ENFIELD DISTRIBUTION PARK, EAST DUCK LEES LANE, PONDERS END, LONDON BOROUGH OF ENFIELD EN3 7SR (SITE CODE: EDP14): GEOARCHAEOLOGICAL FIELDWORK AND DEPOSIT MODEL REPORT

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INTRODUCTION

This report summarises the findings arising out of the geoarchaeological fieldwork and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of land at Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield EN3 7SR (National Grid Reference: TQ 365 959; Site Code: EDP14; Figure 1). Quaternary Scientific were commissioned by CgMs Consulting to undertake the geoarchaeological investigations. The site is in the lower valley of the River Lea, immediately to the west of the River Lee Navigation channel, King George V Reservoir and *ca*. 500m to the west of the present course of the River Lea (Figure 1). The mouth of the River Lea (known as Bow Creek), at its confluence with the Thames, lies *ca*. 10km to the south. 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).

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 Enfield Distribution Park site lies within Landscape Zones 5.5 and 5.6. In Zone 5.5 Corcoran *et al*. (2011) suggest that the Lea Valley Gravel surface lies at *ca*. 11-12m OD. However, Corcoran *et al*. (2011) highlight that ‘there are virtually no borehole data or archaeological interventions within this zone’, and ‘there are no borehole data to reconstruct the depositional sequences that exist above the gravels’. They also highlight that ‘the construction of the (King George V) reservoir has truncated the natural deposits below the level of the Pleistocene gravels, removing almost all of the deposits of archaeological or palaeoenvironmental significance. However, a thin slice of land

exists on the western periphery of the zone… (where) alluvial deposits survive that may contain palaeoenvironmental or archaeological evidence'. Landscape Zone 5.6 is described by Corcoran *et al*. (2011) as defined by the Leyton Gravel terrace (mapped by the BGS as Kempton Park Gravel). The gravels are described as occurring at *ca*. 17-13m OD. In this area, the gravels are 'overlain by silty clays and clays up to 1m in thickness… likely to be the result of overbank flooding of prehistoric to modern date'. Significantly the eastern edge of this zone, bordering the King George V reservoir, has 'produced Mesolithic channel deposits with good palaeoenvironmental and landscape reconstruction potential'.

A series of geotechnical boreholes has been put down at the site by BWB Environment Group (2014). These demonstrate that the gravel surface across the site lies at between 10.5 and 12.5m OD, and is overlain by predominantly silty clay alluvium, which in places is organic, at levels between *ca*. 11 and 14m OD. Peat is recorded within the alluvium in three boreholes (BH101, WS18B and WS103). In all three cases the peat directly overlies the gravel, and is between 0.2 (WS18B), 0.3 (BH101) and 0.45m thick (WS103). No OD heights were available for WS18B and WS103, but the peat is recorded at between 11.63 and 11.93m OD in BH101. The sequence across the site is capped by between 1.0 and 2.5m of made ground, so that the current elevation of the site is between *ca*. 14 and 15.5m OD. Given the elevation of the gravel surface recorded across the site, it seems likely that the Enfield Distribution Park site lies within Corcoran *et al*. (2011)'s Zone 5.5, and the gravel represents Late Devensian Lea Valley Gravel, with subsequent deposition of Holocene alluvium and in places, peat. Where peat and organic alluvium is recorded, it may represent pockets of palaeoenvironmental potential.

The aims of the geoarchaeological investigations at the site were thus: (1) to clarify the nature of the sub-surface stratigraphy, in particular the presence and thickness of alluvium (including peat) across the site, and (2) to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. In order to achieve this aim, two geoarchaeological boreholes were put down at the site and three new geotechnical boreholes (put down by BWB Consulting) were monitored in the field. A programme of deposit modelling was then undertaken, as outlined in the written scheme of investigation for the site (Young, 2014). This process incorporated:

1. Recording the lithostratigraphy of the new geoarchaeological and geotechnical borehole sequences to clarify the nature of the subsurface stratigraphy at the site, and to provide a preliminary reconstruction of the sedimentary history;

2. To use the stratigraphic data from the new locations and existing records to produce a deposit model of the major depositional units across the site.

