01-09-2017 End: 18-01-2018
Previous/future work	No / Not known
Any project codes associated with reference codes	UFO18 - Sitecode

Type of project      Environmental assessment

Survey techniques   Landscape

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### Project location

Country                England

Site location         GREATER LONDON SOUTHWARK SOUTHWARK Ufford Street

Postcode             SE1 8LJ

Site coordinates     TQ 3155 7990 51.502207166993 -0.104462571045 51 30 07 N 000 06 16  
W Point

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### Project creators

Name                 of Quaternary Scientific (QUEST)  
Organisation

Project                brief CgMs Consulting  
originator

Project                design D.S. Young  
originator

Project                D.S. Young  
director/manager

Project supervisor   D.S. Young

Type                  of Developer  
sponsor/funding  
body

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### Project archives

Physical    Archive No  
Exists?

Digital     Archive No  
Exists?

Paper        Archive LAARC  
recipient

Paper Contents      "Environmental", "Stratigraphic"

Paper                Media "Report"  
available

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

Entered on 18 January 2018