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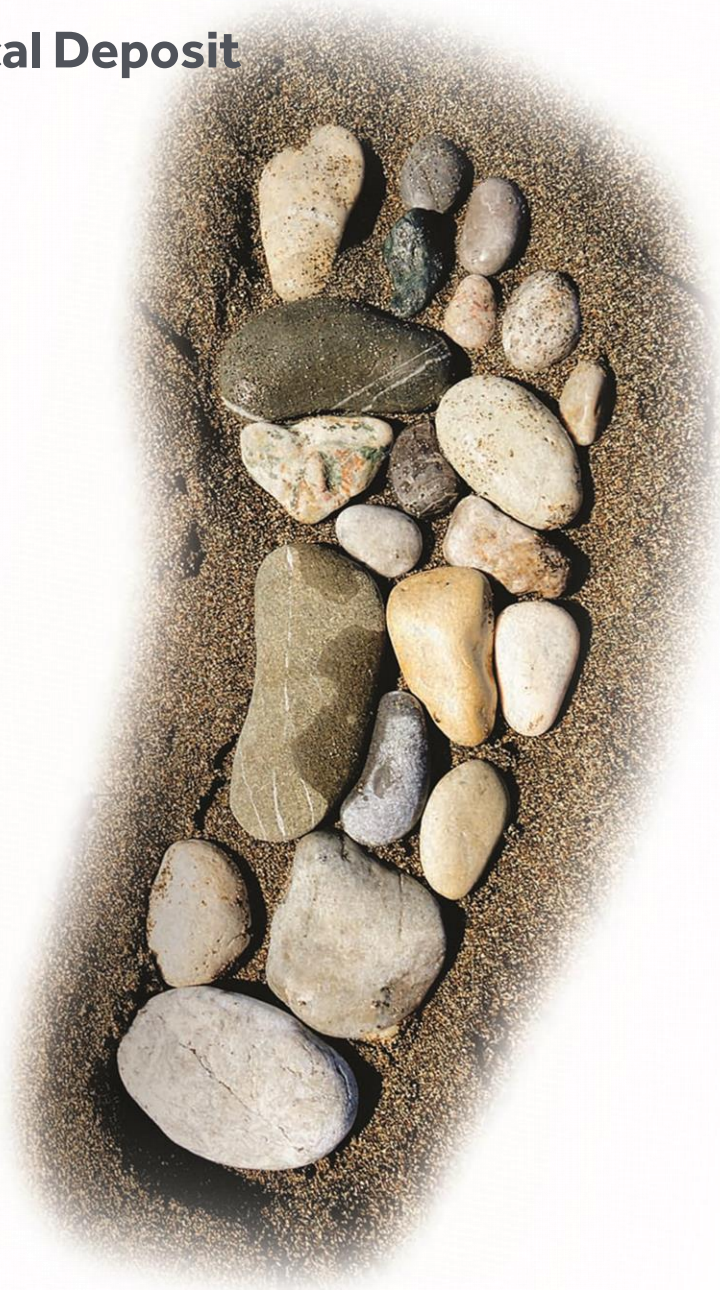
LEVEN ROAD, POPLAR, LONDON BOROUGH OF TOWER HAMLETS, E14 0GX

Updated Geoarchaeological Deposit Model Report



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NGR: TQ 3835 8162
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CONTENTS

1. NON-TECHNICAL SUMMARY

A programme of geoarchaeological field investigations and deposit modelling was undertaken at the Leven Road site, building on a previous desk-based deposit model (Young, 2019), in order to (1) enhance our understanding of the sub-surface stratigraphy of the site, in particular clarifying the height of the Gravel surface towards the northwest, and the nature of the sequence toward the centre of the site; (2) assess the palaeoenvironmental and archaeological potential of the site, and (3) make recommendations for any further palaeoenvironmental or archaeological investigations. The results of investigations indicate that the Lea Valley Gravel surface here lies at between *ca*. 0.6 and -2.7m OD, generally falling from the southern margins of the site (0.1 to 0.11m OD) and the northwest (-0.43 to 0.61m OD) to between *ca*. -1 and -2m OD in the eastern and north-eastern areas of the site.

Within the overlying alluvial sequence, peat was identified only towards the east/northeast, recorded in thicknesses of between 0.3 and 0.82m, and with an upper surface of between -0.78 and -0.11m OD. On the basis of the palaeoenvironmental potential of the sequence of sediments retained from the Leven Road site, and the unknown age of the peat in this Landscape Zone highlighted by Corcoran *et al.* (2011), a programme of environmental archaeological assessment is recommended on the sequence retained from the site (CP125). In terms of its prehistoric archaeological potential, the higher Gravel surfaces (above *ca*. -0.5m OD) recorded in the southern and northwestern areas of the site represent areas of higher, drier ground that are likely to have been elevated above the surrounding floodplain during the prehistoric period, perhaps at the margin of a former channel or the floodplain itself. On this basis, the southern and northwestern areas of the site are considered to have higher prehistoric archaeological potential.

2. INTRODUCTION

2.1 Site context

This report summarises the findings arising out of the geoarchaeological field investigations and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of land at Leven Road, Poplar, London Borough of Tower Hamlets (National Grid Reference: TQ 3835 8162; Figure 1). The work was commissioned by Pre-Construct Archaeology Ltd on behalf of Temple Group. The site is in the lower valley of the River Lea, approximately 1km from the confluence of the Lea with the River Thames. The modern surface elevation of the site lies at around *ca*. 3m OD in the western area, rising gradually to around 4.5m OD in the east. The northern boundary of the site is adjacent to the present-day channel of the Lea, at a point where the river, known here as Bow Creek, begins to follow a very convoluted meandering course. The British Geological Survey (1:50,000 Sheet 257 Romford 1996) shows the site underlain by Alluvium, described as comprising mainly sand, silt and clay with some gravel, resting on London Clay bedrock. In fact, the Holocene alluvium of the Lower Thames and its tributaries is almost everywhere underlain by Late Devensian Late Glacial Gravels (in the Thames valley, the Shepperton Gravel of Gibbard, 1985, 1994; in the Lea valley, the Lea Valley Gravel of Gibbard, 1994), and this gravel is widely recorded in boreholes in the vicinity of the site.

The site lies within the area that has been investigated in the Lea Valley Mapping Project (Corcoran *et al.,* 2011). In this project the Lea Valley has been divided into Landscape Zones characterised by their Holocene landscape history, based largely on sedimentary evidence derived from borehole records. The Leven Road site is within Landscape Zone LZ1-6 (see Figure 1), which represents the deposits of a tributary valley. The surface of the gravels are estimated as lying at around 0m OD, and are overlain by sands that accumulated within a tributary channel draining off the river terrace from the south and west. Peat is recorded overlying the sands; this is generally thin (<0.3m), but significantly thicker horizons (up to 3m) are recorded towards the north of the zone. The Peat is undated and may be of different age to that recorded throughout the rest of the Lower Thames Valley/Lower Lea Valley, due to the different and possibly localised processes that led to its formation (Corcoran *et al*., 2011). Although a very thin peat unit was recorded at between 0.01 and -0.01m OD at the Leven Wharf site (immediately next door to Leven Road; see Figure 1), no radiocarbon dates were obtained from this unit due to an absence of suitable material for dating (Young, 2015).

During a recent desk-based geoarchaeological review of the existing records for the present site (Young, 2019), the Lea Valley Gravel surface was found to lie at between *ca*. 0 and -2m OD, generally falling from the southern area of the site, where it is recorded as high as 0.1 and 0.11m OD, to between *ca*. -1 and -2m OD in the northern area of the site. Peat was identified only towards the northeast, recorded in thicknesses of between 0.3 and 0.6m, and with an upper surface of between -0.59 and -0.11m OD. It was unclear using the existing data whether the localised peat unit recorded here represents isolated pockets of peat, forming in floodplain hollows, or a widespread unit of peat which has subsequently been eroded by fluvial activity (see Young, 2019). The surface of the Gravel at Leven Wharf was recorded at between -1.6 and 0.2m OD, recorded at its lowest in the

northeastern area of the site, but also falling from the centre of the site towards the south (Young, 2015). The Gravel here was overlain by a horizon of generally silty and occasionally gravelly sand, generally recorded to a level of between 0.0 and -0.3m OD and interpreted as the Lower Alluvium. In one borehole (Leven-QBH1) a thin peat unit was recorded between -0.01 and 0.01m OD, indicative of a short period of semi-terrestrial conditions supporting the growth of wetland vegetation. No distinct organic horizons were recorded elsewhere on the site, although organic lenses were recorded in various geotechnical logs (see Young, 2015). A horizon of generally silty, clayey Upper Alluvium was recorded across the Leven Wharf site, to an uneven level (probably as a result of modern truncation) of between 3.6 and 0m OD (Young, 2015).

In terms of its prehistoric archaeological potential, the higher Gravel surfaces (*ca*. 0m OD) recorded in the southern area of the site represent areas of higher, drier ground elevated above the surrounding floodplain, perhaps at the margin of a former channel or the floodplain itself. On this basis, the southern area of the site is considered to have high prehistoric archaeological potential, and any further archaeological investigations should target this area. The archaeological potential of the possible higher Gravel surface in the northwestern area of the site will be determined following completion of the updated deposit model.

2.2 Palaeoenvironmental and archaeological significance

On the basis of the existing desk-based deposit model, geoarchaeological investigations at nearby sites, and the work undertaken in this general area by Corcoran *et al*. (2011), the sedimentary sequence at the Leven Road site may therefore have the potential to provide evidence of prehistoric and historic human activity on both the wetland and dryland surfaces in the area of the site, which should be compared with existing evidence for this area of the Lower Lea valley. Geoarchaeological investigations at the site would have the potential to identify important variations in the height of the gravel surface, and the type, thickness and age of the subsequent Holocene deposits within the vicinity of the site. Such variations are significant as they represent different environmental conditions that would have existed in a given location. For example: (1) the varying surface of the Gravel may represent the location of pre-Holocene river terraces, former channels and bars; (2) the presence of peat represents former terrestrial or semi-terrestrial land-surfaces, and (3) the various alluvial units represent periods of changing hydrological conditions. Thus by studying the sub-surface stratigraphy across the site in greater detail, it will be possible to build an understanding of the former landscapes and environmental changes that took place across space and time.

Organic-rich sediments (in particular peat) have high potential to provide a detailed reconstruction of past environments on both the wetland and dryland. In particular, they provide the potential to increase knowledge and understanding of the age of the peat unit recorded in Corcoran *et al*.'s (2011) Landscape Zone 1-6, and the interactions between hydrology, human activity, vegetation succession and climate in this area of the Lower Lea Valley. Significant vegetation changes include the Mesolithic/Neolithic decline of elm woodland, the Neolithic colonisation and decline of yew woodland; the Late Neolithic/Early Bronze Age growth of elm on peat, and the general decline of wetland and dryland woodland during the Bronze Age. 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 structures) and palaeoenvironmental record (e.g. changes in vegetation composition).

2.3 Aims and objectives

Although uncertainties remain as to which Landscape Zone the Leven Road site should be compared, Corcoran *et al*. (2011) stress that the peat in LZ1-6 is undated, and may be of a different age to that recorded throughout the rest of the Lower Thames/Lower Lea Valley, due to the different and possibly localised processes that led to its formation. On the basis of the unknown age of the peat at the Leven Road site, and its palaeoenvironmental potential, a targeted programme of geoarchaeological investigation was recommended following the desk-based review (Young, 2019), targeting the northwestern part of the site to ground-truth the higher Gravel surface in borehole TQ38SE1998, the central area of the site, where there are no existing records, and the north-eastern area of the site where peat is recorded. It was recommended that these new sequences should be used to update the existing deposit model, and make recommendations for any further palaeoenvironmental or archaeological investigations.