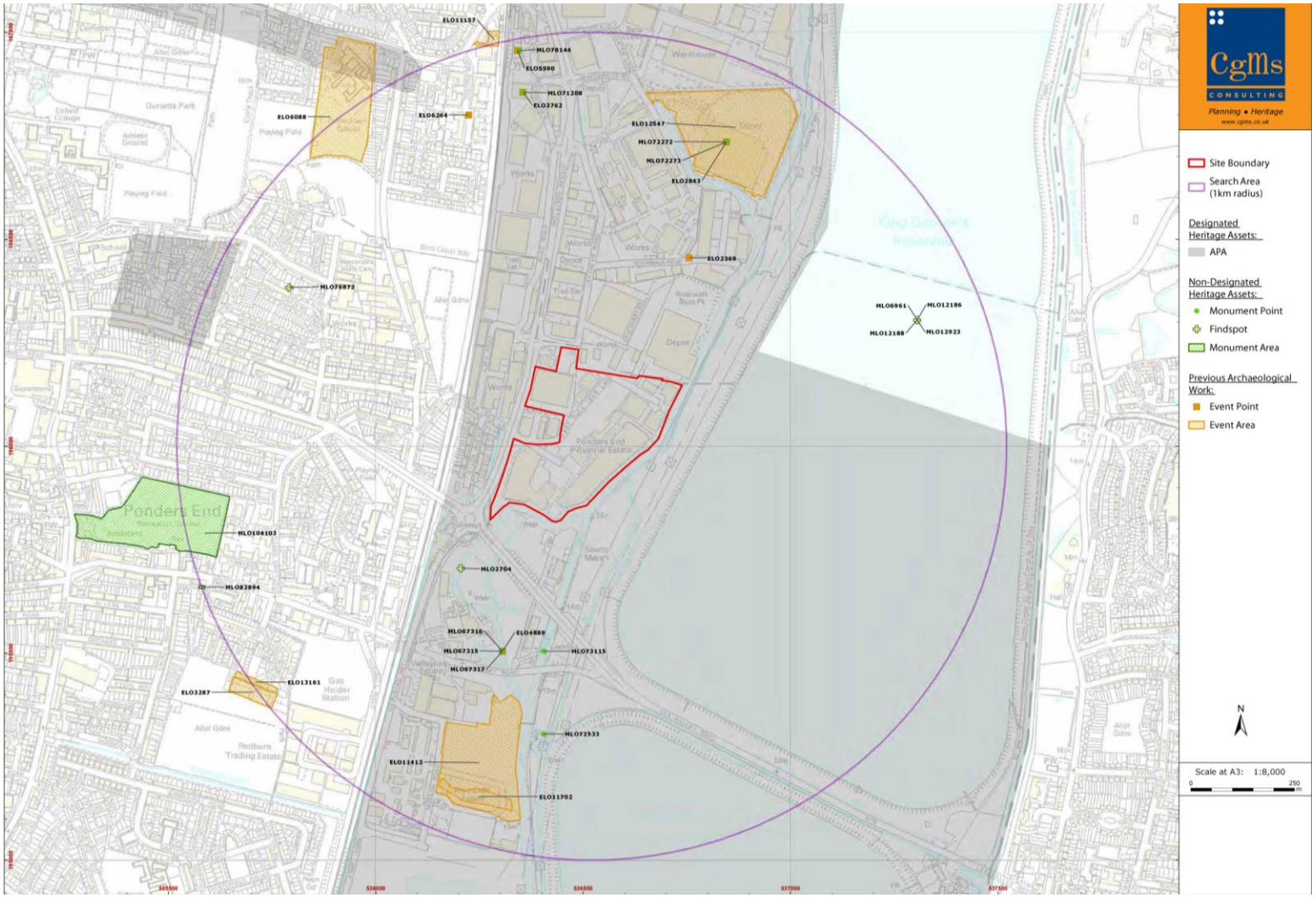

Figure 1: Location of the Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield site with associated HER data (figure provided by CgMs Consulting [Meager, 2014]).

