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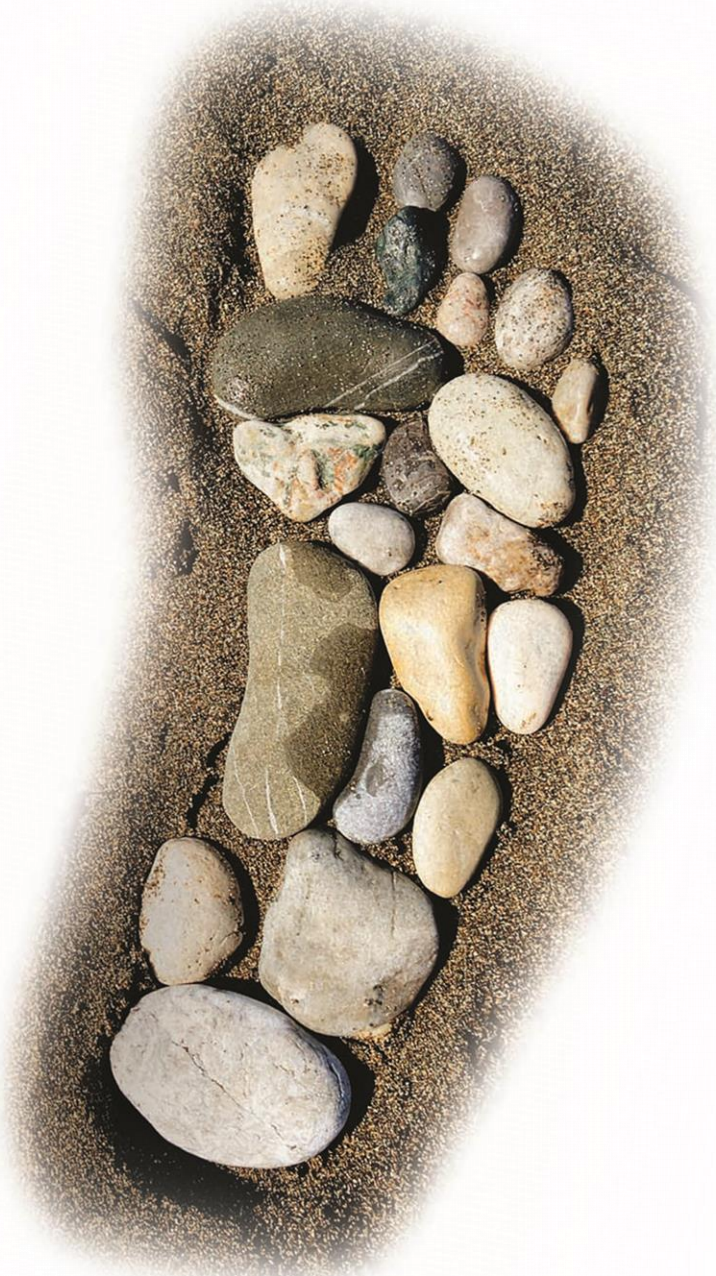
LEVEN ROAD, POPLAR, LONDON BOROUGH OF TOWER HAMLETS, E14 0GX

Palaeoenvironmental Assessment Report



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CONTENTS

1. NON-TECHNICAL SUMMARY

A programme of palaeoenvironmental assessment was undertaken at the Leven Road site, building on previous geoarchaeological field investigations and deposit modelling. This work was undertaken in order to (1) investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity; (2) investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland); and (3) make recommendations for any further palaeoenvironmental analysis. In order to achieve this aim, paleoenvironmental assessment was undertaken on borehole CP125, in which the thickest sequence of organic sediments had been identified during the previous geoarchaeological investigations.

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 alluvium, peat was identified at the site only towards the east/northeast, recorded in thicknesses of between 0.3 and 0.82m. The results of the radiocarbon dating show that the peat in borehole CP125, recorded at between -0.78 and -1.60m OD, is of later Neolithic to earlier Bronze Age date. The combined results of the pollen and plant macrofossil assessments are indicative of a peat surface dominated by alder with willow, with an understorey of grasses, mixed herbs and ferns. Hazel, ash and birch may have occupied the peat surface with alder and willow, but are more likely to grown on the dryland, forming mixed deciduous woodland with oak and lime. The limited values of elm throughout the sequence are consistent with the later Neolithic/early Bronze Age date for the peat, post-dating the Neolithic elm decline. The pollen and macrofossil assemblages, both dominated by alder carr, provide little indication that the vegetation changed significantly on either the peat surface or surrounding dryland during the period of peat formation. No definitive evidence for human activity was recorded in the sequence from the peat.

On the basis of the results of the assessment presented here, and the similar age of the peat sequence to that recorded elsewhere in this general area of the Lower Thames Valley, no further environmental archaeological analysis is recommended.

2. INTRODUCTION

2.1 Site context

This report summarises the findings arising out of the geoarchaeological investigations and palaeoenvironmental assessment 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).

A programme of geoarchaeological field investigations and deposit modelling undertaken at the site (Young, 2019b) revealed 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 was found to lie at levels 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. The levels for the Gravel in southern and north-western areas

of the site are generally consistent with Corcoran *et al.*'s (2011) Landscape Zone (LZ) 1-6, but much of the site was 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 (see Young, 2019b). 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.

2.2 Palaeoenvironmental and archaeological significance

On the basis of the geoarchaeological investigations at the site and those nearby, as well as the work undertaken in this general area by Corcoran *et al*. (2011), the sedimentary sequence at the Leven Road site has 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.

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). 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 north-western areas of the site were considered to have higher prehistoric archaeological potential (see Young, 2013 Fig. 13).

2.3 Aims & Objectives

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 was 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 (see Young, 2019b). Five significant research aims relevant to the palaeoenvironmental assessment at the site were therefore as follows:

1. To investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity;
2. To investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland);
3. To integrate the new geoarchaeological record with other recent work in the local area for publication in an academic journal.

The results of the assessment presented here (incorporating Aims 1 and 2) will enable recommendations to be made for further palaeoenvironmental analysis and publication (Aim 3; if necessary).

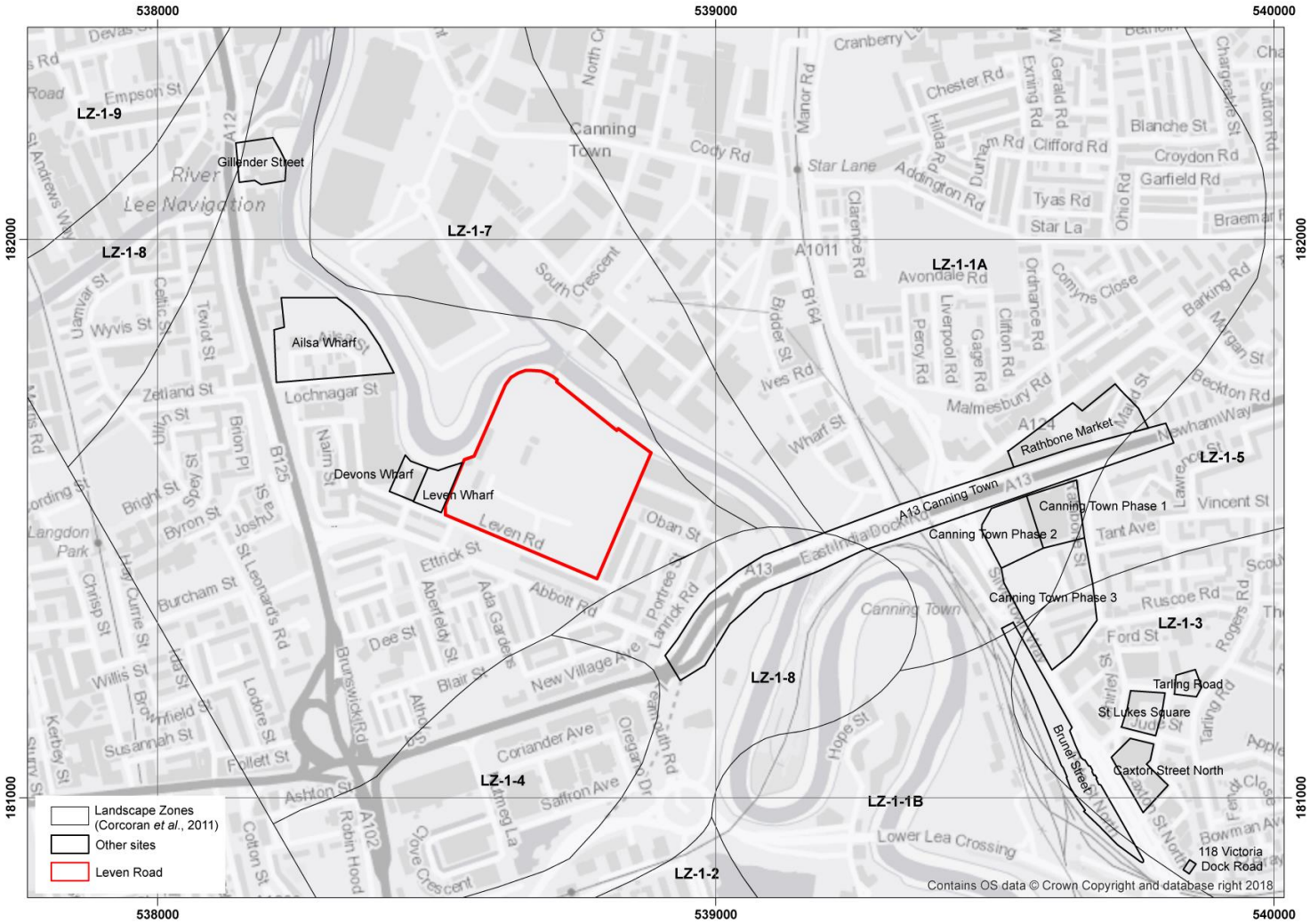

Figure 1: Location of Leven Road and other sites in the local area: Devons Wharf (AIG, 2007); Leven Wharf (Batchelor, 2015); Ailsa Wharf (Batchelor, 2019); Rathbone Market (Young *et al.*, 2013); A13 Ironbridge-Canning Town (Stafford, 2012); Canning Town Phase 1 (Green & Young, 2012); Canning Town Phase 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 MoLA).