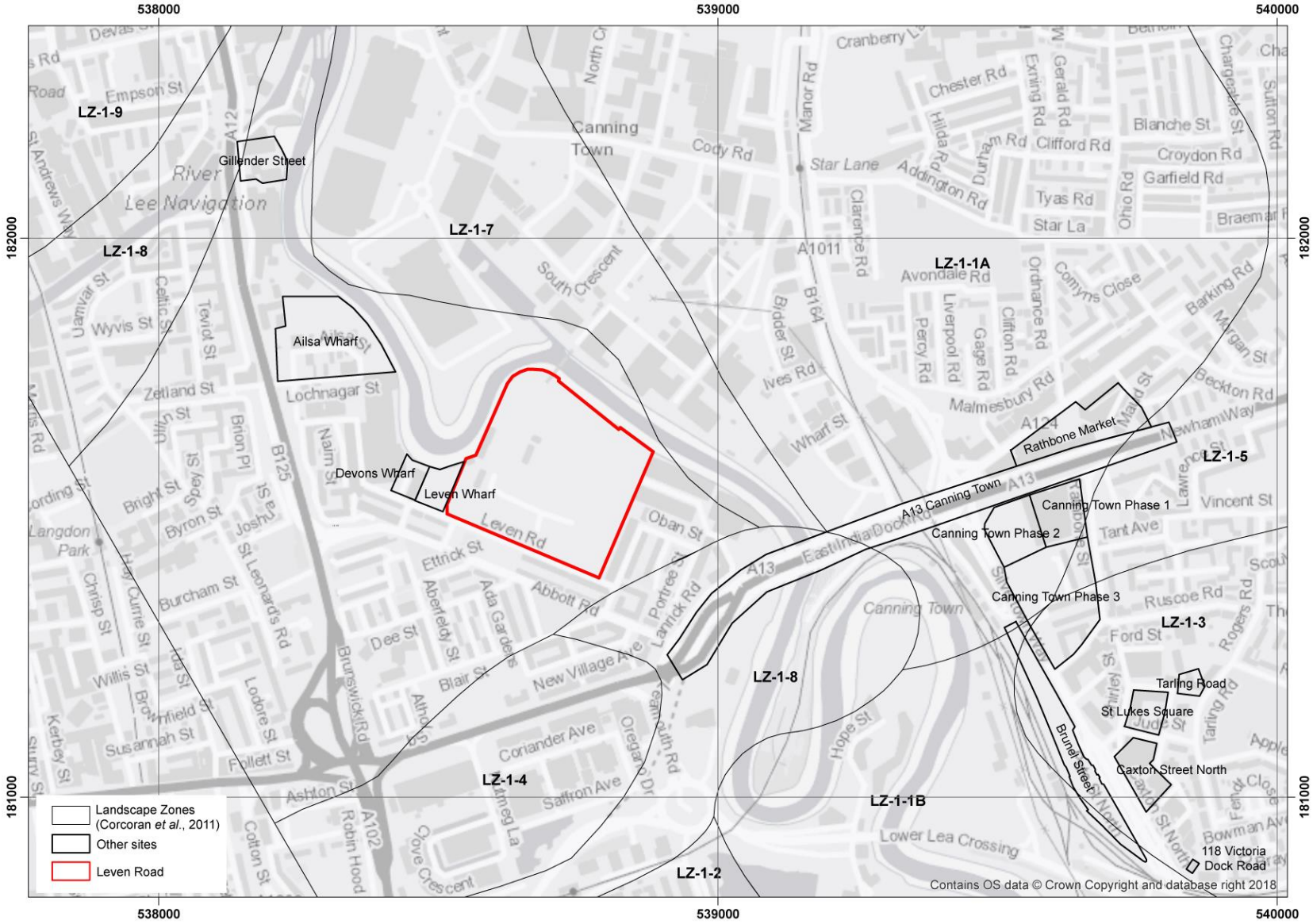

Figure 1: Location of Leven Road and other sites in the local area: Devons Wharf (AIG, 2007); Leven Wharf (Batchelor, 2015); Ailsa Wharf (Batchelor, 2019); Rathbone Market (Young *et al.*, 2013); A13 Ironbridge-Canning Town (Stafford, 2012); Canning Town Phase 1 (Green & Young, 2012); Canning Town Phase 2 (Young, 2014); Canning Town Phase 3 (Young, 2018a); Caxton Street North (Young & Batchelor, 2014a); St Luke's Square (Weale, 2008; Wicks, 2008); 105-107 Tarling Road (Batchelor & Young, 2014); 118 Victoria Dock Road (Barnett et al., 2010); Brunel Street (Batchelor & Young, 2018) and Gillender Street (Young, 2018b). Lower Lea Valley Mapping Project (Corcoran *et al.*, 2011) Landscape Zones (LZ) also shown (data provided by Museum of London Archaeology).

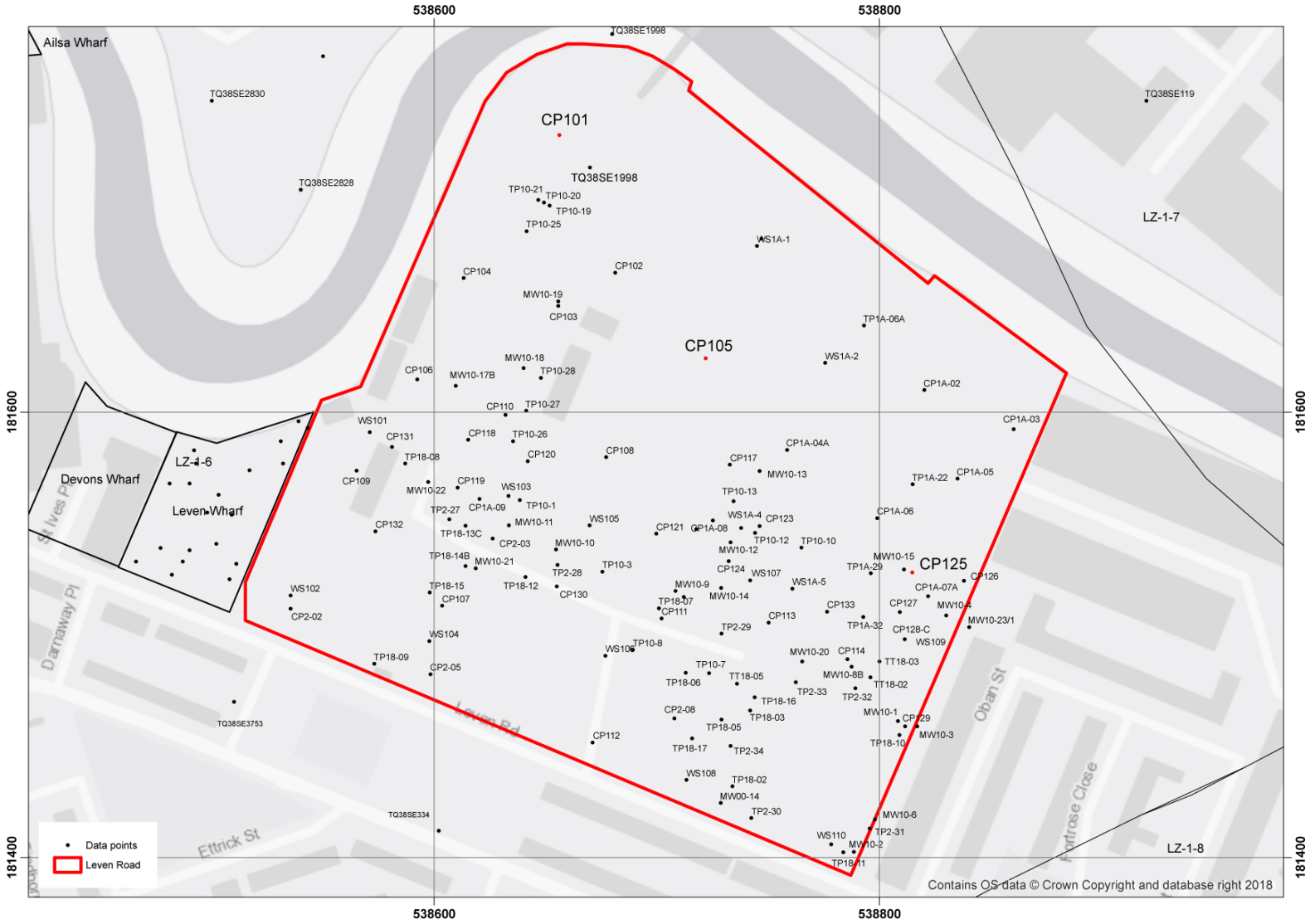

Figure 2: Location of the geotechnical boreholes and test pits at Leven Road, including those records used in the deposit model from Leven Wharf (Young, 2015) and the British Geological Survey borehole archive. New geoarchaeological boreholes shown in red.

3. METHODS

3.1 Field investigations and lithostratigraphic descriptions

During a new phase of geotechnical investigations at the site, a total of 40 new boreholes were put down in March 2019 by MLM Group; of these, three (CP101, CP105 and CP125) were monitored by a geoarchaeologist (see Figure 2), with samples from one sequence (CP125) retained for further palaeoenvironmental assessment, as recommended in the desk-based deposit model report (Young, 2019). The boreholes were put down using a cable percussion rig.

The lithostratigraphy of the core samples was described in the field, with additional laboratory descriptions of the retained samples from CP125, 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 lithostratigraphic descriptions of the monitored boreholes are displayed in Tables 2 to 4, with the spatial attributes for the data used in the deposit model shown in the Table 1.

3.2 Deposit modelling

The updated geoarchaeological deposit model for the site, building on the desk-based deposit model produced by Young (20919). was based on a review of the three new monitored boreholes; 37 new geotechnical records from MLM Group (2019), and the existing 84 geotechnical logs provided by Advisian (2017), MLM Group (2017), Worley Parsons (2010; 2013) and Komex (2003a; 2003b) (see Table 1 and Figure 2). These logs were combined with the stratigraphic data from Leven Wharf (Young, 2015) and existing records in the Quaternary Scientific Lower Thames Valley Geoarchaeological Database, combining records from various geoarchaeological and geotechnical investigations in the wider area (see Figure 1) and the British Geological Survey (BGS) borehole archive (https://www.bgs.ac.uk/geoindex/). A total of 883 data points were used in the deposit model for the wider area of the site (see Figure 12).

Deposit modelling was undertaken using RockWorks 16 geological utilities software. The term 'deposit modelling' describes any method used to depict the sub-surface arrangement of geological deposits, but particularly the use of computer software to create contoured maps or three dimensional representations of contacts between stratigraphic units. The first requirement is to classify the recorded borehole sequences into uniformly identifiable stratigraphic units. At the Leven Road site, the sedimentary units were classified into four groupings: (1) London Clay (bedrock), (2) Gravel, (3) Lower Alluvium, (4) Peat, (5) Upper Alluvium and (6) Made Ground. Models of surface height (using a nearest neighbour routine) were generated for the Gravel, Lower Alluvium, Peat and Upper Alluvium (Figures 3, 4, 5 and 7 respectively). Thickness of the Peat (Figure 6), combined Holocene alluvium (incorporating the Lower Alluvium, Pea and Upper Alluvium (Figure 8) and Made

Ground (Figure 9) was also modelled (also using a nearest neighbour routine). Two-dimensional stratigraphic profiles were also generated for selected boreholes across the site (Figures 10 and 11). A deposit model for the surface of the Gravel in the wider area is shown in Figure 12.

How effectively Rockworks portrays the relief features of stratigraphic contacts or the thickness of sediment bodies depends on the number of data points (boreholes/test pits) per unit area, and the extent to which these points are evenly distributed across the area of interest. The portrayal is also affected by the significance assigned to these data points, in terms of the extent of the area around the point to which the data are deemed to apply. This can be predetermined for each data set, and in the present case the value chosen for each data point (borehole) is equivalent to an area of 50m radius for all models with the exception of the wider Gravel surface, for which a radius of 100m is used in order to aid interpretation of the topographic features. The boreholes are relatively well distributed over the area of investigation. In general, reliability improves towards the core area of boreholes where mutually supportive data are likely to be available from several adjacent data points. Reliability is also affected by the quality of the stratigraphic records, which in turn are affected by the nature of the sediments and/or their post-depositional disturbance during previous stages of land-use on the site. Finally, because of the 'smoothing' effect of the modelling procedure, the modelled levels of stratigraphic contacts may differ slightly from the levels recorded in borehole logs.

Table 1: Borehole attributes for the records used in the deposit model at Leven Road, Poplar.