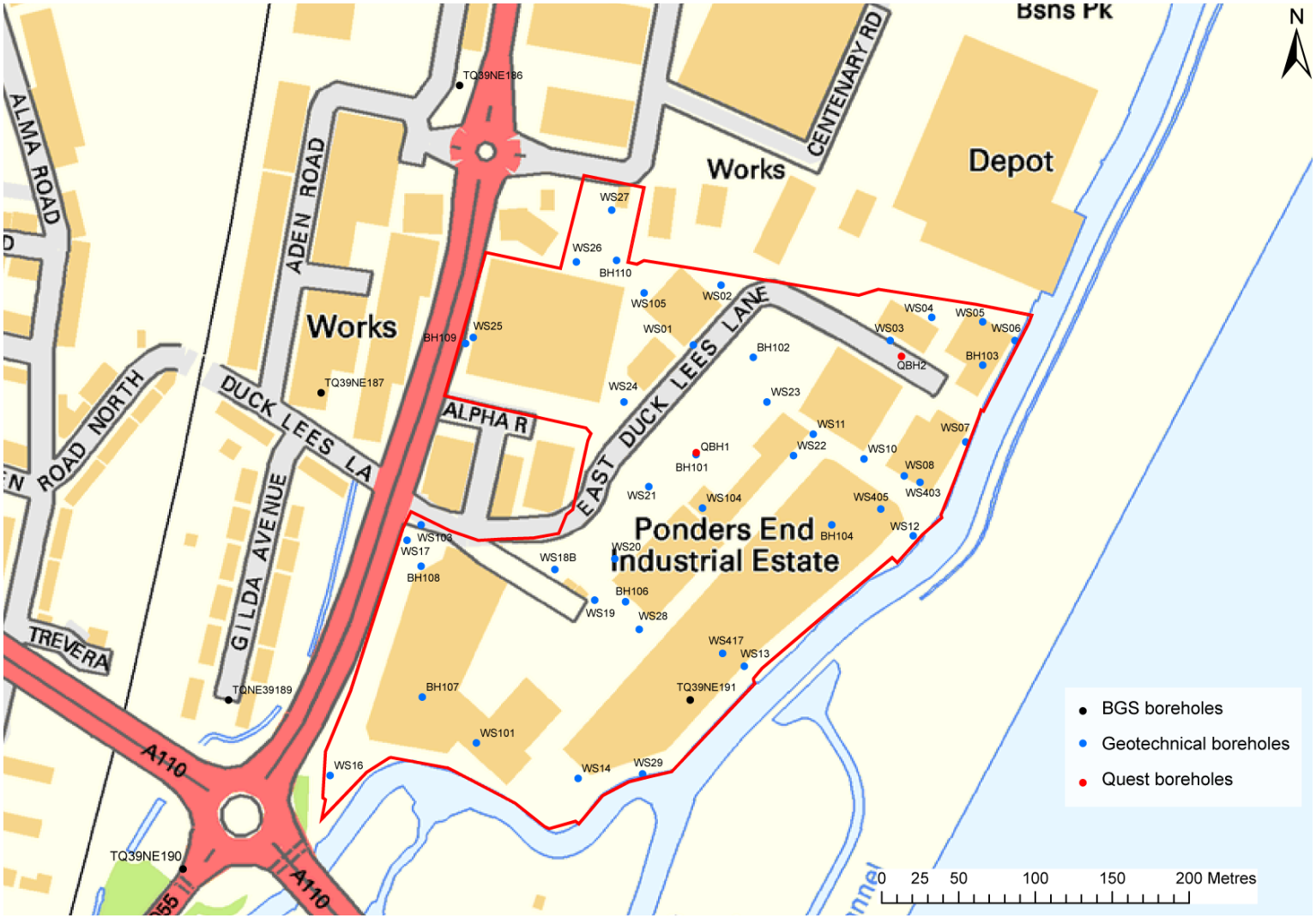

Figure 2: Location of the new geoarchaeological (red) and geotechnical boreholes (blue), and existing BGS borehole records (black) at Enfield Distribution Park. ***Contains Ordnance Survey data © Crown copyright and database right [2012].***

METHODS

Field investigations and lithostratigraphic descriptions

Two geoarchaeological boreholes (boreholes QBH1 to QBH2) were put down at the site in July 2014 (Figure 2) by Quaternary Scientific. A proposed third borehole in the southern area of the site (Young, 2014) was not put down due to this area of the site being in use at the time of the fieldwork. Borehole core samples were recovered using an Eijkelkamp window sampler and gouge set using an Atlas Copco TT 2-stroke percussion engine. This coring technique is a suitable method for the recovery of continuous, undisturbed core samples and provides sub-samples suitable for not only sedimentary and microfossil assessment and analysis, but also macrofossil analysis. The borehole locations were recorded using a Leica GS09 Differential GPS (Table 1). The lithostratigraphy of the retained core samples was described in the laboratory 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.