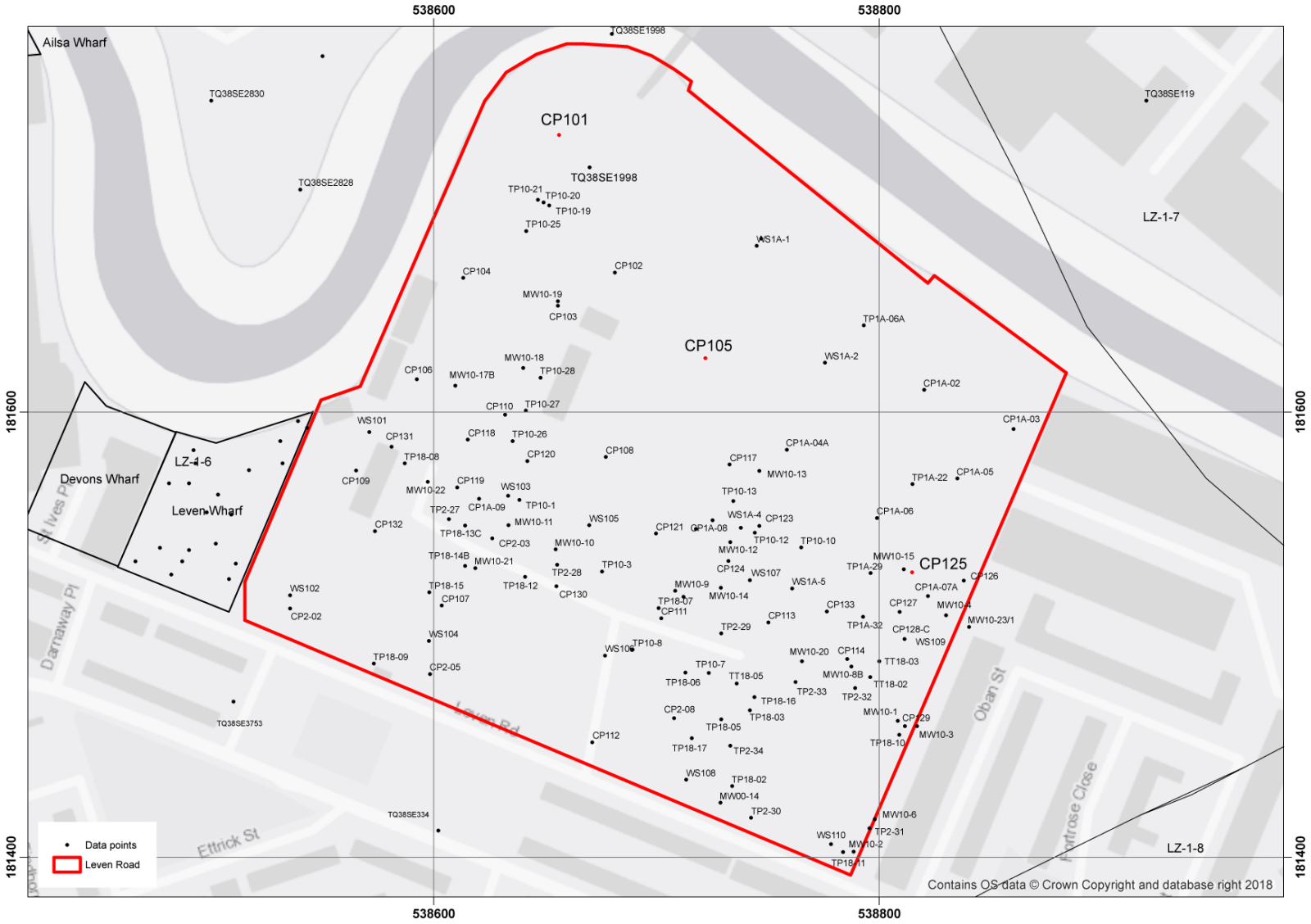

Figure 2: Location of the geotechnical boreholes and test pits at Leven Road, including those records used in the deposit model from Leven Wharf (Young, 2015) and the British Geological Survey borehole archive. New geoarchaeological boreholes shown in red.

3. METHODS

3.1 Previous investigations (field investigations, lithostratigraphic descriptions & deposit modelling)

As reported in Young (2019b). during a 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, 2019a). 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 Appendix 1.

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, following the general guidelines shown in Historic England (2020). 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.

3.2 Radiocarbon dating

Two samples of indeterminate twig wood (less than 5 growth rings) were extracted for radiocarbon dating from the top (0.26 to 0.31m OD) and base (0.07 to 0.12m OD) of the peat deposit in QBH3 and submitted for AMS radiocarbon dating to the BETA Analytic Radiocarbon Dating Facility, Miami, Florida (Table 9; Figure 3). The results have been calibrated using OxCal v4.3 (Bronk Ramsey & Lee, 2013) and the IntCal13 atmospheric curve (Reimer *et al*., 2013).

3.3 Pollen assessment

Ten subsamples from borehole CP125 were extracted for an assessment of pollen content. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) adding one tablet of the exotic clubmoss *Lycopodium clavatum* to provide a measure of pollen concentration in each sample; (3) deflocculation of the sample in 1% Sodium pyrophosphate; (4) sieving of the sample to remove coarse mineral and organic fractions (>125µ); (5) acetolysis; (6) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm^3); (7) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the University of Reading pollen type collection and the following sources of keys and photographs: Moore *et al* (1991); Reille (1992). The assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of pollen grains and spores, and the principal taxa on four transects (10% of the slide) (Table 5).

3.6 Diatom assessment

A total of four samples were submitted for an assessment of diatom presence. The samples were focussed on the interface of the peat unit in borehole CP125, interbedded between minerogenic silts/clays. 0.5g of sediment was processed for the diatom sample preparation. Due to the relative abundance of organic material within all samples, samples chosen for rapid assessment were first treated with hydrogen peroxide (30% solution). Samples were then treated with sodium hexametaphosphate and left overnight, to assist in minerogenic deflocculation. Samples were finally sieved using a 10µm mesh to remove fine minerogenic sediments. The residue was transferred to a plastic vial, from which a slide was prepared for subsequent assessment.

A minimum of four slide traverses were undertaken across each slide sample. When encountered, diatom species ware identified with reference to van der Werff and Huls (1958-74), Hendy (1964) and Krammer & Lange-Bertalot (1986-1991). The results of the assessment are shown in Table 6.

3.7 Macrofossil assessment

A total of six samples from borehole CP125 (measuring approximately 100-300ml in volume) were extracted and processed for the recovery of biological macrofossil remains, including waterlogged seeds, wood, insects and Mollusca (Table 7). The samples were focussed on the peat sequence in borehole CP125. The extraction process involved the following procedures: (1) measuring the sample volume by water displacement, and (2) processing the sample by wet sieving using 300µm and 1mm mesh sizes. Each sample was scanned under a stereozoom microscope at x7-45 magnifications and sorted into the different macrofossil classes. The concentration and preservation of remains was estimated for each class of macrofossil, whilst preliminary identifications of the waterlogged seeds have been made using modern comparative material and reference atlases (e.g. Martin & Barkley, 2000; NIAB, 2004; Cappers *et al.* 2006). Nomenclature used follows Stace (2005).

4. RESULTS & INTERPRETATION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS, DEPOSIT MODELLING & RADIOCARBON DATING

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. The results of the radiocarbon dating (Table 4) show that the peat in this sequence, recorded at between -0.78 and -1.60m OD, began accumulating at 2575-2350 cal BC (4525-4300 cal BP), with peat cessation occurring at 1615-1455 cal BC (3565-3405 cal BP); the peat is therefore of later Neolithic to earlier Bronze Age date.

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 1: 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 2: 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 3: 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

Table 4: Results of the radiocarbon dating of samples from borehole CP125, Leven Road, Poplar, London Borough of Tower Hamlets.

Laboratory code / Method	Material and location	Depth (m OD)	Uncalibrated radiocarbon years before present (yr BP)	Calibrated age BC/AD (BP) (2-sigma, 95.4% probability)	δ13C (‰)
Beta-565344 AMS	Wood (twig indet.; <5 growth rings)	-0.78 to -0.83	3260 ± 30	1615-1455 cal BC 3565-3405 cal BP	-28.6
Beta-565343 AMS	Wood (twig indet.; <5 growth rings)	-1.55 to -1.60	3970 ± 30	2575-2350 cal BC 4525-4300 cal BP	-27.4