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
New geotechnical boreholes					
CP101*	MLM, 2019 *monitored **samples retained	538656.18	181724.52	3.57	15.50
CP105*		538722.00	181624.19	3.62	30.00
CP125**		538814.84	181528.03	4.35	10.50
WS101		538571.03	181591.14	3.69	3.00
WS102		538535.45	181517.75	3.10	4.00
WS103		538633.40	181562.46	3.19	3.00
WS104		538597.80	181497.24	3.17	3.00
WS105		538669.78	181549.18	3.17	4.00
WS106		538676.83	181490.65	2.58	4.00
WS107		538741.99	181524.56	3.93	4.00
WS108		538713.24	181434.81	4.15	4.00
WS109		538811.32	181497.99	4.45	4.00
WS110		538778.38	181405.90	3.82	4.00
CP102		538681.35	181662.75	3.17	40.00
CP103		538655.64	181647.74	3.25	20.45
CP104		538613.11	181660.28	4.43	10.45
CP106		538592.40	181614.72	4.64	20.00
CP107		538603.50	181513.14	3.15	26.14
CP108		538677.18	181579.82	3.35	21.38
CP109		538565.14	181573.78	3.07	22.50
CP110		538632.00	181598.94	3.25	21.60

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
CP111		538702.07	181507.40	3.63	23.59
CP112		538671.20	181451.74	1.66	7.50
CP113		538750.16	181505.57	3.84	31.38
CP114		538787.46	181485.70	4.12	20.00
CP117		538732.86	181576.45	3.76	8.50
CP118		538615.29	181587.60	3.29	8.50
CP119		538610.45	181566.25	3.15	8.50
CP120		538641.96	181578.04	3.29	7.50
CP121		538699.73	181545.44	3.73	10.00
CP123		538737.90	181548.07	3.88	9.00
CP124		538732.24	181533.15	3.97	10.00
CP126		538838.05	181524.27	4.38	11.95
CP127		538809.17	181510.22	4.37	7.20
CP128-C		538811.32	181497.99	4.55	11.00
CP129		538811.60	181458.91	4.94	10.50
CP130		538654.99	181521.81	3.10	8.50
CP131		538581.08	181584.43	3.10	9.00
CP132		538573.49	181546.58	3.04	7.50
CP133		538776.47	181510.47	4.05	50.00
Existing geotechnical boreholes					
CP1A-01	MLM Group (2017)	538747.07	181677.88	5.19	40.00
CP1A-02		538820.16	181609.96	4.59	23.10
CP1A-03		538860.37	181592.48	5.22	23.50
CP1A-04A		538758.57	181583.11	3.64	10.00
CP1A-05		538835.09	181570.23	4.32	23.10
CP1A-06		538799.09	181552.48	3.99	10.00
CP1A-07A		538821.81	181517.33	4.41	9.70
CP1A-08		538717.72	181547.50	3.85	25.00
CP1A-09		538620.38	181561.07	3.19	8.00
CP2-02		538535.36	181511.75	3.11	40.00
CP2-03		538626.20	181543.29	3.25	8.50
CP2-05		538598.29	181482.38	3.23	25.00
CP2-08		538707.86	181462.49	3.78	40.00
TP1A-06A		538793.03	181638.93	3.93	2.50
TP1A-22		538814.96	181567.68	3.86	1.92
TP1A-25		538746.16	181548.86	4.03	2.00
TP1A-29		538796.09	181527.63	4.21	2.12
TP1A-30		538712.08	181517.07	3.75	1.77
TP1A-32		538792.67	181508.12	4.27	1.29
TP2-27		538606.81	181551.90	3.47	3.50
TP2-28		538655.30	181531.48	3.31	4.00
TP2-29		538729.10	181500.55	3.75	3.80
TP2-30		538742.49	181417.74	3.50	3.90

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
TP2-31		538795.56	181413.01	3.78	3.50
TP2-32		538789.18	181476.06	4.37	4.00
TP2-33		538762.35	181478.78	4.01	3.90
TP2-34		538733.16	181450.07	4.02	4.00
WS1A-1		538745.02	181674.74	5.19	7.60
WS1A-2		538775.68	181622.17	3.89	5.00
WS1A-4		538725.15	181551.47	3.81	4.00
WS1A-5		538760.94	181520.85	4.05	3.00
MW10-1	Worley Parsons (2010; 2013)	538808.29	181461.23	4.99	10.60
MW10-2		538788.44	181402.61	3.83	8.90
MW10-3		538816.88	181458.95	3.16	6.00
MW10-4		538829.94	181508.78	4.57	10.00
MW10-6		538798.01	181417.03	3.58	4.00
MW10-8B		538785.67	181489.09	4.11	4.00
MW10-9		538708.38	181519.71	3.63	4.10
MW10-10		538654.63	181538.33	3.05	7.70
MW10-11		538633.46	181549.19	3.16	7.30
MW10-12		538733.11	181541.60	3.83	4.50
MW10-13		538746.10	181573.58	3.80	8.40
MW10-14		538728.81	181521.14	3.82	8.40
MW10-15		538810.99	181529.35	4.39	3.00
MW10-17B		538609.70	181611.94	3.32	8.20
MW10-18		538640.19	181619.85	3.25	7.50
MW10-19		538655.66	181649.85	3.22	7.00
MW10-20		538765.26	181488.06	3.88	10.00
MW10-21		538618.57	181529.97	3.10	7.50
MW10-22		538597.30	181568.67	3.05	9.00
MW10-23/1		538840.40	181503.53	2.22	5.70
TP10-1		538638.40	181560.60	3.15	1.30
TP10-3		538675.50	181528.40	3.23	2.10
TP10-7		538723.40	181482.80	3.81	2.80
TP10-8		538689.20	181493.30	3.39	3.00
TP10-10		538764.90	181539.20	3.83	1.80
TP10-12		538744.20	181545.80	3.97	2.50
TP10-13		538734.40	181560.00	3.75	2.60
TP10-19		538651.88	181692.95	3.40	4.50
TP10-20		538649.26	181694.18	3.40	3.50
TP10-21		538646.79	181695.41	3.40	3.50
TP10-25		538641.55	181681.38	3.30	3.50
TP10-26		538635.35	181587.07	3.20	3.00
TP10-27		538641.39	181600.65	3.20	3.30
TP10-28		538647.85	181615.52	3.25	3.50
MW00-14	Komex (2003a; 2003b)	538728.66	181424.52	4.10	9.50

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
TP18-02	Advisian (2017)	538734.00	181432.00	4.09	4.00
TP18-03		538742.00	181466.00	3.97	3.90
TP18-05		538729.00	181462.00	4.11	4.00
TP18-06		538713.00	181483.00	4.10	4.10
TP18-07		538701.00	181512.00	3.81	3.60
TP18-08		538587.00	181577.00	3.14	3.90
TP18-09		538573.00	181487.00	3.28	3.90
TP18-10		538809.00	181455.00	4.80	3.70
TP18-11		538783.83	181402.40	3.33	3.95
TP18-12		538641.00	181526.00	3.30	4.00
TP18-13C		538614.00	181549.00	3.38	3.80
TP18-14B		538614.00	181531.00	3.27	4.00
TP18-15		538598.00	181519.00	3.37	4.00
TP18-16		538744.00	181472.00	3.92	2.00
TP18-17		538715.79	181453.51	3.80	3.80
TT18-02		538796.00	181481.00	4.80	4.00
TT18-03		538800.00	181488.00	5.05	3.90
TT18-05		538736.00	181478.00	4.05	4.20

4. RESULTS & INTERPRETATION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS & UPDATED DEPOSIT MODELLING

The updated geoarchaeological deposit models are displayed in Figures 3 to 12. Figures 3 to 9 provide surface elevation and thickness models for each of the main stratigraphic units at the site (overlying the bedrock), whilst Figures 10 and 11 are two-dimensional stratigraphic profiles across the site (north to south, and west to east). The results indicate that a sufficient number and spread of boreholes have been put down in the area of the site to permit deposit modelling of the major stratigraphic units with a reasonable degree of certainty. Previous gaps in the deposit model, namely towards the centre of the site, have been addressed by the new phase of geoarchaeological and geotechnical investigations.

The full sequence of sediments recorded at the site comprises:

Made Ground
Upper Alluvium – widely present
Peat – recorded only towards the east/northeast
Lower Alluvium – recorded only towards the east and north
Lea Valley Gravel – widely present

4.1 Lea Valley Gravel

A unit of sandy gravel, interpreted as the Lea Valley Gravel of Gibbard (1984), was present in all boreholes that penetrated to the base of the Holocene alluvial sequence. This unit of sandy gravel was deposited during the Devensian Late Glacial (Marine Isotope Stage (MIS) 2; *ca.* 16,000 to 11,700 years before present) and comprises the sands and gravels of a high-energy braided river system which, while it was active would have been characterised by longitudinal gravel bars and intervening low-water channels in which finer-grained sediments might have been deposited. Such a relief pattern would have been present on the valley floor at the beginning of the Holocene when a lower-energy fluvial regime was being established.

The updated deposit model indicates that the surface of the Lea Valley Gravel lies at between *ca.* 0.6 and -2.7m OD across the Leven Road site, although across much of the site levels between *ca.* 0 and -2m OD are recorded. The Gravel surface generally falls from the southern area of the site, where it is recorded as high as between 0.1 and 0.11m OD (TP2-30 and CP2-02 respectively), falling to between *ca.* -1 and -2m OD in the northern and north-eastern areas of the site. In one borehole towards the south the Gravel surface is recorded at -2.72m OD (MW10-20), perhaps representing a scour hollow within the Late Devensian/Early Holocene channel. In the desk-based deposit model report (Young, 2019) it was reported that one borehole towards the northwestern area of the site recorded a Gravel surface of 0.61m OD (TQ38SE1998). However, it was unclear at this stage whether the high Gravel surface here represented a genuine Gravel high or an erroneous data point, since the Gravel high was only represented in one sequence (the closest two sequences show Gravel surfaces of -1.48 and -1.81m OD). The results of the new geoarchaeological investigations

indicate that the Gravel surface does indeed rise in the north-western area of the site, where it was recorded at -0.43m OD in borehole CP101 and -0,30m OD in TP10-19.

The Gravel surface across the modelled area is typical of the topography associated with a braided river system, with areas of higher gravel bars and intervening channels in which alluvial sediments have accumulated. Similar levels for the surface of the Gravel were recorded at the Leven Wharf site, immediately to the west and shown within the deposit model: the surface of the Gravel here was recorded at between -1.6 and 0.2m OD, recorded at its lowest in the north-eastern area of the site where it lies at between -0.9 and -1.5m OD (see Young, 2015). Significantly, the elevated Gravel surface towards the northwest of the site represents an area of higher, drier ground that is likely to have been elevated above the surrounding floodplain during the prehistoric period (see Recommendations).

4.2 Lower Alluvium

A unit typical of the Lower Alluvium recorded elsewhere in the Lower Thames Valley and its tributaries was identified in the geotechnical logs only in two sequences towards the northeast of the site (CP1A-01 and CP1A-06), resting directly on the Lea Valley Gravel. This unit was not identified in any of the new geoarchaeological boreholes. The deposits of the Lower Alluvium are described as a predominantly silty or clayey, tending to become increasingly sandy downward. Elsewhere, the Lower Alluvium frequently contains detrital wood or plant remains, and in many cases is described as organic and with occasional Mollusca. The sediments of the Lower Alluvium are indicative of deposition during the Early to Mid-Holocene, when the main course of the Thames and its tributaries became confined to single meandering channels. During this period, the surface of the Lea Valley 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 Lea Valley Gravel.

The surface of the Lower Alluvium was recorded at between -0.61 (CP1A-06) and -0.81m OD (CP1A-01) (Figure 4). Its presence here, being confined to areas of lower Gravel topography, is consistent with alluvial sequences elsewhere in the Lower Thames Valley and its tributaries.

4.3 Peat

A distinct unit of peat was identified in three (CP1A-05, CP1A-06 and CP1A-07A) of the previous geotechnical records and one of the new geoarchaeological boreholes (CP125) in the eastern/north-eastern area of the site. It is of note however that the alluvium is frequently described in the geotechnical logs as 'organic' in other areas of the site. Although only localised, and confined to the eastern/north-eastern area of the site, this transition to peat accumulation is indicative of a transition towards semi-terrestrial (marshy) conditions, supporting the growth of sedge fen/reed swamp and/or woodland communities on the floodplain.

The surface of the peat (Figure 5) was recorded at between -0.78 (CP125) and -0.11m OD (CP1A-06), and it was recorded in thicknesses (see Figure 6) of between 0.3 (CP1A-07A) and 0.82m (CP125).

The new geoarchaeological borehole from which samples were retained (CP125) represents the thickest sequence of peat identified at the site, and here it was described as a woody and in places herbaceous silty peat. On the basis that 1m of peat represents around 1000 years of peat accumulation (a figure typical of lowland fen peatlands in southern England), the peat here may represent a continuous record of up to 800 years of environmental conditions. Elsewhere, a very thin unit of peat was recorded at the neighbouring Leven Wharf site (Young, 2015), identified at between -0.01 and 0.01m OD towards the north-eastern corner of that site; no dates were obtained from this unit due to an absence of suitable material for dating. As at the present site, no other distinct peat units were recorded within the remainder of the geoarchaeological or geotechnical boreholes, but 'organic' material (with no specified depth) was recorded within the alluvium in two of the previous geotechnical boreholes.

4.4 Upper Alluvium

Across much of the site, a unit described mainly as a silty clay (in places described as organic) rests directly on the Lea Valley Gravel (or Peat/Lower Alluvium where present). This unit is interpreted as the Upper Alluvium recorded elsewhere in the Lower Thames Valley and its tributaries, the sediments of which are indicative of deposition within low energy fluvial and/or semi-aquatic conditions during the Holocene. 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 surface of the Upper Alluvium across the site is uneven (see Figure 7), recorded at between -0.48 (MW10-17B) and 3.52m OD (TP18-16); in the new geoarchaeological boreholes it was recorded at between 1.12 (CP105) and 2.47m OD (CP101). The variability in the surface of the Upper Alluvium across the site most likely represents a variable degree of truncation of the natural sequence by the overlying Made Ground.