An additional three window sample boreholes put down by BWB Consulting were monitored in the field by Quaternary Scientific, also in July 2014. The lithostratigraphy of these boreholes was described in the field using the same procedure as outlined above. The results of the geoarchaeological descriptions of both sets of boreholes are displayed in Tables 2 to 6. The spatial attributes of the new geotechnical records are displayed in Table 1 and in Figure 2.

Table 1: Borehole attributes for those records used in the deposit model, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Borehole	Easting	Northing	Elevation (m OD)
Geoarchaeological boreholes			
QBH1	536523.73	196059.76	14.64
QBH2	536657.34	196123.57	15.35
Geotechnical boreholes monitored by Quaternary Scientific			
WS417	536541.20	195930.31	14.89
WS405	536643.83	196024.35	14.86
WS403	536669.33	196041.64	15.73
Geotechnical boreholes			
WS01	536522	196131	14.89

Borehole	Easting	Northing	Elevation (m OD)
WS02	536540	196170	15.36
WS03	536650	196134	15.51
WS04	536677	196149	15.49
WS05	536710	196146	15.58
WS06	536731	196134	15.41
WS07	536699	196068	15.63
WS08	536659	196046	15.70
WS10	536633	196057	15.64
WS11	536600	196073	14.67
WS12	536665	196007	14.66
WS13	536555	195922	14.05
WS14	536447	195849	14.84
WS16	536286	195851	14.08
WS17	536336	196004	14.36
WS18B	536432	195985	14.59
WS19	536458	195965	14.74
WS20	536471	195992	14.40
WS21	536493	196039	14.53
WS22	536587	196059	14.69
WS23	536570	196094	14.38
WS24	536477	196094	14.77
WS25	536374	196132	15.05
WS26	536446	196185	15.69
WS27	536469	196219	15.94
WS28	536487	195946	14.76
WS29	536489	195852	14.76
WS101	536381	195872	14.75
WS103	536345	196014	14.43
WS104	536528	196025	14.84
WS105	536490	196165	14.87
BH101	536524	196061	14.53
BH102	536561	196123	14.71
BH103	536710	196118	15.63
BH104	536612	196014	14.91
BH106	536478	195964	14.80
BH107	536346	195902	14.41
BH108	536345	195987	14.27
BH109	536379	196136	15.05
BH110	536472	196186	15.13
BGS borehole records			
TQ39NE186	536370	196300	14.50
TQ39NE187	536280	196100	14.00
TQNE39189	536220	195900	13.50
TQ39NE190	536190	195790	13.55
TQ39NE191	536520	195900	13.50

Deposit modelling

The deposit model was based on a review of 50 borehole records, incorporating the two new geoarchaeological boreholes, three geotechnical boreholes monitored by Quaternary

Scientific, 40 geotechnical boreholes and five BGS borehole records (www.bgs.ac.uk/opengeoscience) within or around the site (Figure 2). 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 Enfield Distribution Park site sedimentary units from the boreholes were classified into five groupings: (1) Gravel, (2) Lower Alluvium, (3) Peat, (4) Upper Alluvium and (5) Made Ground. Models of surface height (using a nearest neighbour routine) were generated for the Gravel and Upper Alluvium (Figures 5 and 7). Thickness of the Peat (Figure 6), combined Alluvium (incorporating the Lower Alluvium, Peat and Upper Alluvium (Figure 8) and Made Ground (Figure 9) was also modelled (also using a nearest neighbour routine).

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 each data point (borehole) is equivalent to an area of 50m radius around each borehole.

Although the boreholes are well distributed at the present site, the boreholes are not uniformly distributed over the area of investigation and the reliability of the models is variable. Fewer boreholes have been put down in the southern area of the site, where the existing buildings are yet to be demolished. In general, reliability improves from the boundaries of the site, where edge effects adversely influence the reconstructions, towards the core area of the site where mutually supportive data are likely to be available from several adjacent boreholes.

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. Quality is also affected where boreholes have been put down at different times and recorded using different descriptive terms and subject to differing technical constraints in terms of recorded detail including the exact levels of the stratigraphic

boundaries. Of the records used in the deposit model, the cores from the boreholes put down or monitored by Quaternary Scientific represent the most detailed record of the sediment sequences. 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.