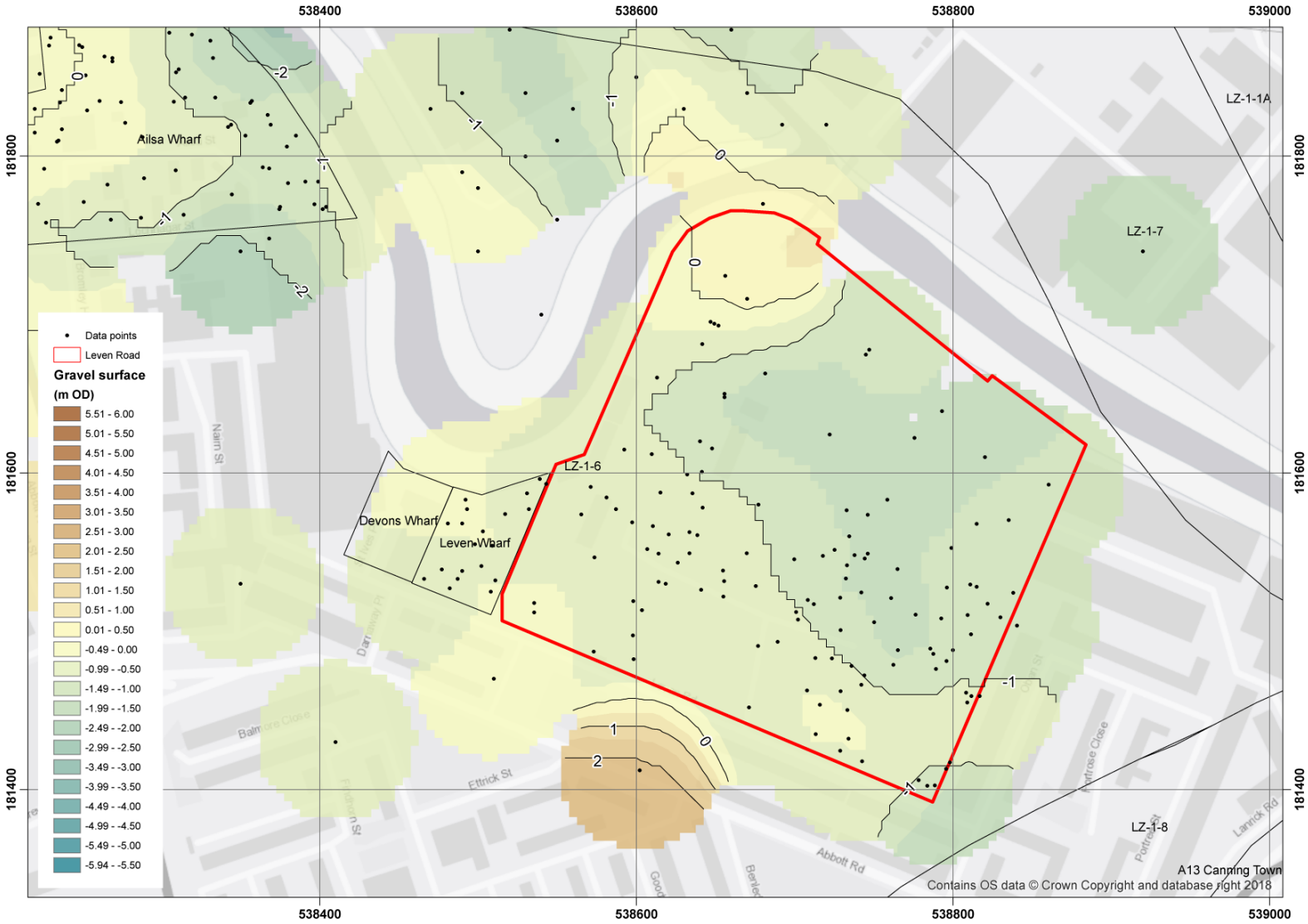

Figure 3: Surface of the Lea Valley Gravel (contour heights in m OD).

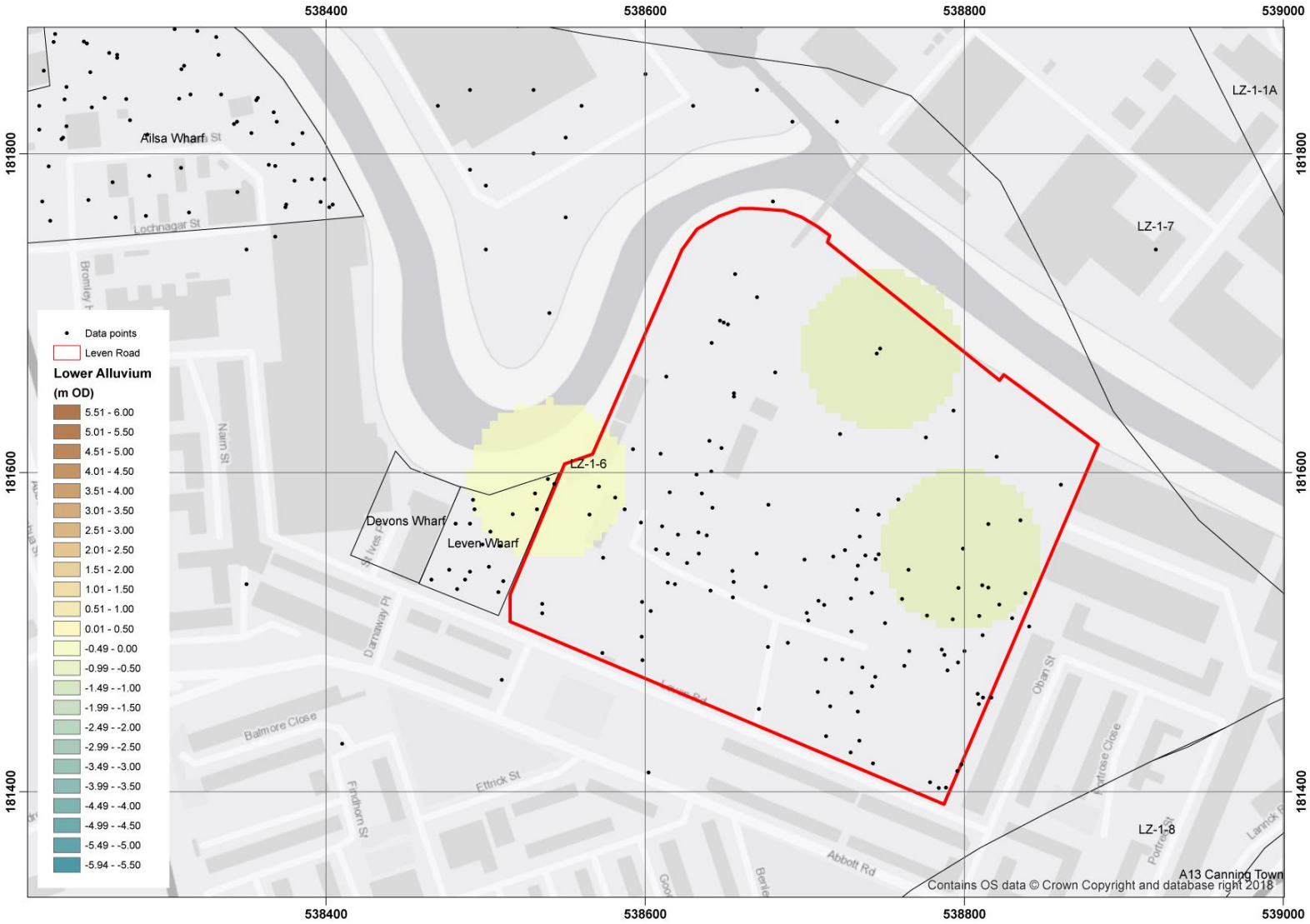

Figure 4: Surface of the Lower Alluvium (contour heights in m OD).

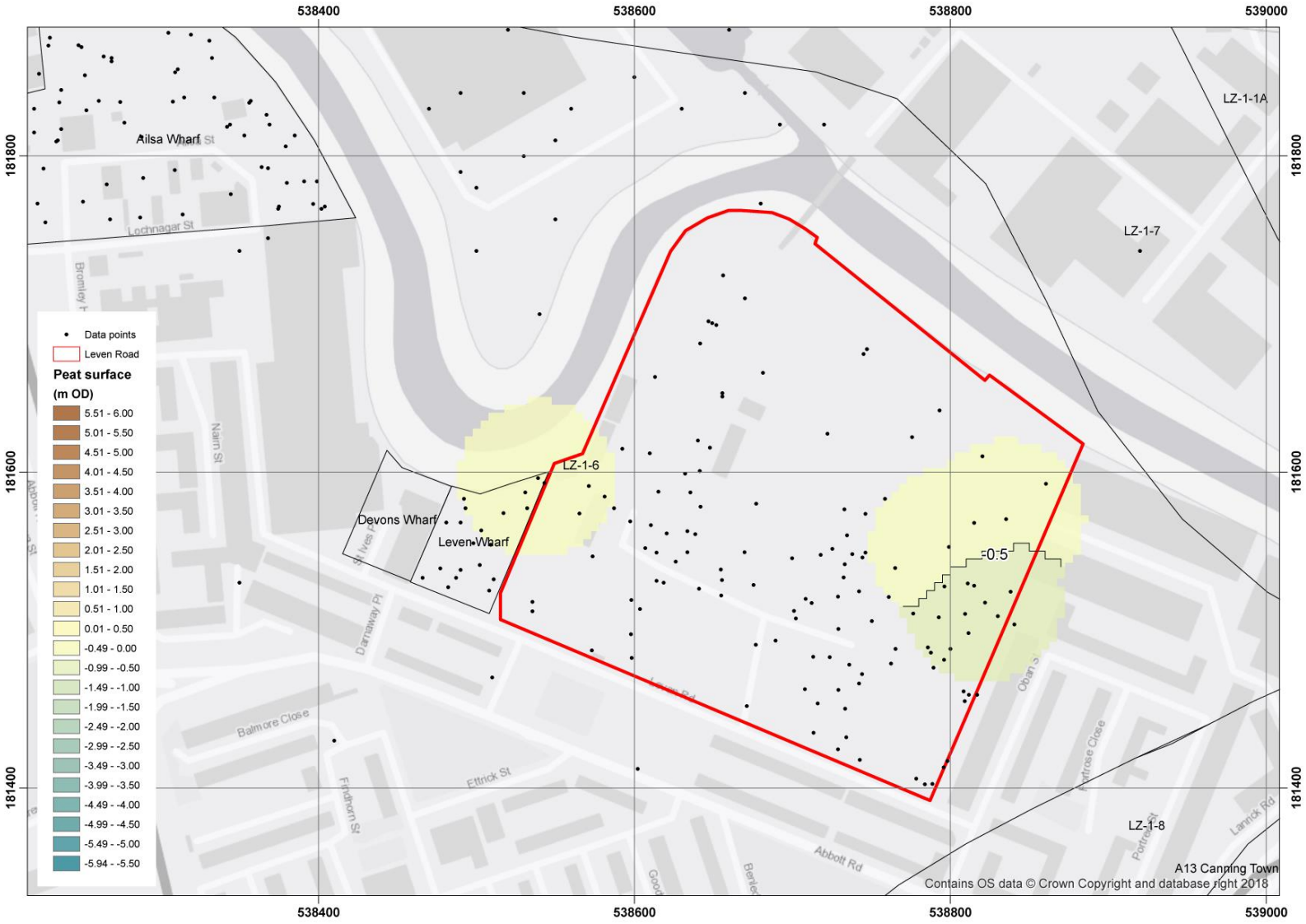

Figure 5: Surface of the Peat (contour heights in m OD).