The thickness of the combined Holocene alluvial units (incorporating the Lower Alluvium, Peat and Upper Alluvium) is displayed in Figure 8. In general, between *ca.* 1 and 4m of alluvium is recorded, with no clear relationship to the underlying Gravel topography (perhaps reflecting the influence of subsequent truncation of the natural sequence by the overlying Made Ground).

4.5 Made Ground

Between *ca.* 1 and 4.5m of Made Ground caps the Holocene alluvial sequence across the majority of the site (Figure 9). As described above, greater thicknesses of Made Ground appear to reflect greater truncation of the underlying natural sequence at the site, and this is particularly true of the south-eastern area of the site: here, between 2.5 and 4.5m of Made Ground is present.

Table 2: Lithostratigraphic description of borehole CP101, Leven Road, Poplar, London Borough of Tower Hamlets.

Depth (m OD)	Depth (m bgs)	Description	Stratigraphic unit
3.57 to 2.47	0.00 to 1.10	Concrete blocks over gravel and brick in brown sandy clay matrix.	MADE GROUND
2.47 to 0.57	1.10 to 3.00	As3 Ag1 Gg+; blue grey silty clay with occasional gravel clasts.	UPPER ALLUVIUM
0.57 to 0.07	3.00 to 3.50	Ag2 Ga2 Dh+; greyish brown silt and sand with traces of detrital herbaceous material. Contamination from Made Ground (hydrocarbons). Possible worm and root hollows. Diffuse contact in to:	
0.07 to -0.43	3.50 to 4.00	Ag2 Ga1 Gg1; dark grey gravelly sandy silt. Sharp contact in to:	
-0.43 to -1.43	4.00 to 5.00	Gg2 Ga1 Ag1; sandy silty gravel. Clasts are flint, sub-angular to well-rounded, average diameter 20mm.	LEA VALLEY GRAVEL

Table 3: Lithostratigraphic description of borehole CP105, Leven Road, Poplar, London Borough of Tower Hamlets.

Depth (m OD)	Depth (m bgs)	Description	Stratigraphic unit
3.62 to 1.62	0.00 to 2.00	Concrete hardstanding over gravel, concrete and brick rubble.	MADE GROUND
1.62 to 1.12	2.00 to 2.50	Gravel, brick and mortar with ash and clinker.	
1.12 to 0.62	2.50 to 3.00	Ag2 As2; dark grey silt and clay. Very contaminated from overlying Made Ground (hydrocarbons). Diffuse contact in to:	UPPER ALLUVIUM
0.62 to -1.88	3.00 to 5.50	As3 Ag1; greenish grey silty clay. Sharp contact in to:	
-1.88 to -2.38	5.50 to 6.00	Gg2 Ga1 Ag1; sandy silty gravel. Clasts are flint, sub-angular to well-rounded, average diameter 20mm.	LEA VALLEY GRAVEL

Table 4: Lithostratigraphic description of borehole CP125, Leven Road, Poplar, London Borough of Tower Hamlets.

Depth (m OD)	Depth (m bgs)	Description	Stratigraphic unit
4.35 to 2.85	0.00 to 1.50	Gravel, concrete and brick in grey clayey matrix,	MADE GROUND
2.85 to 1.35	1.50 to 3.00	As2 Ag2 Gg+; grey silty and clay with occasional gravel clasts. Some fine metal strands; appears to be layer associated with previous remediation of site.	
1.35 to 0.85	3.00 to 3.50	As3 Ag1 Gg+; greyish brown silty clay. Diffuse contact in to:	UPPER ALLUVIUM
0.85 to 0.35	3.50 to 4.00	As3 Ag1 Gg+; grey silty clay with occasional gravel clasts. Hydrocarbon contamination. Diffuse contact in to:	
0.35 to -0.4	4.00 to 4.75	As3 Ag1; blue grey silty clay with some iron staining.	
-0.4 to -0.78	4.75 to 5.13	VOID – NO SAMPLE RETAINED	
-0.78 to -1.25	5.13 to 5.60	Sh3 Ag1 Th+ Tl+; humo. 3; dark reddish brown well humified silty peat with traces of herbaceous and woody material. Diffuse contact in to:	PEAT
-1.25 to -1.38	5.60 to 5.73	VOID – NO SAMPLE RETAINED	
-1.38 to -1.60	5.73 to 5.95	Sh2 $Tl^2$1 Ag1 Th+; humo. 2/3; dark reddish brown moderately to well humified woody and silty peat with a	

Depth (m OD)	Depth (m bgs)	Description	Stratigraphic unit
		trace of herbaceous material. Diffuse contact in to:	
-1.60 to -1.80	5.95 to 6.15	Gg2 Ag1 Sh1; dark brown organic silty gravel. Clasts are flint, sub-angular to well-rounded, average diameter 20mm. Possible soil horizon.	LEA VALLEY GRAVEL

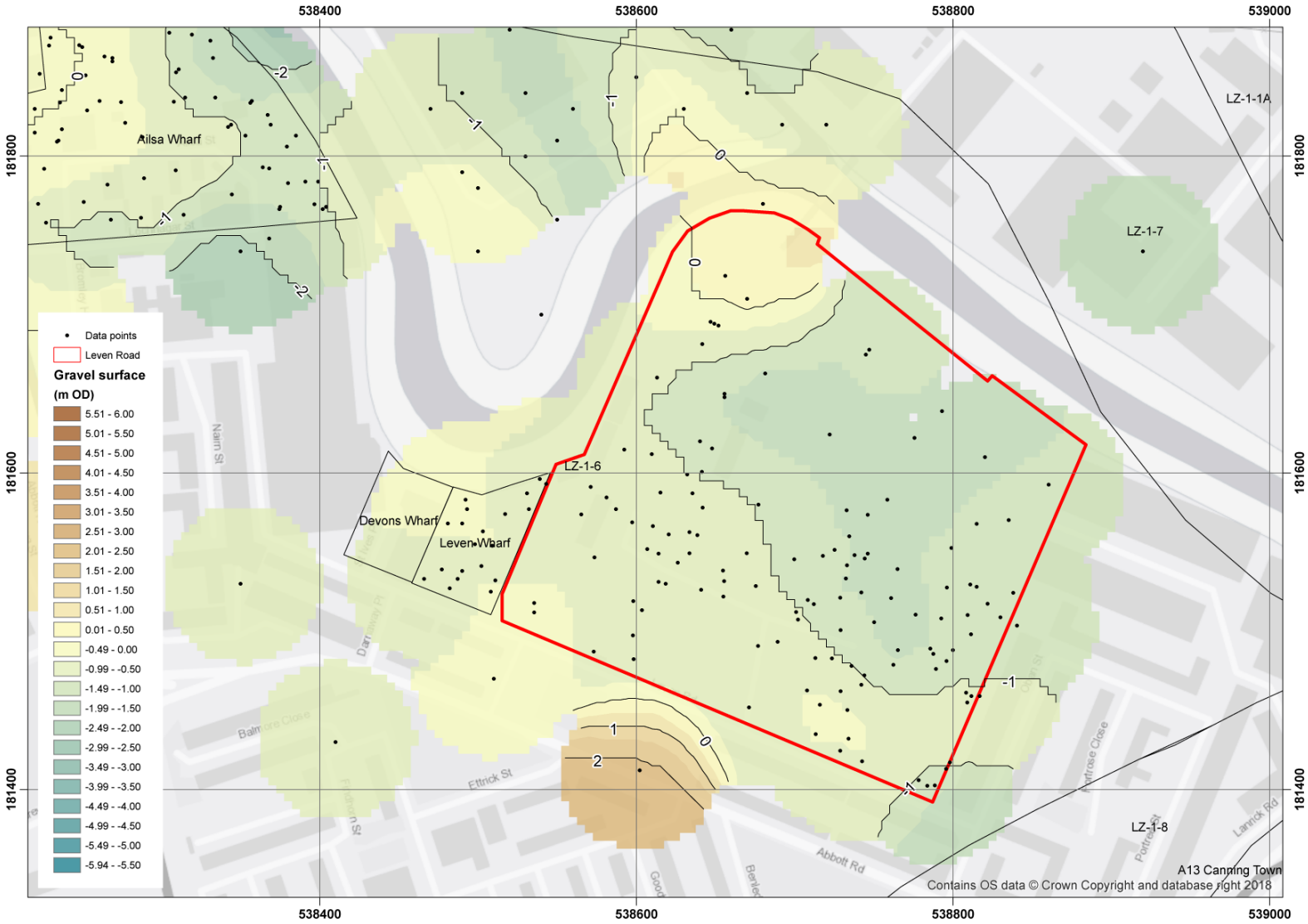

Figure 3: Surface of the Lea Valley Gravel (contour heights in m OD).

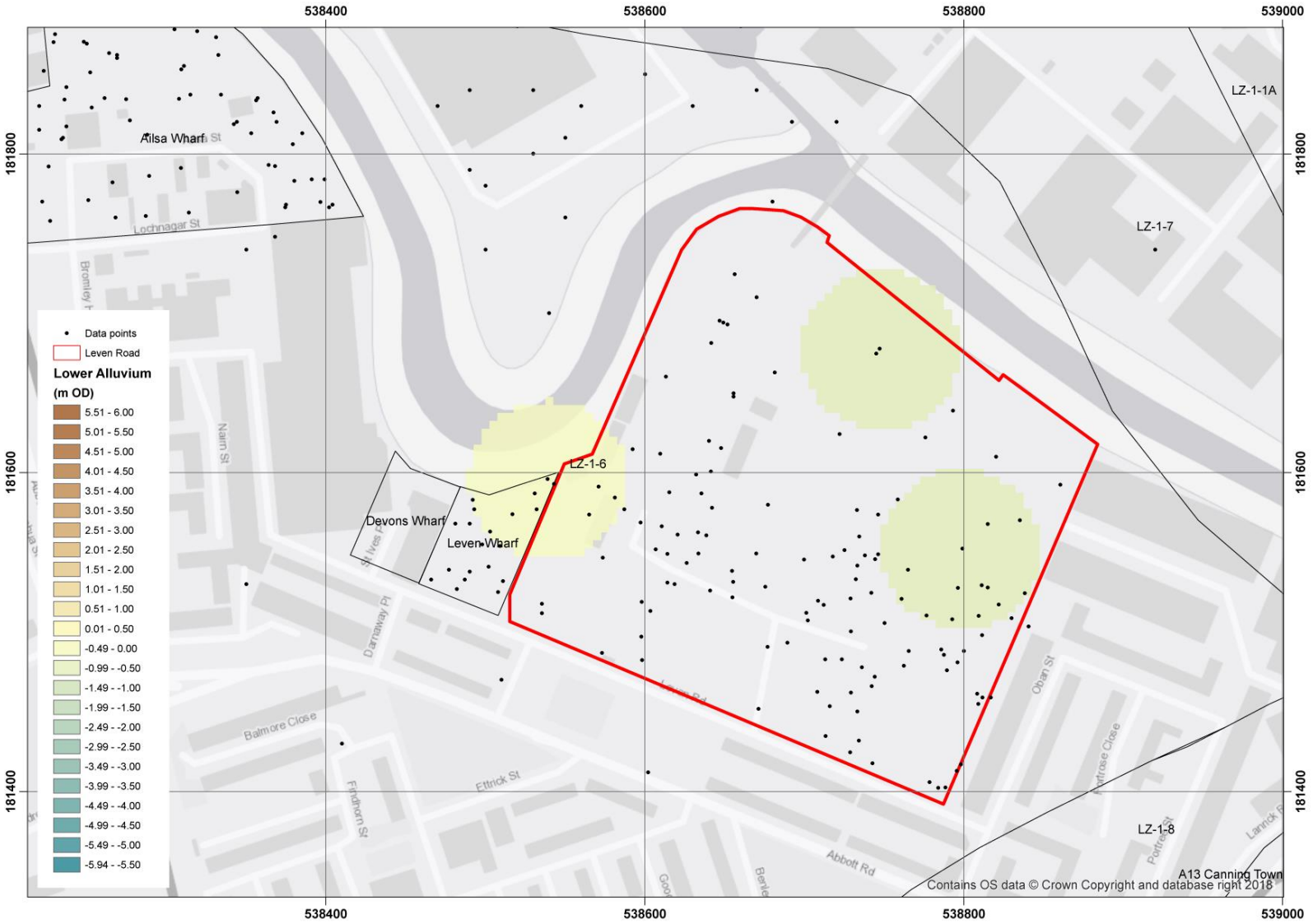

Figure 4: Surface of the Lower Alluvium (contour heights in m OD).