RESULTS, INTERPRETATION AND DISCUSSION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS AND DEPOSIT MODELLING

The geoarchaeological investigations (Tables 2 to 6) have permitted a programme of deposit modelling of the surface elevation and thickness of each major stratigraphic unit (Figures 3 to 9). The basal unit at the site is a horizon of sand and gravel, which across the majority of the site lies at between *ca*. 10.5 and 12.2m OD and is probably equivalent to the Lea Valley Gravel (Gibbard, 1985), deposited during the Late Devensian (10-15,000 years before present) within a high energy braided river environment. To the west of the site in boreholes TQ39NE187, TQ39NE189 and TQ39NE190 the Gravel surface rises to 12.93, 12.59 and 12.33m OD (see Figures 3 and 5), where it is most likely equivalent to the Leyton Gravel (mapped by the BGS as Kempton Park Gravel) and represents Gravel deposited during the Early to Middle Devensian (30-120,000 years before present). Within the area of the site the Lea Valley Gravel surface appears to fall towards the southern and northeastern areas of the site (see Figure 4), from between *ca*. 11.5 and 12.2m OD in the northwestern area of the site (e.g. 11.94 [WS27], 11.69 [WS26], 11.89 [WS02] and 12.21m OD [BH102]) to between 10.5 and 11.5m OD in the central and southern areas of the site (e.g. 11.12 [QBH1], 11.14 [WS19], 10.55 [WS13] and 11.14m OD [WS14]). In the northeastern area of the site the Gravel surface is recorded at 10.61m OD in borehole WS06, 11.23m OD in BH103 and 11.24m OD in QBH2.

In ten of the 50 borehole records the Gravel is overlain by a horizon of variably sandy silt, with frequent inclusions of detrital organic matter (see Figure 5). The boreholes containing this unit are generally well distributed across the site, but appear to be absent towards the south. This horizon was identified in two of the three geotechnical boreholes monitored, and in one of the two geoarchaeological boreholes; however, this horizon is not frequently recorded in the geotechnical logs. Where this unit is recorded it is similar in nature to the Lower Alluvium recorded elsewhere in the Lower Thames Valley and its tributaries, the sediments of which were deposited during the Early to Mid-Holocene, as the energy of flow decreased and the Lea probably became confined to a single meandering channel. It is

generally between 0.1 and 0.3m thick, its elevation varying depending on the underlying Gravel topography. In those boreholes monitored or put down by Quaternary Scientific it is recorded at 11.31 to 11.12m OD (QBH1), 11.86 to 12.06m OD (WS405) and 11.29 to 11.11m OD (WS417).

In four boreholes (TQ39NE191, BH101, WS103 and QBH2) the Gravel is directly overlain by a generally silty or very silty Peat horizon, whilst in five boreholes Peat overlies the Lower Alluvium (QBH1, WS03, WS18B, WS403 and WS417). Significantly, the Peat horizon is indicative of a transition towards a semi-terrestrial environment, supporting the growth of wetland vegetation and which may have been utilised by prehistoric people. Within the area of the site the Peat is between 0.07 (QBH1) and 0.41m thick (QBH2), with the exception of BGS borehole TQ39NE191, where it is recorded as 0.76m thick (Figure 6). As with the Lower Alluvium, the elevation of the Peat appears to vary depending on the underlying Gravel topography, recorded at its lowest in the southwestern area of the site in borehole WS103 (10.68 to 10.43m OD) and at its highest in WS03 towards the northeast of the site (13.01 to 12.91m OD). The presence of Peat appears to be localised to particular areas of the site, with Peat absent from the northwestern area of the site (generally where the Gravel surface lies above 12.0m OD) and apparently from the southwestern area of the site. It should be noted however that relatively few boreholes have been put down in the southwestern part of the site, where demolition of the existing buildings is yet to take place.