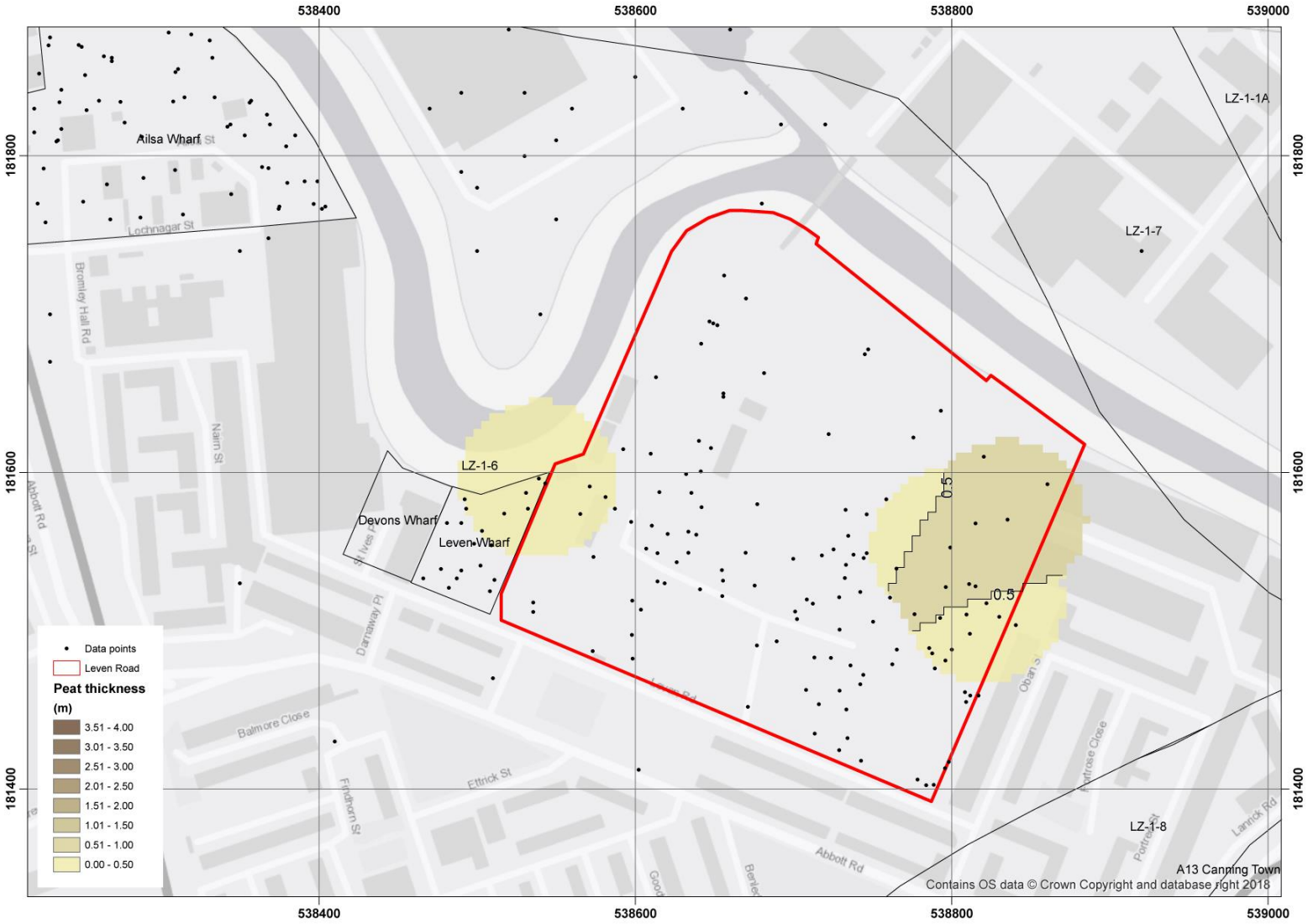

Figure 6: Thickness of the Peat (contour heights in m).

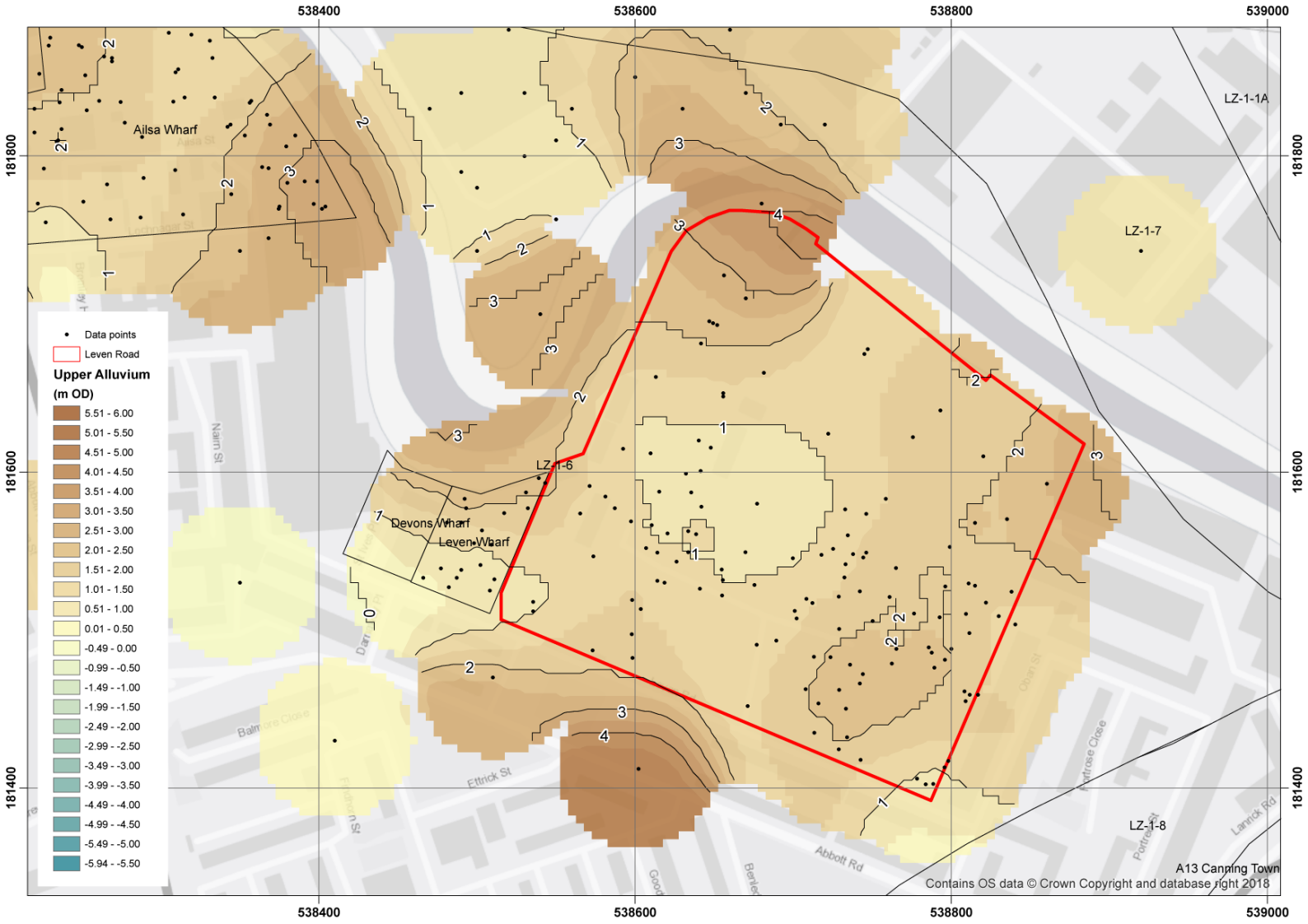

Figure 7: Surface of the Upper Alluvium (contour heights in m OD).