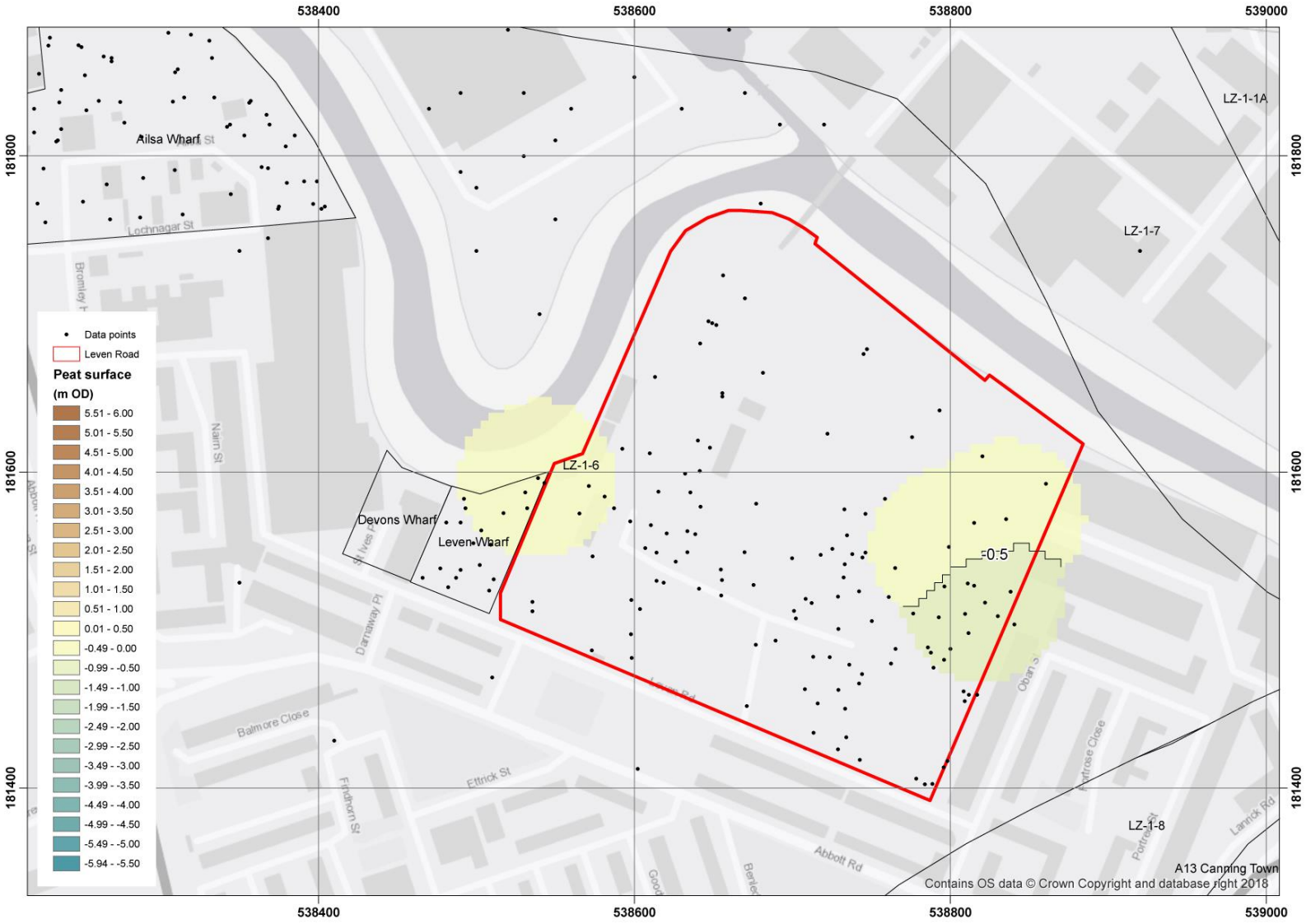

Figure 5: Surface of the Peat (contour heights in m OD).

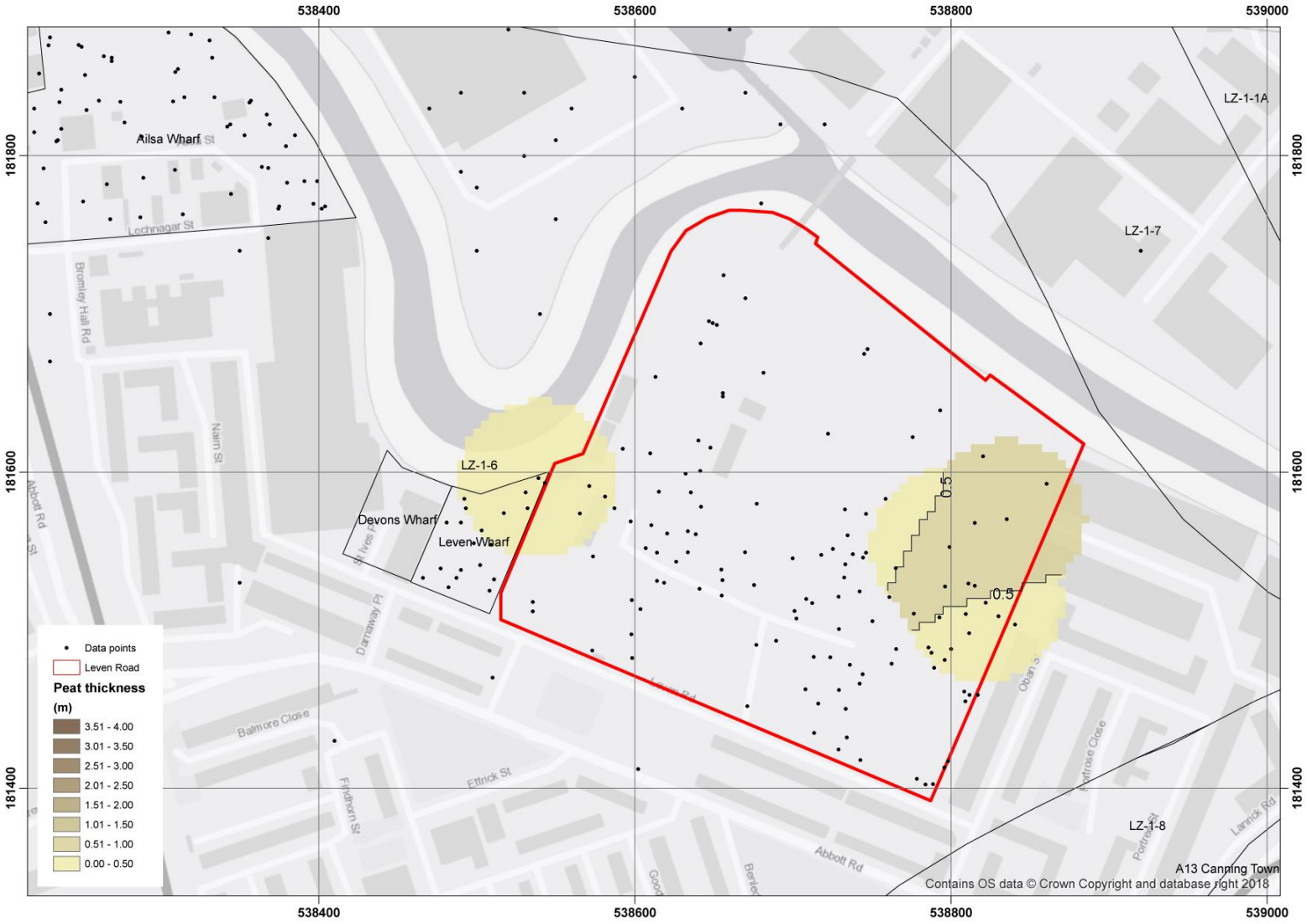

Figure 6: Thickness of the Peat (contour heights in m).

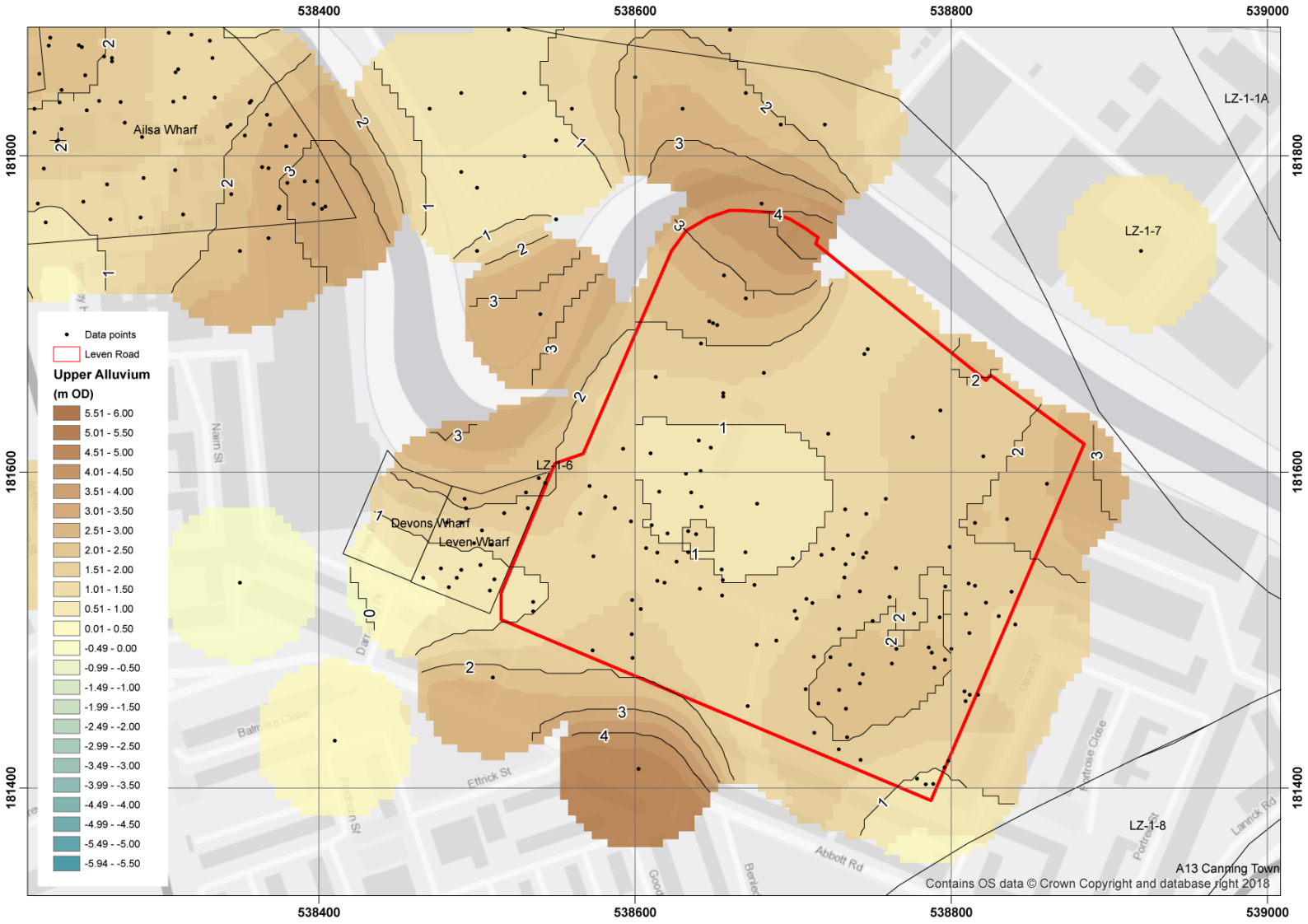

Figure 7: Surface of the Upper Alluvium (contour heights in m OD).