Overlying the Peat and Lower Alluvium where it is recorded, or directly overlying the Gravel elsewhere, is a horizon of silty clay Alluvium which in places contains detrital organic material. This horizon is considered to represent the Upper Alluvium, indicative of sediment accumulation on the floodplain at a distance from any active channels. The surface of the Upper Alluvium generally lies at between *ca*. 12.5 and 13.5m OD (Figure 7), where in most boreholes (with the exception of those BGS boreholes to the west of the site) it is directly overlain by Made Ground. In general the total thickness of the Holocene Alluvium (incorporating the Lower Alluvium, Peat (where present) and Upper Alluvium) is greater in the southern and northeastern areas of the site (where the Gravel surface is lower; Figure 8), where it is generally between 2.0 and 3.0m thick. In the northwestern area of the site the Holocene Alluvium is between 1.0 and 2.0m thick, whilst in the area of boreholes WS25, WS26 and WS27 between 0.0 and 1.0m is recorded (see Figure 8). The thickness of Made Ground across the site is generally reflected in the model for the thickness of the Holocene Alluvium, with greater thicknesses recorded towards the north of the site (generally between

2.0 and 3.0m) and between 1.0 and 2.0m towards the south (Figure 9). The modern surface of the site is relatively even, lying at between 14.5 and 15.5m OD.

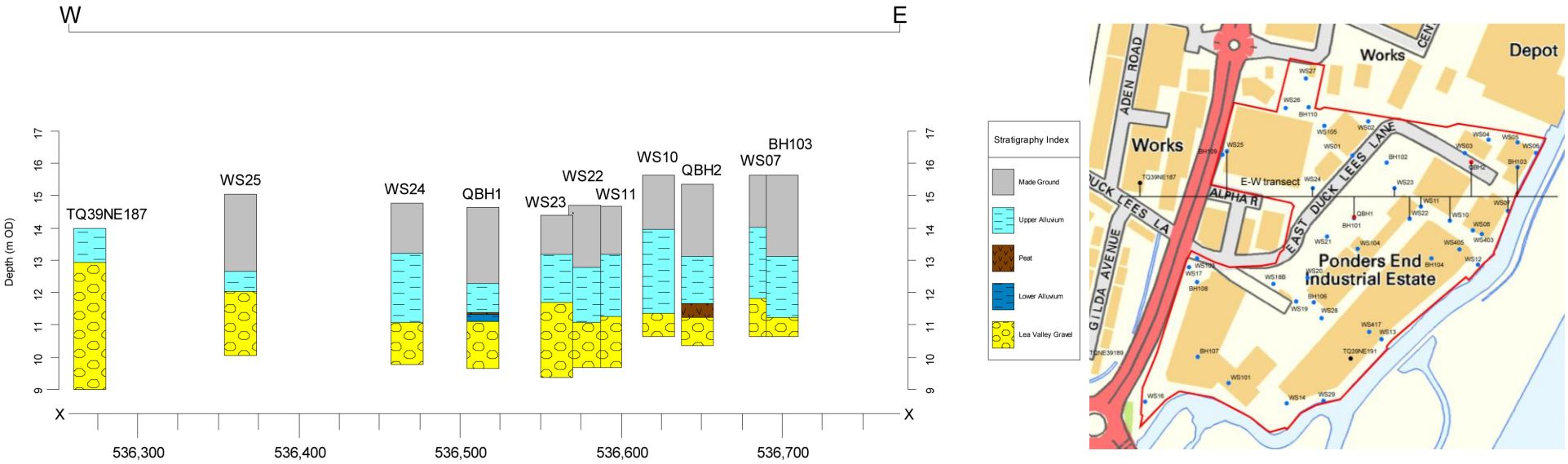

Figure 3: West-East transect of selected boreholes across the site at Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