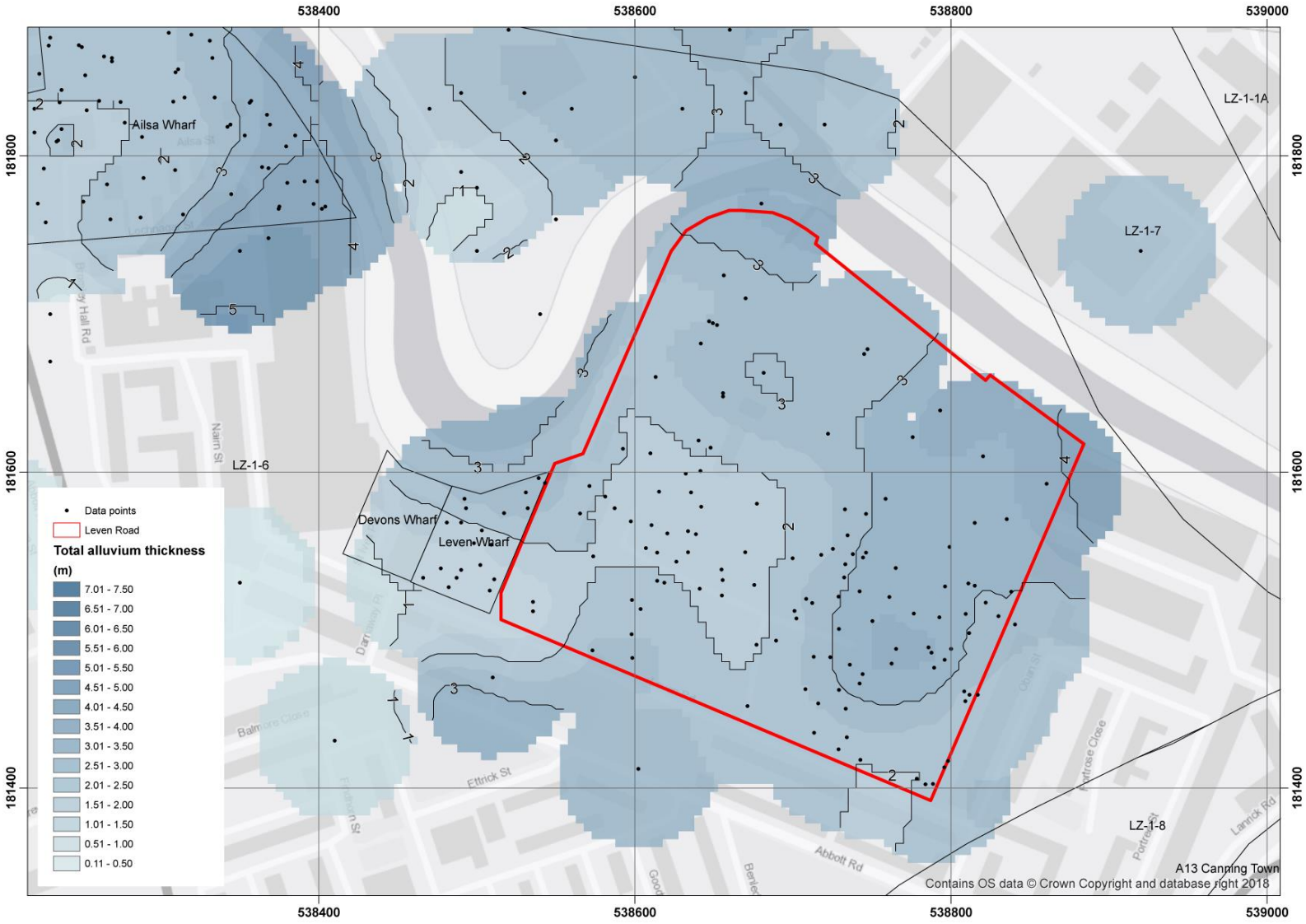

Figure 8: Thickness of the Holocene Alluvium (incorporating the Lower Alluvium, Peat and upper Alluvium (contour heights in m).

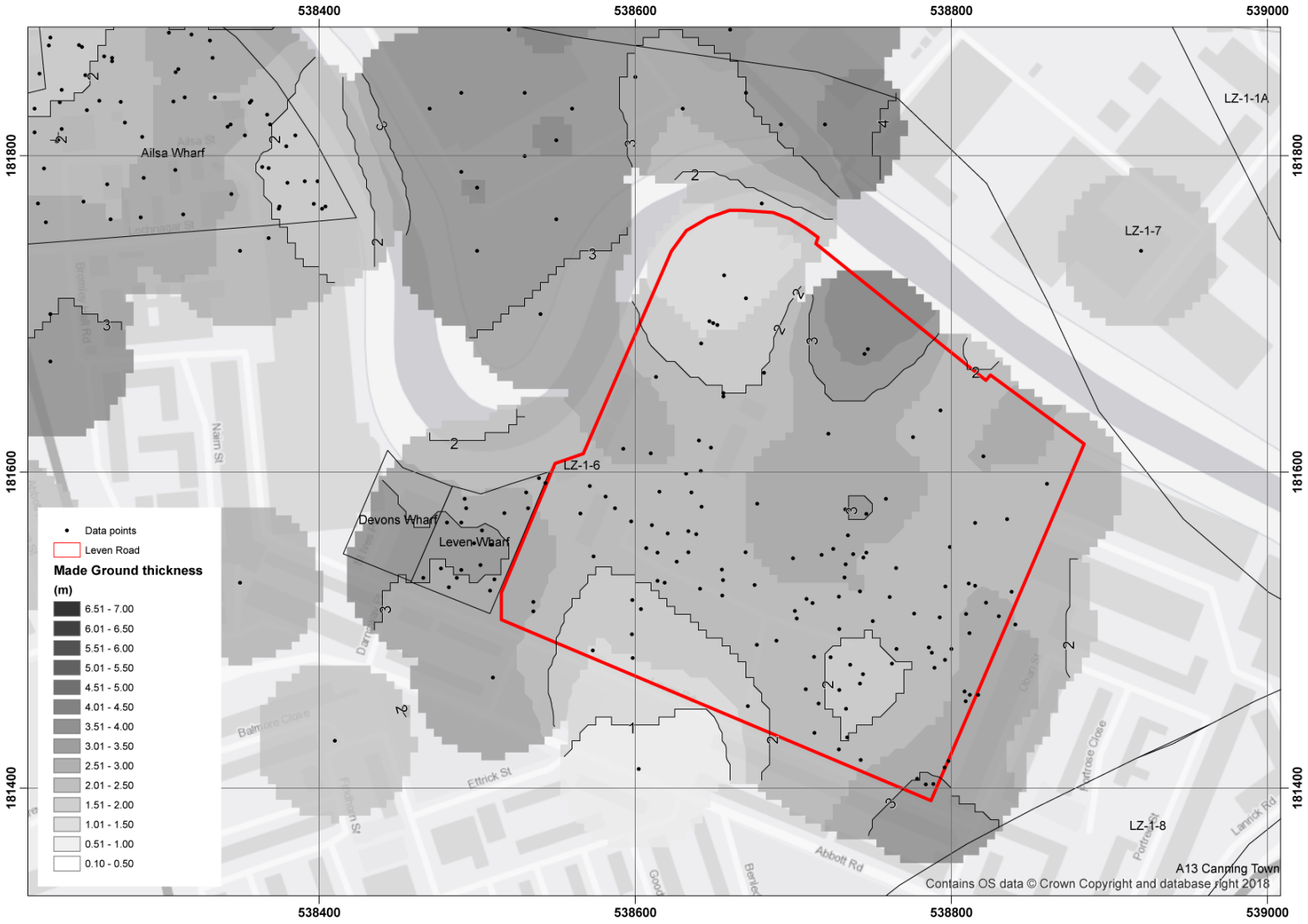

Figure 9: Made Ground thickness (contour heights in m).

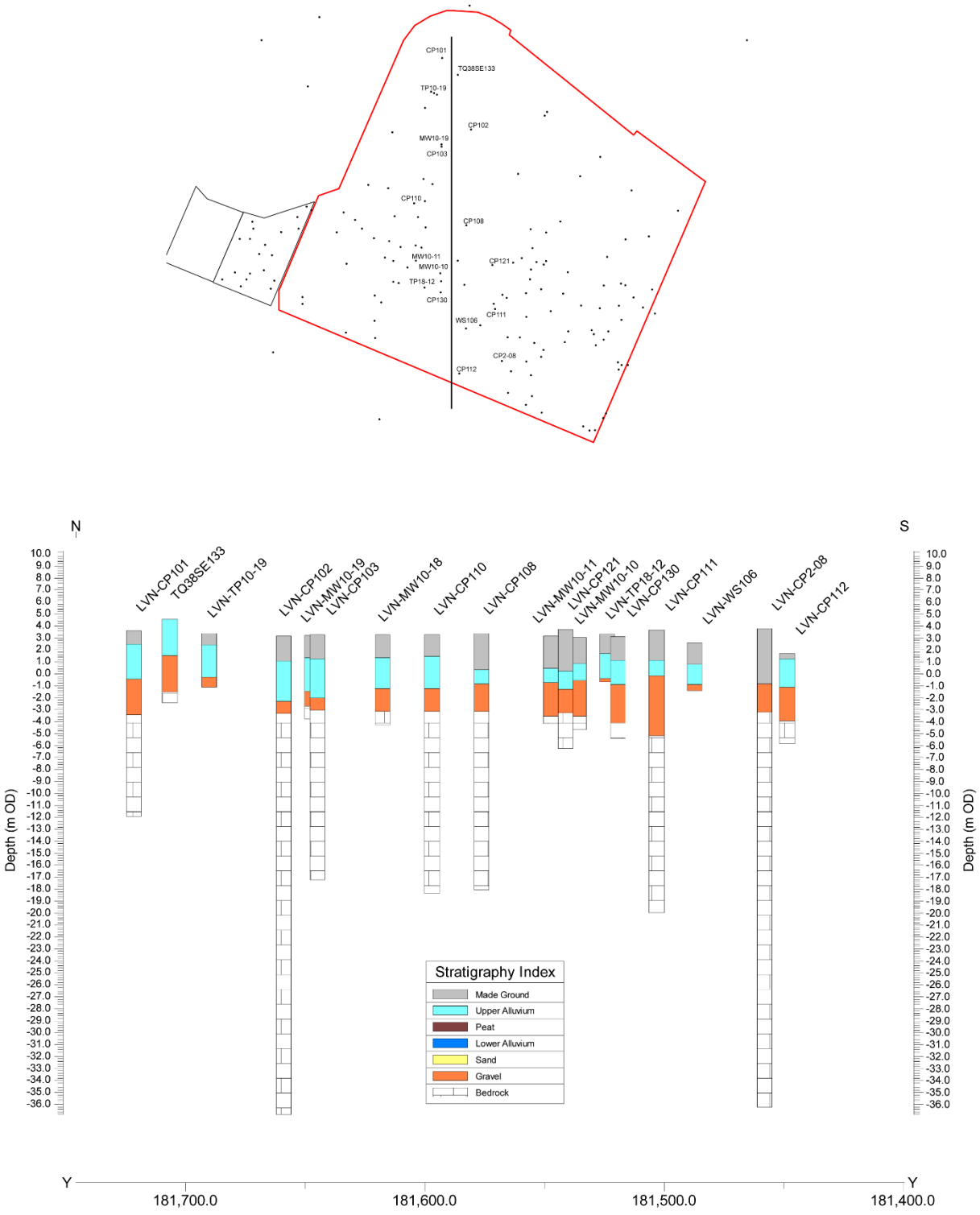

Figure 10: North to south transect of boreholes across the Leven Road, Poplar site.