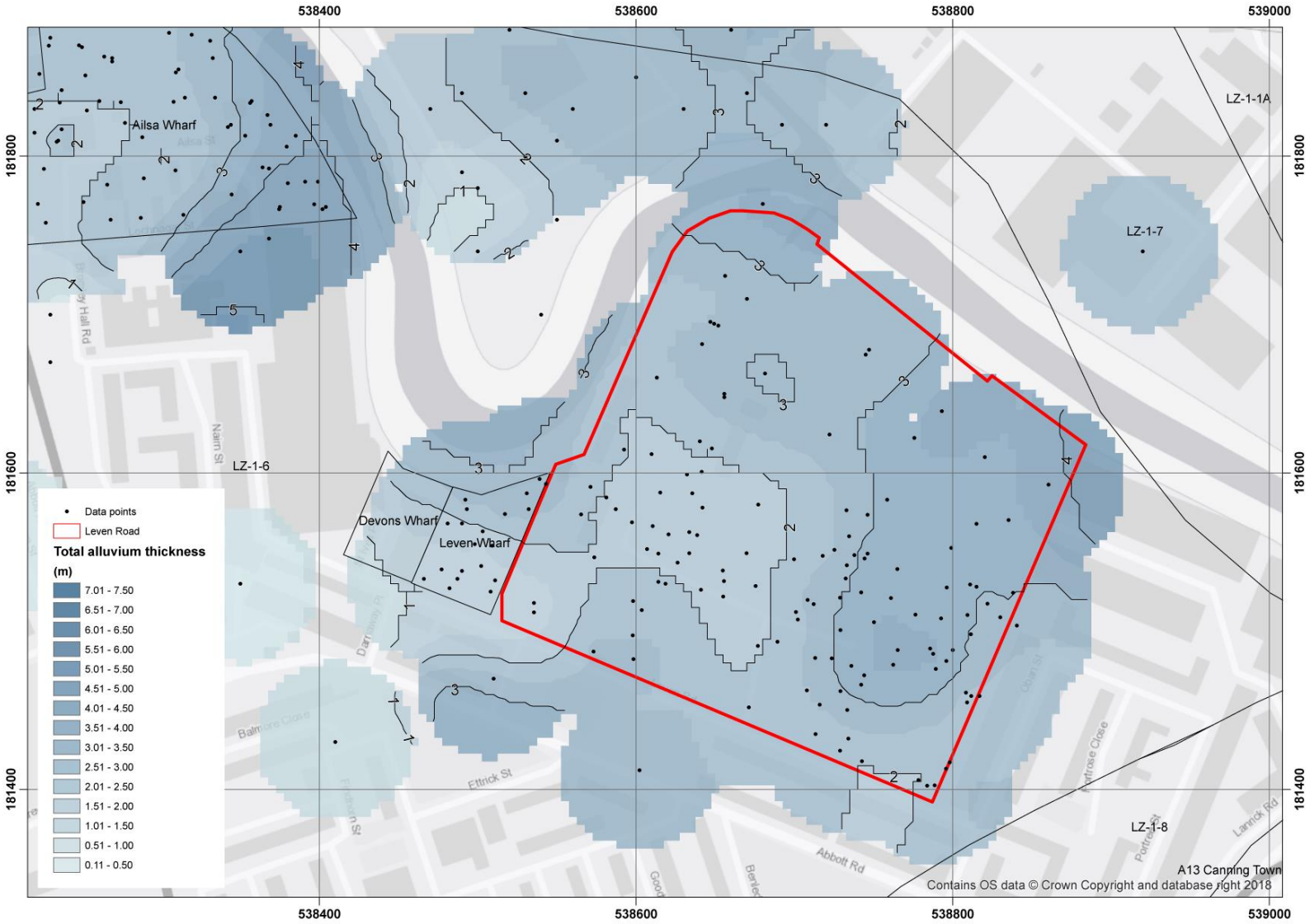

Figure 8: Thickness of the Holocene Alluvium (incorporating the Lower Alluvium, Peat and upper Alluvium (contour heights in m).

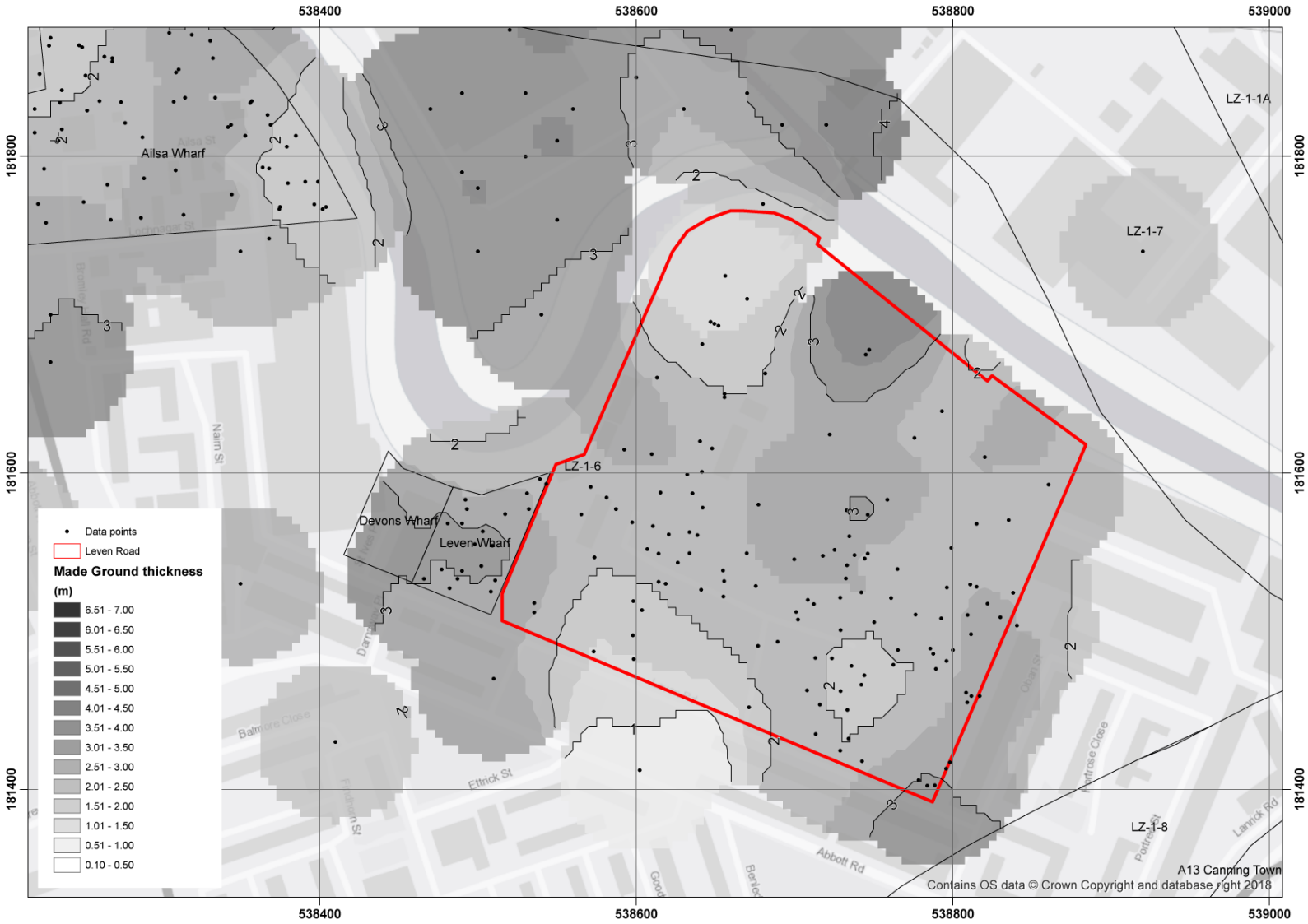

Figure 9: Made Ground thickness (contour heights in m).

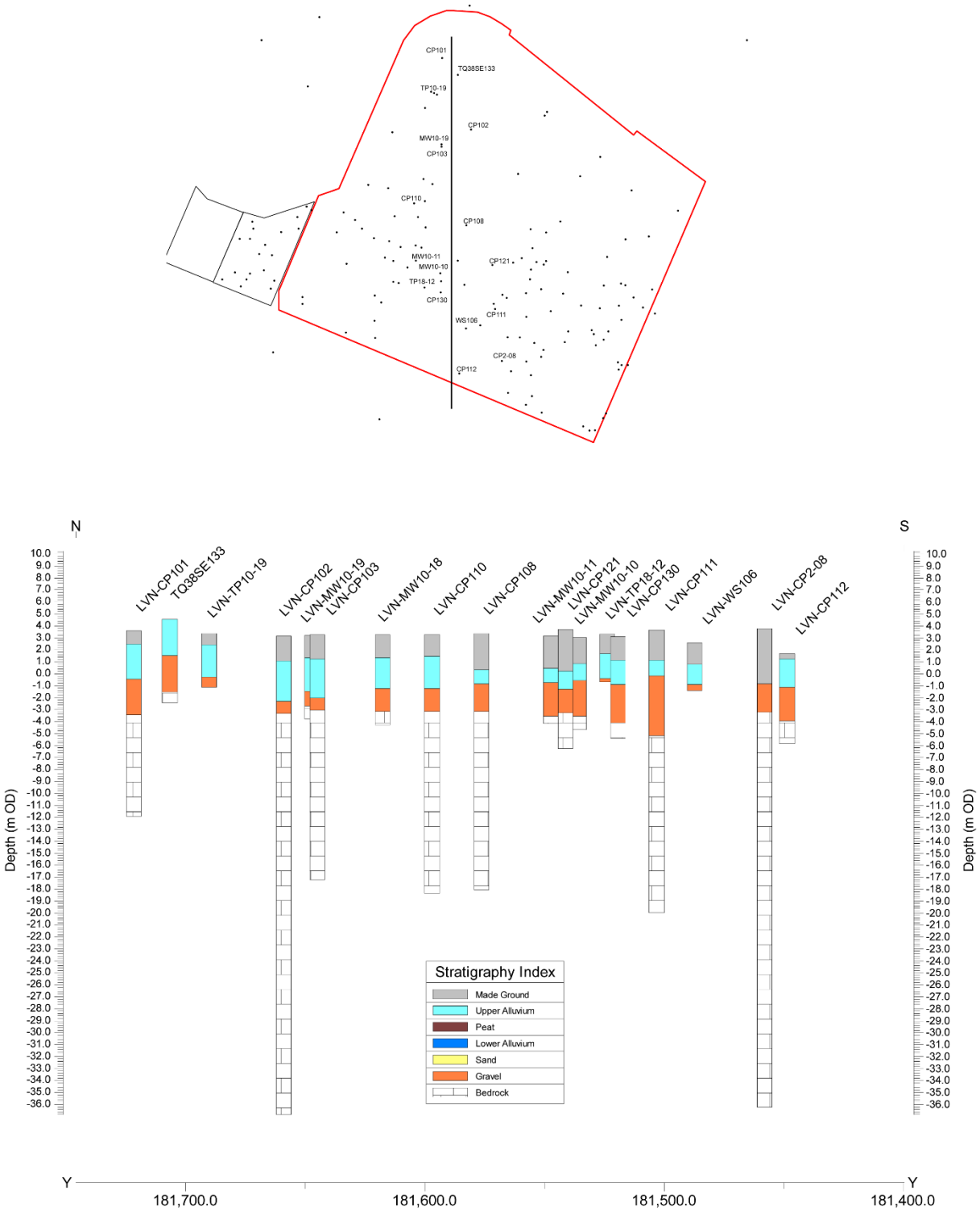

Figure 10: North to south transect of boreholes across the Leven Road, Poplar site.

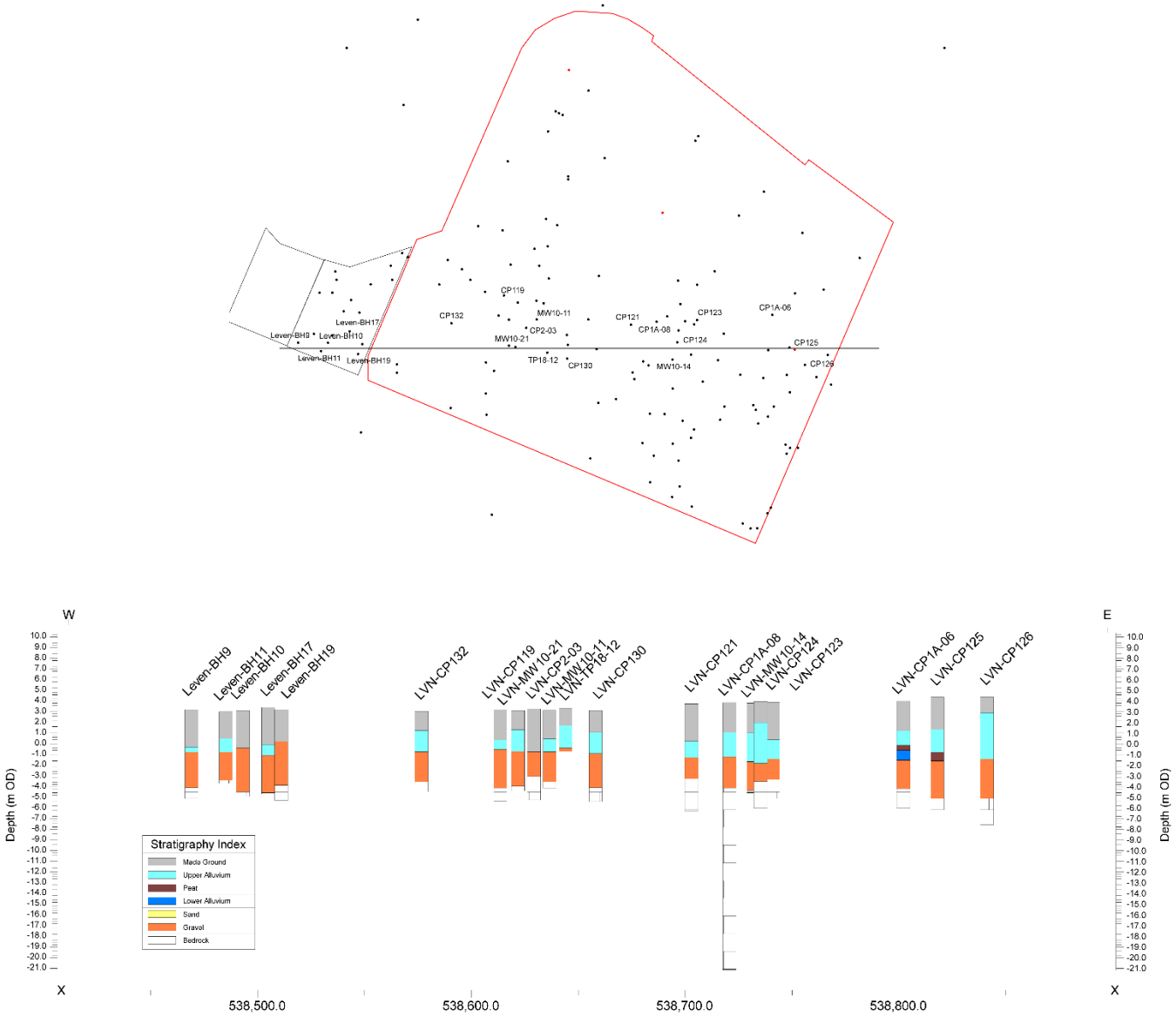

Figure 11: West to east transect of boreholes across the Leven Road, Poplar site.