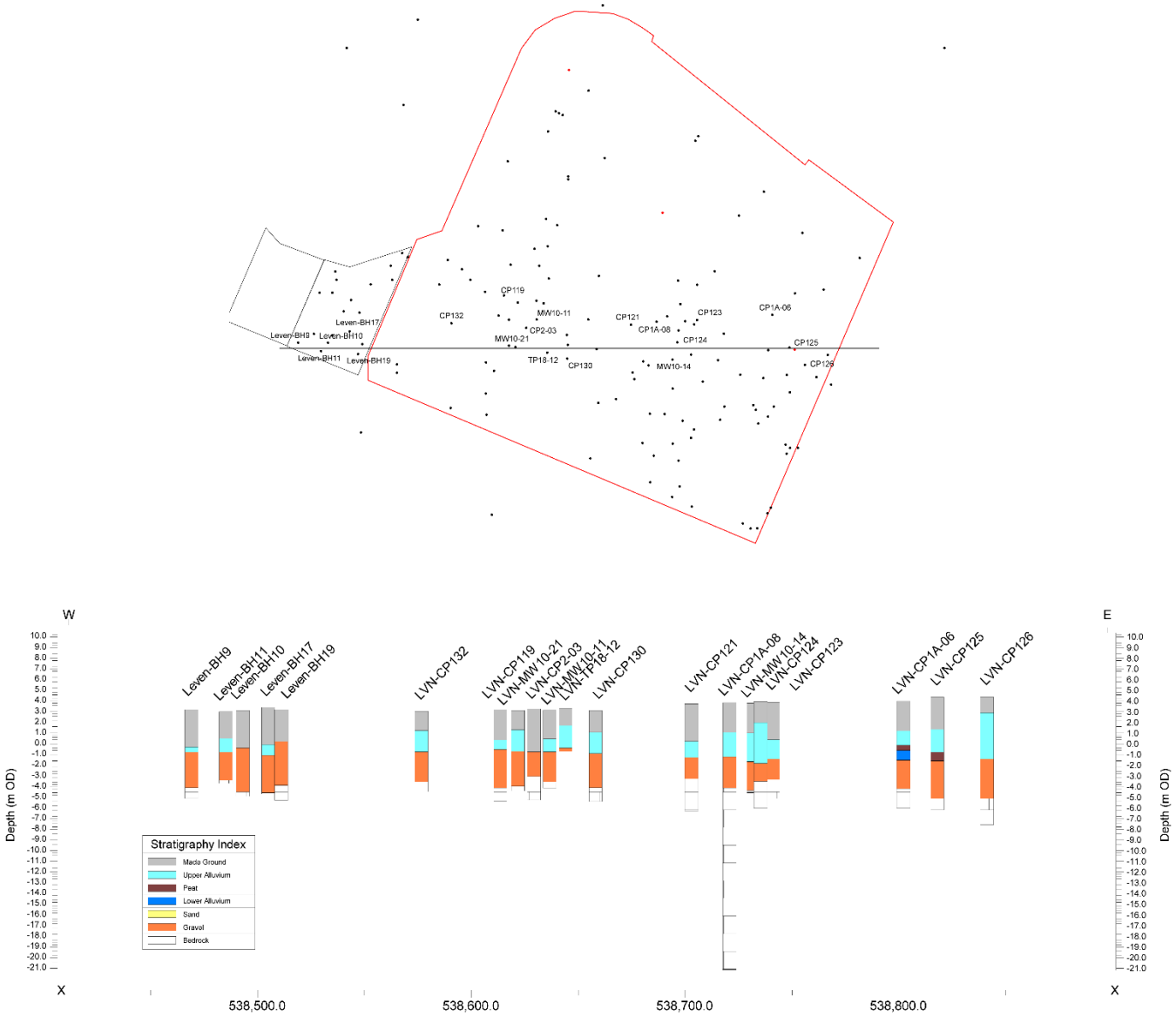

Figure 11: West to east transect of boreholes across the Leven Road, Poplar site.

5. RESULTS & INTERPRETATION OF THE POLLEN ASSESSMENT

Samples were prepared for pollen assessment from the peat horizons of CP125. The results indicate a high concentration and preservation of remains in the majority of samples assessed (Table 5).

The sequence are characterised by high values of tree and shrub pollen: alder (*Alnus*) dominates with oak (*Quercus*), hazel (*Corylus* type), and more sporadic values of lime (*Tilia*), elm (*Ulmus*), birch (*Betula*), willow (*Salix*) and ivy (*Hedera*). The herbaceous assemblage is limited in number and diversity, with only sporadic occurrences of grasses (Poaceae), daisies (Asteraceae) and buttercups (*Ranunculus* type). No aquatics were recorded. Spores are also limited; ferns (*Filicales*) are the most frequent with polypody (Polypodium vulgare). Microcharcoal is absent or recorded in negligible concentrations.

The results of the assessment indicate a peat surface dominated by alder with willow, with an understorey of grasses, mixed herbs and ferns. Hazel, ash and birch may have occupied the peat surface with alder and willow but are more likely to grown on the dryland forming mixed deciduous woodland with oak and lime. The limited values of elm throughout the sequence are consistent with the later Neolithic/early Bronze Age data for the peat, post-dating the Neolithic elm decline. There is little indication that the vegetation changed significantly on either the peat surface or surrounding dryland during the period of peat formation. There is also no definitive evidence for human activity.

Table 5: Results of the pollen assessment of samples from borehole CP125, Leven Road, Poplar, London Borough of Tower Hamlets.

	Depth (m bgl)	5.14	5.22	5.30	5.34	5.38	5.42	5.78	5.82	5.86	5.90
	Depth (m OD)	-0.79	-0.87	-0.95	-0.99	-1.03	-1.07	-1.43	-1.47	-1.51	-1.55
Latin name	Common name										
Trees											
Alnus	alder	12	29	18	8	16	5	27	12	55	38
Quercus	oak	7	4	6	8	5	2	13		2	6
Pinus	pine						1				1
Ulmus	elm	1	1	1							1
Tilia	lime	1	4	2		1		2		1	
Betula	birch				1						
Fraxinus	ash					1				1	
Shrubs											
Corylus type	e.g. hazel	2	11	7	5	12	1	10	2	1	7
Hedera	ivy					1		1	1		
Salix	willow	2									
Sambucus nigra	elder	1									
Vibernum type	wayfaring tree					5					
Herbs											
Poaceae	grass family	2		1					1	2	
Asteraceae	daisy family			1		2					
Caryophyllaceae	pink family							1			
Ranunculus type	buttercups		1	1		1					
Trifolium /Vicia	clover / vetch		1								
Spores											
Filicales	ferns	2	1	2		2		2	1		2
Pteridium aquilinum	bracken		1								
Polypodium vulgare	polypody		2		1	1	1				
Sphagnum	moss										
Total Land Pollen (grains counted)		27	51	37	22	44	9	54	16	62	53
Concentration*		4	5	5	4	5	2	5	3	5	5
Preservation**		3	3-4	4	3	4	2-3	3	3	4	4
Microcharcoal Concentration***		1	1	0	0	0	0	0	0	0	0
Suitable for further analysis		YES	YES	YES	YES	YES	NO	YES	YES	YES	YES

*Key: *Concentration: 0 = 0 grains; 1 =1-75 grains, 2 = 76-150 grains, 3 =151-225 grains, 4 = 226-300, 5 =300+ grains per slide; **Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent; ***Microcharcoal Concentration: 0 = none, 1= negligible, 2 = occasional, 3 = moderate, 4 = frequent, 5 = abundant*

6. RESULTS & INTERPRETATION OF THE DIATOM ASSESSMENT

A summary of the main diatom presence-absence assessment results of the samples from borehole CP125 is provided in Table 6. The most typical diatoms encountered in each sample are listed in order of abundance (most common at the top of each list). Overall, diatom preservation was poor, with two of the four samples yielding no diatoms at all during assessment. When present, many diatom frustules displayed evidence of dissolution, often preventing identifications beyond genus level.

Diatoms were only present at the interface of the upper peat boundary. Samples at the lower peat boundary interface were barren of diatoms. Benthic taxa were most dominant within the upper two samples, with planktonic taxa more restricted in abundance. The most common benthic diatoms were species of *Synedra* and *Punctastriata*, with other common diatoms including species of *Cocconeis, Amphora, Diploneis,* and *Nitzscha.* The planktonic species are restricted to *Cyclotella* sp., *Pseudopodosira stelligera and Actinoptychus senarius*. The majority of the benthic taxa encountered are typically affiliated with more freshwater environments, although some are associated with brackish environments (*Nitzschia navicularis, Diploneis interrupta, Scoliopleura tumida* etc). The planktonic taxa, with the exception of *Cyclotella striata* (a brackish taxa), are open marine water species (*Pseudopodosira stelligera and Actinoptychus senarius).* There is therefore a mixture of fresh, brackish and marine taxa within the two samples under rapid assessment.

Table 6: Results of the diatom assessment of samples from CP125, Leven Road, Poplar, London Borough of Tower Hamlets.

Depth (m OD)	Depth (m bgl)	Diatoms encountered
-0.79 to -0.80	5.14 to 5.15	*Synedra sp.* *Punctastriata sp.* *Amphora sp.* *Cyclotella sp.* *Cocconeis placentula* *Pseudopodosira stelligera* *Actinoptychus senarius* *Nitzschia navicularis*
-0.83 to -0.84	5.18 to 5.19	*Synedra sp.* *Diploneis interrupta* *Nitzschia navicularis* *Scoliopleura tumida* *Cyclotella striata*
-1.55 to -1.56	5.90 to 5.91	*n/a*
-1.59 to -1.60	5.94 to 5.95	*n/a*

7. RESULTS & INTERPRETATION OF THE PLANT MACROFOSSIL ASSESSMENT

A total of six samples from borehole CP125 were extracted and processed for the recovery of biological macrofossil remains, including waterlogged seeds, wood, insects and Mollusca (Table 7). The samples were focussed on the Peat in borehole CP125.

The samples were dominated by waterlogged wood, with moderate to high quantities recorded throughout the sequence, and waterlogged seeds, with low to moderate quantities recorded. Insects were recorded in moderate quantities in one sample at the base of the peat (-1.55 to -1.60m OD). No charred plant remains, Mollusca or bone were recorded in any of the six samples.

The waterlogged seed assemblage was dominated by catkins and fruits of *Alnus glutinosa* (black alder), with *Rubus fruticosus/idaeus* (blackberry/raspberry) recorded in the uppermost sample (-0.78 to -0.83m OD). This assemblage is typical of that in an alder carr, the plant macrofossil remains indictating that this environment persisted throughout the accumulation of the peat.

Table 7: Results of the macrofossil assessment of samples from borehole CP125, Leven Road, Poplar, London Borough of Tower Hamlets.

					Charred					Waterlogged			Mollusca		Bone				
Depth (m OD)	Depth (m bgl)	Stratigraphic Unit	Volume processed (ml)	Fraction	Charcoal (>4mm)	Charcoal (2-4mm)	Charcoal (<2mm)	Seeds	Chaff	Wood	Seeds*	Sedge remains (e.g. stems/roots)	Whole	Fragments	Large	Small	Fragments	Insects	*Waterlogged seed identifications
-0.78 to -0.83	5.13 to 5.18	Peat	100	>300µm	-	-	-	-	-	4	2	-	-	-	-	-	-	-	*Alnus glutinosa* (fruit) x7 *Alnus glutinosa* (catkin) x5 *Rubus fruticosus/idaeus* x1
-0.83 to -0.88	5.18 to 5.23		100	>300µm	-	-	-	-	-	3	2	-	-	-	-	-	-	-	*Alnus glutinosa* (fruit) x2 *Alnus glutinosa* (catkin) x6
-1.00 to -1.10	5.35 to 5.45		200	>300µm	-	-	-	-	-	4	2	-	-	-	-	-	-	-	*Alnus glutinosa* (catkin) x9
-1.40 to -1.50	5.75 to 5.85		300	>300µm	-	-	-	-	-	4	2	-	-	-	-	-	-	-	*Alnus glutinosa* (fruit) x2 *Alnus glutinosa* (catkin) x6
-1.50 to -1.55	5.85 to 5.90		100	>300µm	-	-	-	-	-	3	1	-	-	-	-	-	-	-	*Alnus glutinosa* (catkin) x2
-1.55 to -1.60	5.90 to 5.95		100	>300µm	-	-	-	-	-	4	1	-	-	-	-	-	-	2	*Alnus glutinosa* (catkin) x4

Key: 0 = Estimated Minimum Number of Specimens (MNS) = 0; 1 = 1 to 25; 2 = 26 to 50; 3 = 51 to 75; 4 = 76 to 100; 5 = 101+

8. DISCUSSION, CONCLUSIONS & RECOMMENDATIONS

A programme of palaeoenvironmental assessment was undertaken at the Leven Road site, building on previous geoarchaeological field investigations and deposit modelling presented in Young (2019b). This work was undertaken in order to (1) investigate whether the sequences contain any artefact or ecofact evidence for prehistoric or historic human activity; (2) investigate whether the sequences contain any evidence for natural and/or anthropogenic changes to the landscape (wetland and dryland); and (3) make recommendations for any further palaeoenvironmental analysis. In order to achieve this aim, paleoenvironmental assessment was undertaken on borehole CP125, in which the thickest sequence of organic sediments had been identified during the previous geoarchaeological investigations.

The results of the previous investigations 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 within the alluvium 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. The results of the radiocarbon dating show that the peat in borehole CP125, recorded at between -0.78 and -1.60m OD, began accumulating at 2575-2350 cal BC (4525-4300 cal BP), with peat cessation occurring at 1615-1455 cal BC (3565-3405 cal BP); the peat is therefore of later Neolithic to earlier Bronze Age date. In terms of the diatom assemblage, poor overall preservation limits the palaeoenvironmental potential of these samples. Where present, frustules often display dissolution, and hence the assemblage present may not be representative of what was present at the time of deposition. Due to the overall poor preservation, no further analysis of the diatoms is recommended.

The combined results of the pollen and plant macrofossil assessments are indicative of a peat surface dominated by alder with willow, with an understorey of grasses, mixed herbs and ferns. Hazel,

ash and birch may have occupied the peat surface with alder and willow, but are more likely to grown on the dryland, forming mixed deciduous woodland with oak and lime. The limited values of elm throughout the sequence are consistent with the later Neolithic/early Bronze Age date for the peat, post-dating the Neolithic elm decline. The pollen and macrofossil assemblages, both dominated by alder carr, provide little indication that the vegetation changed significantly on either the peat surface or surrounding dryland during the period of peat formation. No definitive evidence for human activity was recorded in the sequence from the peat. 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.

The peat at Leven Road is of a similar age to that recorded elsewhere in this area of the Lower Lea Valley. 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). Peat has also 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.

On the basis of the results of the assessment presented here, and the similar age of the peat sequence to that recorded elsewhere in this general area of the Lower Thames Valley, no further environmental archaeological analysis is recommended.

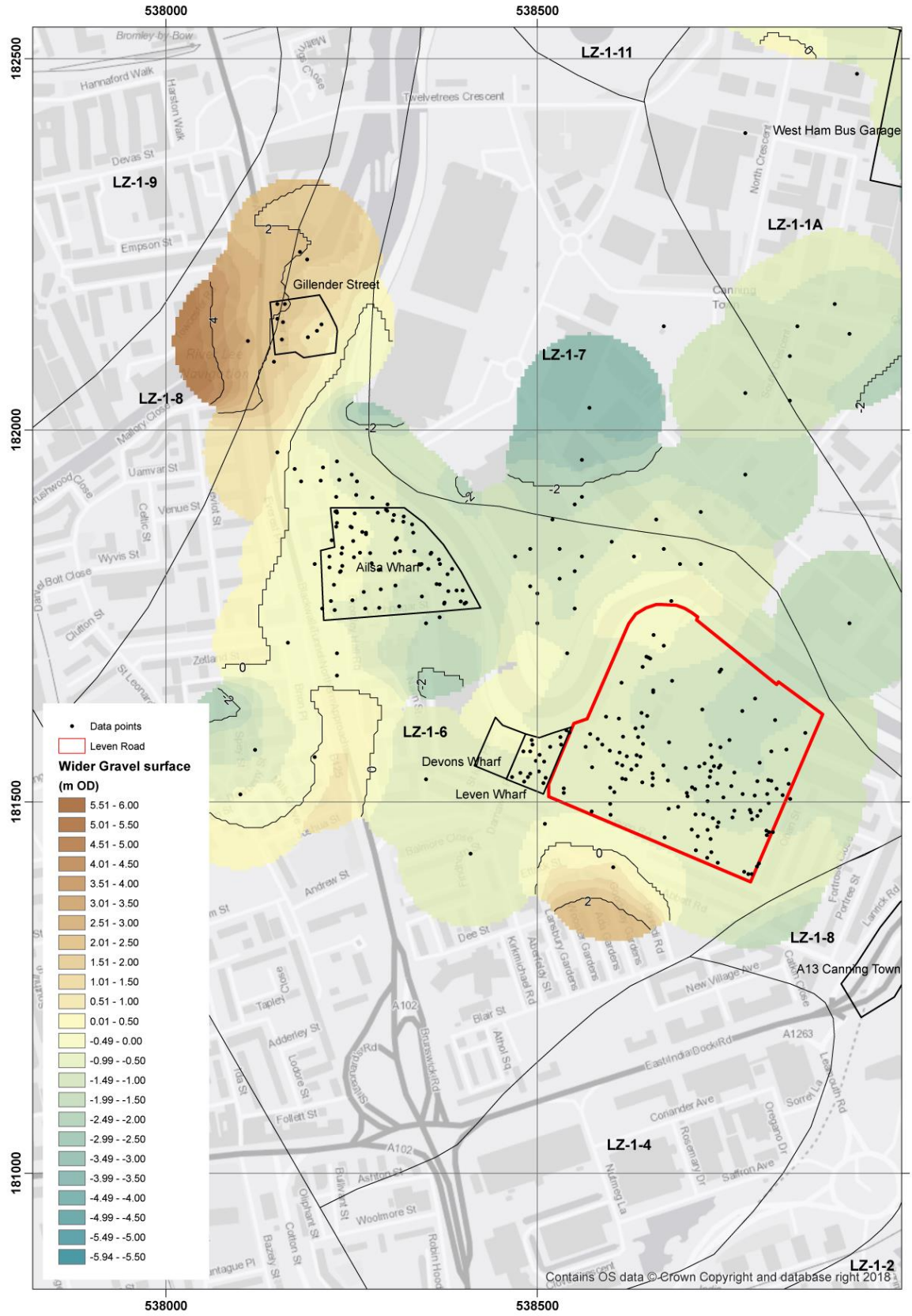

Figure 12: Surface of the Gravel (m OD) in the wider area of the site (see Figure 1 for site references).

9. REFERENCES

Advisian (2017) High level remediation strategy. Leven Road, Poplar. Reference 305008-00018 50510-15, revision 3. *Advisian Unpublished Report, February 2017*.

AIG Engineering Group (2007) Devons Wharf, Leven Road, Poplar: Phase One and Phase Two environmental report. Unpublished report.