5. DISCUSSION & CONCLUSIONS

A programme of geoarchaeological field investigations and deposit modelling was undertaken at the Leven Road site, building on a previous desk-based deposit model (Young, 2019), in order to (1) enhance our understanding of the sub-surface stratigraphy of the site, in particular clarifying the height of the Gravel surface towards the north-west, and the nature of the sequence toward the centre of the site; (2) assess the palaeoenvironmental and archaeological potential of the site, and (3) make recommendations for any further palaeoenvironmental or archaeological investigations. In order to achieve these aims, a programme of geoarchaeological field investigations and deposit modelling of the surface elevation and thickness of the major stratigraphic units at the site was undertaken, incorporating logs from previous geotechnical investigations at the site and existing records from the wider area from the Quaternary Scientific Lower Thames Valley Geoarchaeological Database and the British Geological Survey (BGS) borehole archive.

The results of the geoarchaeological investigations have contributed to our understanding of the Holocene stratigraphic sequence in this area of the Lea Valley. Overlying the London Clay bedrock at the site is a sequence of Late Devensian Lea Valley Gravel, Holocene alluvial deposits and variable thicknesses of Made Ground, which in places (particularly towards the southeast of the site) has truncated the alluvial sequence significantly. The Lea Valley Gravel surface here lies at between *ca*. 0.6 and -2.7m OD, generally falling from the southern margins of the site (0.1 to 0.11m OD) and the northwest (-0.43 to 0.61m OD) to between *ca*. -1 and -2m OD in the eastern and north-eastern areas of the site. As described above, the site lies within Corcoran *et al.*'s (2011) Landscape Zone (LZ) 1-6. Within this zone, the surface of the gravels are estimated as lying at around 0m OD, generally consistent with the southern and north-western areas of the site. However, much of the Leven Road site can be considered more consistent with LZ 1-7, mapped to the east (see Figure 1); within this zone, Corcoran *et al*. (2011) describe the gravel as falling from 0 to -2m OD, with overlying alluvial/colluvial deposits up to 5m thick with an upper surface of 4m OD.

Corcoran *et al*. (2011) do not describe the presence of organic alluvium or peat within LZ1-7, but within LZ1-6, peat is often recorded overlying a basal sand unit; it is generally thin (<0.3m), but significantly thicker horizons (up to 3m) have been recorded towards the north of LZ1-7. At the present site, peat was identified only towards the east/northeast, recorded in thicknesses of between 0.3 and 0.82m, and with an upper surface of between -0.78 and -0.11m OD. A very thin peat unit was recorded at a slightly higher elevation at the Leven Wharf site immediately to the east (0.01 to -0.01m OD; Young, 2015), but in the absence of suitable material, no dates were obtained from this unit. It is unclear whether the localised peat units recorded at both sites represent isolated pockets of peat, forming in floodplain hollows, or a widespread unit of peat which has subsequently been eroded by fluvial activity. Although uncertainties remain as to which Landscape Zone the Leven Road site should be compared, Corcoran *et al*. (2011) stress that the peat in LZ1-6 is undated, and may be of a different age to that recorded throughout the rest of the Lower Thames/Lower Lea Valley, due to the different and possibly localised processes that led to its formation.

In the wider area (see Figure 1), peat measuring between 0.15 and 2m in thickness was recorded at the Brunel Street site, at elevations of between *ca*. -1 and -4m OD (Batchelor & Young, 2018); elsewhere, peat has been recorded on the nearby sites of 105-107 Tarling Road (-1.5 to -2.0m OD; Batchelor & Young, 2014), St Luke's Square (-0.61 to -2.03m OD; Wicks, 2008) and Caxton Works (-0.2 and -1.9m OD; Young & Batchelor, 2014a). Radiocarbon dating of these horizons indicates that the peat accumulated between 5730-5600 and 3630-3460 cal BP at 105-107 Tarling Road; between 5660-5580 and 3570-3440 cal BP at St Luke's Square and between 4960-4840 and 4390-4100 cal BP at Caxton Works. The peat at these sites was between 0.5 and 1.7m in thickness, generally accumulating between -2 and 0m OD, and spanning the middle Neolithic to middle Bronze Age periods.

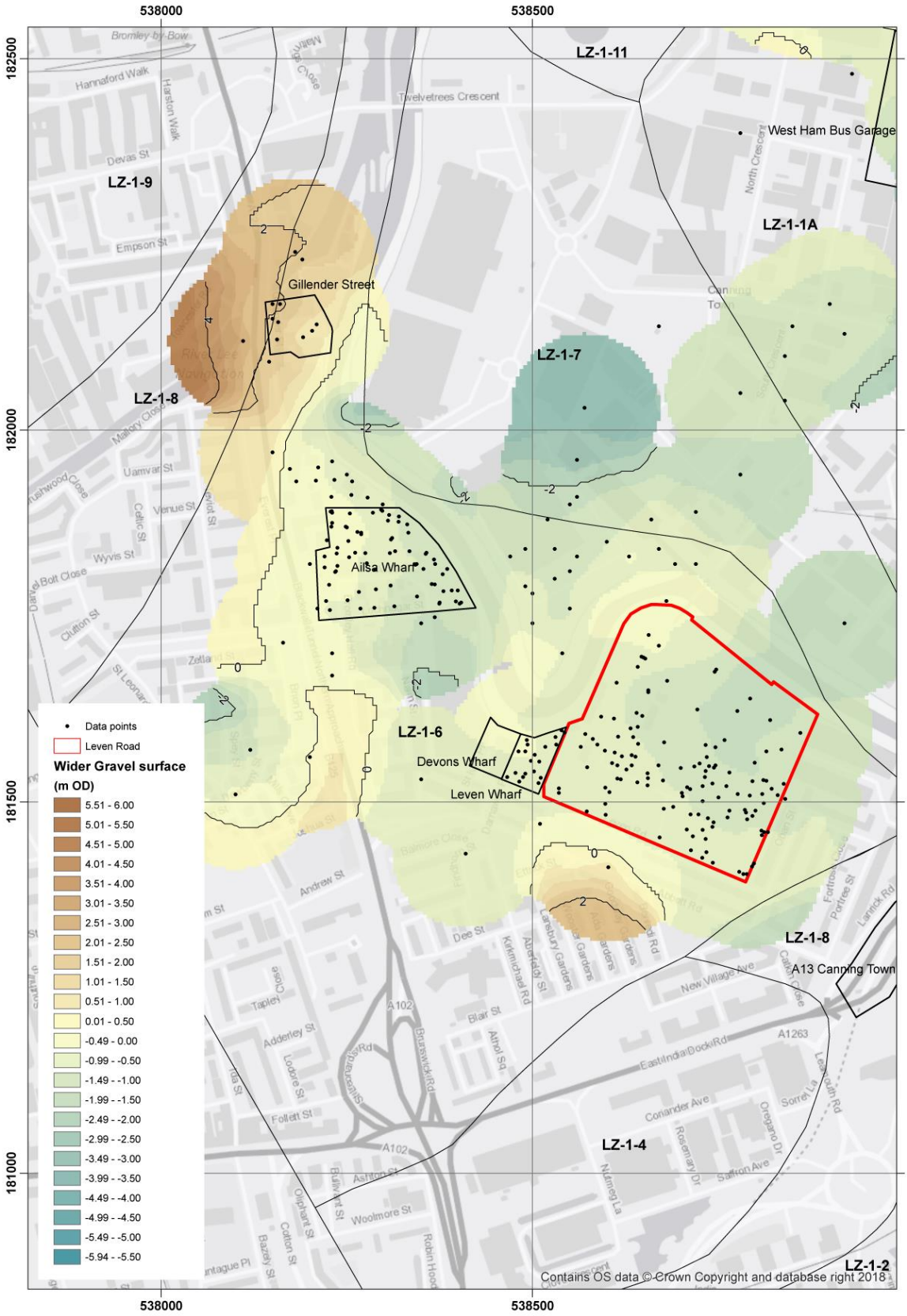

Figure 12: Surface of the Gravel (m OD) in the wider area of the site (see Figure 1 for site references).

6. RECOMMENDATIONS

On the basis of the palaeoenvironmental potential of the sequence of sediments retained in borehole CP125, and the unknown age of the peat in this Landscape Zone highlighted by Corcoran *et al.* (2011), a programme of environmental archaeological assessment is recommended, in order to investigate the potential of the sediments to provide a detailed reconstruction of the environmental history of the site and its environs. This assessment should incorporate: (1) radiocarbon dating of the base and top of the peat in order to ascertain the age of peat accumulation and cessation; (3) organic matter determinations to aid identification of the sedimentary units; (4) assessment of the palaeobotanical remains (pollen, waterlogged wood and seeds) to provide a provisional reconstruction of the vegetation history; (5) assessment of the diatoms to provide an indication of the palaeohydrology (e.g. marine, brackish or freshwater), and (6) assessment of the zooarchaeological remains (insects, Ostracoda and Mollusca) to provide information on the general environmental conditions, climatic change and hydrology of the site. The assessment will highlight any indications of nearby human activity and provide recommendations for any further analysis (if necessary).

In terms of its prehistoric archaeological potential, the higher Gravel surfaces (above *ca.* -0.3m OD) recorded in the southern area of the site, and rising to above this level towards the northwest, represent areas of higher, drier ground that are likely to have been elevated above the surrounding floodplain during the prehistoric period, perhaps at the margin of a former channel or the floodplain itself. On this basis, the southern and northwestern areas of the site (see Figure 13) are considered to have higher prehistoric archaeological potential, and any further archaeological investigations should target these areas (subject to depth of impact of the development and contamination constraints).