Barnett, C., Allen, M.J., Evans, G., Grimm, J.M., Scaife, R., Stevens, C.J. & Wyles, S.F. (2011) A Submerged Forest with Evidence of Early Neolithic Burning Activity and the Tilbury Alluvial Sequence at Canning Town, East London. *Transactions of the London and Middlesex Archaeological Society*, **61**, 1-15.

Batchelor, C.R. (2019) *Ailsa Wharf, London Borough of Tower Hamlets, Geoarchaeological Deposit Model Report.* Quaternary Scientific (QUEST) Unpublished Report April 2019; Project Number 120/18.

Batchelor, C.R. & Young, D.S. (2014) *105-107 Tarling Road, London Borough of Newham (Site Code: TAR13): Geoarchaeological Assessment Report.* Quaternary Scientific (QUEST) Unpublished Report March 2014; Project Number 206/13.

Batchelor, C.R., Young, Austin, P., and Elias, S. (2013) The Pitts Head Public House, 2 Fords Park Road, London Borough of Newham, E16 1NL (site code: PHD12): Environmental Archaeological Assessment. Quaternary Scientific (QUEST) Unpublished Report January 2013; Project Number 180/12.

Batchelor, R., Green, C., Young, D., Austin, P., Cameron, N. & Elias, S. (2015) The Evolution of the Prehistoric Landscape beneath the London Cable Car. *London Archaeologist* **14(3)** 65-72.

Batchelor, C.R. (2015) in RPS 2015, Leven Wharf, Poplar, London Borough of Tower Hamlets: Written Scheme of Investigation. *Quaternary Scientific (QUEST) Unpublished Report September 2015; Project Number 179/14.*

Batchelor, C.R. & Young, D.S. (2018) Brunel Street Works, Canning Town, London Borough Of Newham Geoarchaeological Deposit Model Report With Radiocarbon Dating Addendum. *Quaternary Scientific (QUEST) Unpublished Report February 2018; Project Number 112/17.*

Branch, N.P., Batchelor, C.R., Elias, S., Green., C.P. & Swindle, G.E. (2007) Preston Road, Poplar High Street, Poplar, London Borough of Hamlets (site code: PPP06): environmental archaeological analysis. ArchaeoScape Unpublished Report.

Branch, N., Canti, M., Clark, P. and Turney,C. (2005) *Environmental Archaeology: theoretical and Practical Approaches*. Edward Arnold, London.

Bronk Ramsey, C.. & Lee, S., (2013). Recent and planned developments of the program OxCal. *Radiocarbon*, 55(2), pp.720-730.

Cappers, R.T.J., Bekker R.M. & Jans J.E.A. (2006) *Digital Seed Atlas of the Netherlands*. Groningen Archaeological Series 4. Barkhuis, Netherlands

Corcoran, J., Halsey, C., Spurr, G., Burton, E. and Jamieson, D. (2011) *Mapping past landscapes in the lower Lea valley : A geoarchaeological study of the Quaternary sequence*. Museum of London Archaeology, MOLA Monograph 55.

Eastbury, E. Ruddy, M. & Jones, S. (2009) MoLA 2009. Canning Town Sites, London E16, London Borough of Newham: Post-Excavation Assessment and updated project design. MoLA Unpublished Report.

Gibbard, P. (1984) *The Pleistocene History of the Lower Thames Valley.* Cambridge University Press, Cambridge.

Green, C.P. and Batchelor, C.R.. (2014) *A report on the geoarchaeological deposit modelling on land at Strand East, London Borough of Newham*. Quaternary Scientific (QUEST) Unpublished Report November 2014; Project Number 221/14.

Green, C.P. and Young, D.S. (2012) A report on the geoarchaeological investigations and deposit modelling on land at Canning Town Regeneration Area 7/1C, London Borough of Newham (NGR: TQ 539610 181443). *Quaternary Scientific Unpublished Report.*

Historic England (2020) Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits. Swindon. Historic England.

Komex (2003a) Environmental assessment site investigation report. Poplar gasholder station, Leven Road, Poplar, London. Second site area (Phase 2), volume I. *Komex Unpublished Report, May 2003.*

Komex (2003b) Environmental assessment site investigation report. Poplar gasholder station, Leven Road, Poplar, London. Transco area (Phases 1a and 1b), volumes I and II. *Komex Unpublished Report, May 2003.*

Krammer, K. & Lange-Bertalot, H. (1986-1991). *Subwasserflora von Mitteleuropa*. Bacciliarophyceae: 2 (1) Naviculaceae; 2 (2) Bacillariacceae, Epithemiaceae, Surirellaceae; 2 (3) Centrales, Fragilariaceae, Eunotiaceae; 2 (4) Achnanthaceae. Fischer, Stuttgart.

Martin, A.C. and Barkley, W.D. (2000) *Seed Identification Manual.* The Blackburn Press, California.

MLM Group (2018) St William Homes LLP Former Gasworks at Leven Road, Poplar, London E14 Review of Previous Reports. *MLM Group Unpublished Report, September 2017*.

Moore, P.D., Webb, J.A. and Collinson, M.E. (1991) Pollen Analysis (2nd Ed.). Oxford: Blackwell.

Reille, M. (1992) Pollen et Spores d'Europe et d'Afrique du Nord. Marseille : Laboratoire de Botanique Historique et Palynologie.

Reimer, P.J., Bard, E., Bayliss, A., Beck, J.W., Blackwell, P.G., Ramsey, C.B., Brown, D.M., Buck, C.E., Edwards, R.L., Friedrich, M. & Grootes, P.M., (2013). Selection and treatment of data for radiocarbon calibration: an update to the International Calibration (IntCal) criteria. *Radiocarbon*, 55(4), pp.1923-1945.

Stace, C. (2005) New Flora of the British Isles. Cambridge: Cambridge University Press.

Stafford, E., Goodburn, D. and Bates, M. (2012).Landscape and Prehistory of the East London Wetlands. Investigations along the A13 DBFO Roadscheme, Tower Hamlets, Newham and Barking and Dagenham, 2000-2003. Oxford Archaeology Monograph 17.

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

van Der Werff & Huls (1958-1974). *Diatomeeënflora van Nederland*. Eight parts, published privately by van der Werff, De Hoef (U), The Netherlands.

Weale, A. (2008) St Luke's Square, Canning Town, London Borough of Newham. An Archaeological Evaluation. *Thames Valley Archaeological Services Ltd Unpublished Report, March 2008*.

Wicks, K. (2010) St Luke's Square, Canning Town, London Borough of Newham (Site Code: LUC07): Palynological Assessment. *AFESS, University of Reading Unpublished Report, 2010*.

Worley Parsons (2010) Environmental assessment site investigation factual report. Former gasworks, Leven Road, Poplar (Phases 1a, 1b and 2). *Worley Parsons Unpublished Report, October 2010*.

Worley Parsons (2013) Environmental assessment factual site investigation report. Leven Road, Poplar (Phase 2). *Worley Parsons Unpublished Report November 2013*.

Young, D.S. (2014) Land at Canning Town Phase 2, London Borough of Newham (site code: CAN13): environmental archaeological assessment report. Quaternary Scientific (QUEST) Unpublished Report October 2014; Project Number 198/14.

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

Young, D.S. & Green, C.P. (2015) A report on the geoarchaeological deposit modelling on land associated with the Silvertown Tunnel, London Boroughs of Greenwich and Newham. Quaternary Scientific (QUEST) Unpublished Report May 2015; Project Number 046/15

Young, D.S. Batchelor, C.R. & Green, C.P. (2013) *Phase 2, Rathbone Market, Canning Town, London Borough of Newham (site code: RBO10): Geoarchaeological Fieldwork Report*. Quaternary Scientific (QUEST) Unpublished Report January 2013; Project Number 165/12.

Young, D.S. & Batchelor, C.R. (2014a) Caxton Works, The Moss Building and Goswell Bakeries, Caxton Street North, Canning Town (Site Code: CSN14): Environmental Archaeological Assessment Report. Quaternary Scientific (QUEST) Unpublished Report October 2014; Project Number 034/14.

Young, D.S. (2015) Leven Wharf, Poplar, London Borough of Tower Hamlets Geoarchaeological Deposit Model Report. *Quaternary Scientific (QUEST) Unpublished Report November 2015; Project Number 179/14.*

Young, D.S. (2018a) Canning Town Phase 3, London Borough of Newham Geoarchaeological Deposit Model Report. *Quaternary Scientific (QUEST) Unpublished Report July 2018; Project Number 115/17.*

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.*

Young, D.S. (2019a) Leven Road, Poplar, London Borough of Tower Hamlets, E14 0GX Desk-based Geoarchaeological Deposit Model Report. *Quaternary Scientific (QUEST) Unpublished Report January 2019; Project Number 189/18.*

Young, D.S. (2019b) Leven Road, Poplar, London Borough of Tower Hamlets, E14 0GX Updated Geoarchaeological Deposit Model Report. *Quaternary Scientific (QUEST) Unpublished Report April 2019; Project Number 189/18.*

10. APPENDIX 1: DEPOSIT MODEL DATA

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
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

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
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
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

Name	Source	Easting	Northing	Elevation (m OD)	Total depth (m)
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
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

11. OASIS

OASIS ID: quaterna1-349853

Project details

Project name	Leven Road, Poplar
Short description of the project	A programme of geoarchaeological investigations and palaeoenvironmental assessment was undertaken at the site. 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. The peat is of later Neolithic/eariler Bronze Age date; the peat surface during its formation was dominated by alder carr, whilst the dryland was formed of mixed deciduous woodland with oak and lime. No clear evidence for human activity was identified. 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. No further palaeoenvironmental analysis was recommended.
Project dates	Start: 01-01-2019 End: 11-09-2020
Previous/future work	Yes / No
Any associated project reference codes	LVE19 - Sitecode
Type of project	Environmental assessment
Monument type	PEAT Late Neolithic
Monument type	PEAT Early Bronze Age
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	"Environmental","Stratigraphic"
Paper Media available	"Report"

Entered by	Daniel Young (d.s.young@reading.ac.uk)
Entered on	11 September 2020