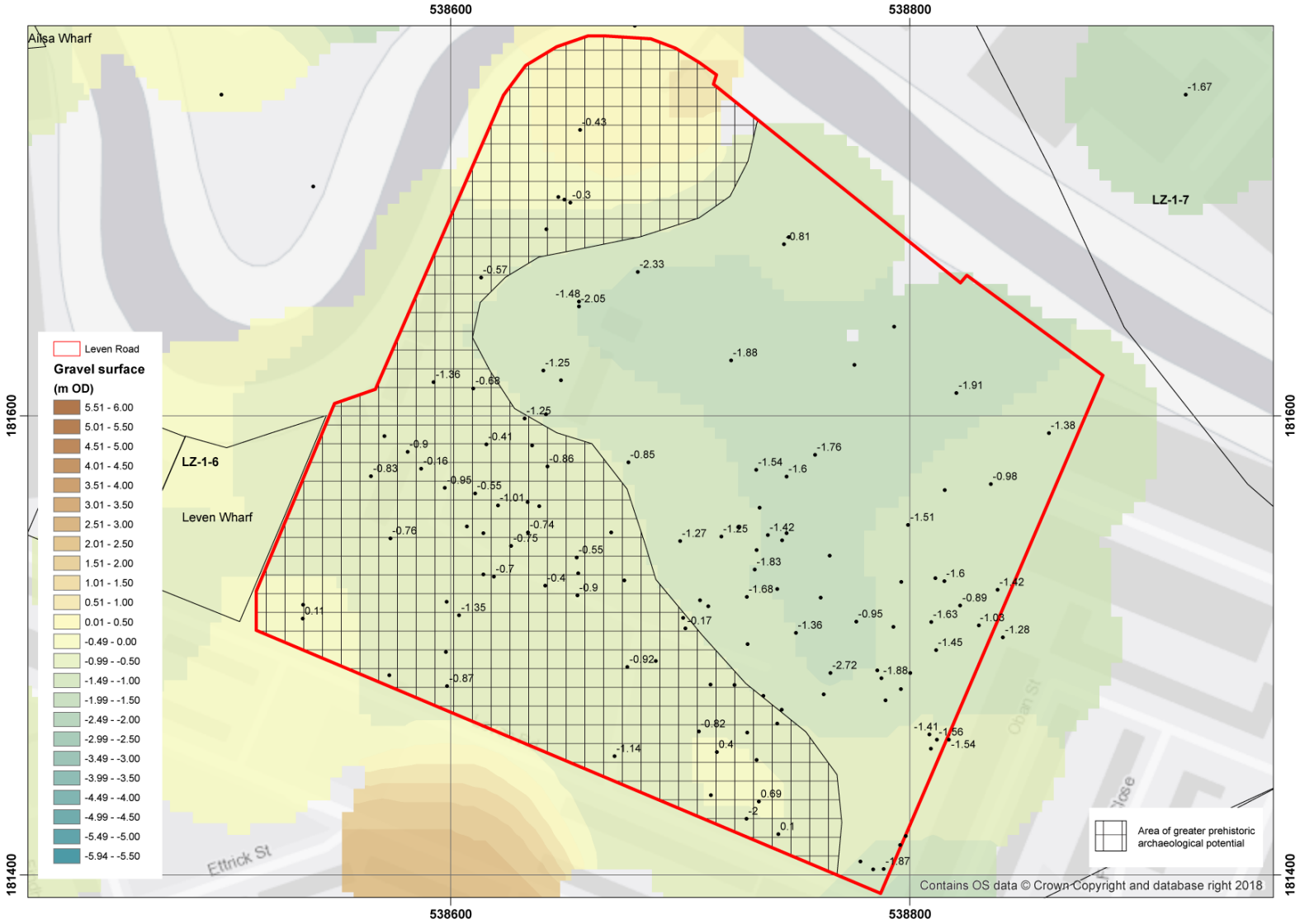

Figure 13: Proposed area of greater prehistoric archaeological potential at Leven Road, Poplar showing the surface of the Gravel (m OD).

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Young, D.S. (2018b) Barratt Industrial Estate, Gillender Street, London Borough of Tower Hamlets. Report on the Geoarchaeological Field Investigations. *Quaternary Scientific (QUEST) Unpublished Report July 2018; Project Number 070/18*.

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8. APPENDIX 1

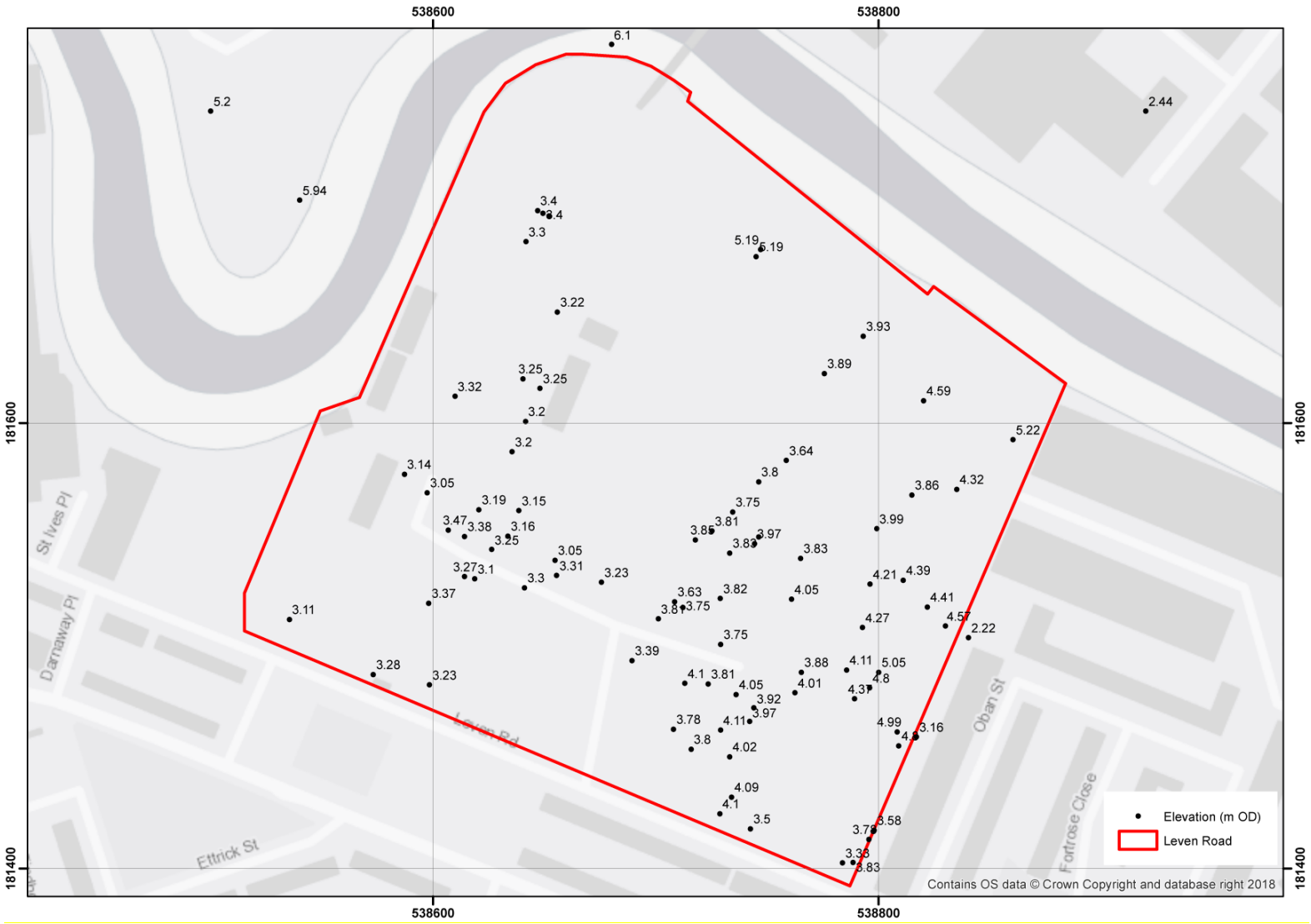

Figure A1: Surface elevation (m OD) at the Leven Road site.

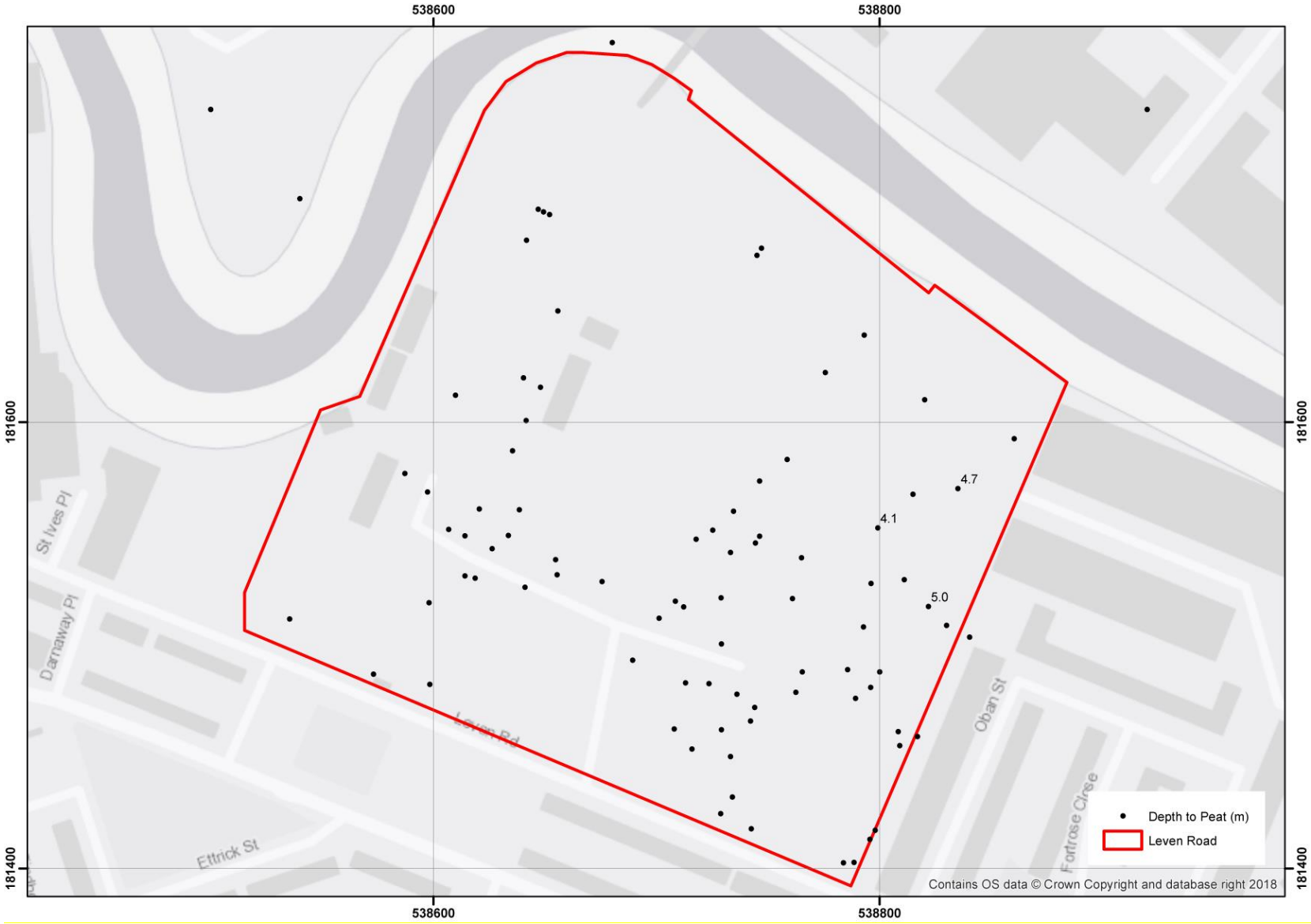

Figure A2: Depth to Peat (m) at the Leven Road site (no data = peat not recorded).

Figure A3: Depth to Gravel (m) at the Leven Road site (no data = Gravel not reached).

9. APPENDIX 2: OASIS

OASIS ID: quaterna1-349853

Project details

Project name	Leven Road, Poplar
Short description of the project	A programme of geoarchaeological field investigations and deposit modelling was undertaken in order to (1) enhance our understanding of the sub-surface stratigraphy of the site, in particular clarifying the height of the Gravel surface in the north-western area, and the nature of the sequence toward the centre of the site; (2) assess the palaeoenvironmental and archaeological potential of the site, and (3) make recommendations for any further palaeoenvironmental or archaeological investigations. The results of investigations indicate that the Lea Valley Gravel surface here lies at between ca. 0.6 and -2.7m OD, generally falling from the southern margins of the site (0.1 to 0.11m OD) and the northwest (-0.43 to 0.61m OD) to between ca. -1 and -2m OD in the eastern and north-eastern areas of the site. Within the overlying alluvial sequence, peat was identified only towards the east/northeast, recorded in thicknesses of between 0.3 and 0.82m, and with an upper surface of between -0.78 and -0.11m OD. A very thin peat unit was recorded at a slightly higher elevation at the Leven Wharf site immediately to the east (0.01 to -0.01m OD; Young, 2015). On the basis of the palaeoenvironmental potential of the sequence of sediments retained from the Leven Road site, and the unknown age of the peat in this Landscape Zone highlighted by Corcoran et al. (2011), a programme of environmental archaeological assessment is recommended. In terms of its prehistoric archaeological potential, the higher Gravel surfaces (above ca. -0.3m OD) recorded in the southern and northwestern areas of the site represent areas of higher, drier ground that are likely to have been elevated above the surrounding floodplain during the prehistoric period, perhaps at the margin of a former channel or the floodplain itself. On this basis, the southern and northwestern areas of the site are considered to have higher prehistoric archaeological potential.
Project dates	Start: 01-01-2019 End: 25-04-2019
Previous/future work	Yes / Yes
Any associated project reference codes	LVE19 - Sitecode

Type of project	Environmental assessment
Monument type	PEAT Uncertain
Survey techniques	Landscape

Project location

Country	England
Site location	GREATER LONDON TOWER HAMLETS POPLAR Leven Road, Poplar
Postcode	E14 0GX
Site coordinates	TQ 3835 8162 51.51603757077 -0.005866844296 51 30 57 N 000 00 21 W Point

Project creators

Name of Organisation	Quaternary Scientific (QUEST)
Project brief originator	Pre-Construct Archaeology
Project design originator	D.S. Young
Project director/manager	D.S. Young
Project supervisor	D.S. Young
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive Exists?	No
Paper Archive recipient	LAARC
Paper Contents	"Stratigraphic"
Paper Media available	"Report"

Entered by	Daniel Young (d.s.young@reading.ac.uk)
Entered on	25 April 2019