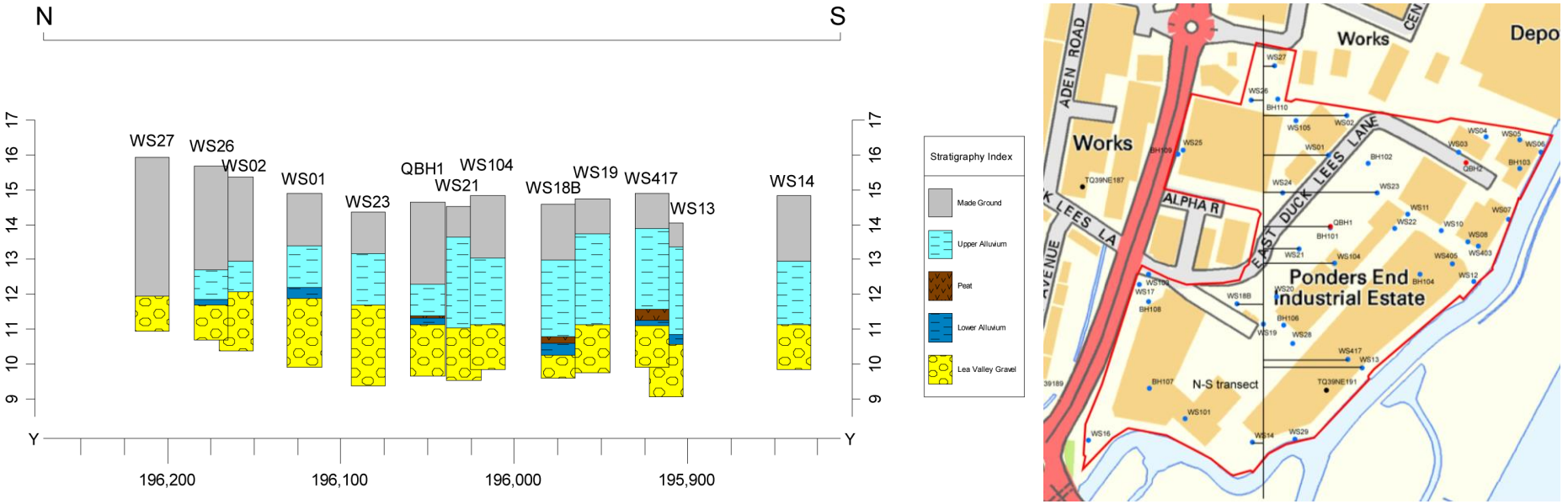

Figure 4: North-South transect of selected boreholes across the site at Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Table 2: Lithostratigraphic description of borehole QBH1, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Depth (m OD)	Depth (m bgs)	Description
14.64 to 12.29	0.00 to 2.35	Made Ground including brick and gravel.
12.29 to 11.86	2.35 to 2.78	Gley1 4/1; Ag2 As2; dark grey silt and clay with some root material and iron staining. Diffuse contact in to:
11.86 to 11.64	2.78 to 3.00	Gley1 3/N; Ag2 As2; very dark grey silt and clay with some root material. Lens of organic clayey silt (Ag2 As1 Sh1).
11.64 to 11.38	3.00 to 3.26	2.5Y 3/1; Ag3 As1 Ga+; very dark grey clayey silt with occasional lenses of sand. Sharp contact in to:
11.38 to 11.31	3.26 to 3.33	2.5YR 2.5/1; Ag2 Sh2; humo. 3/4; reddish black well humified very silty peat. Sharp contact in to:
11.31 to 11.12	3.33 to 3.52	Ga3 Gg1; gravelly sand. Flint clasts up to 20mm in diameter. Sharp contact in to:
11.12 to 10.64	3.52 to 4.00	Gg3 Ga1; sandy gravel. Flint clasts up to 40mm in diameter, sub-angular to sub-rounded.

Table 3: Lithostratigraphic description of borehole QBH2, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Depth (m OD)	Depth (m bgs)	Description
15.35 to 13.35	0.00 to 2.00	Made Ground including brick and gravel.
13.35 to 13.13	2.00 to 2.22	Redeposited alluvium including brick rubble and gravel.
13.13 to 13.06	2.22 to 2.29	7.5YR 2.5/1; Ag2 Sh1 Dh1; black organic silt with detrital herbaceous material. Possible redeposited Alluvium (Made Ground). Sharp contact in to:
13.06 to 12.75	2.29 to 2.60	2.5Y 3/1; As3 Ag1; very dark grey silty clay with root material and some iron staining. Diffuse contact in to:
12.75 to 12.58	2.60 to 2.77	2.5Y 4/1; As2 Ag2; dark grey silt and clay with some root material. Diffuse contact in to:
12.58 to 12.35	2.77 to 3.00	2.5Y 3/1; As2 Ag2; very dark grey silt and clay with some root material.
12.35 to 12.00	3.00 to 3.35	2.5Y 4/1; Ag3 As1; dark grey clayey silt with some root material and iron staining. Diffuse contact in to:
12.00 to 11.65	3.35 to 3.70	2.5Y 3/1; Ag2 As2 Dh+; very dark grey silt and clay with a trace of detrital herbaceous material. Sharp contact in to:
11.65 to 11.24	3.70 to 4.11	2.5YR 2.5/1; Sh2 Tl^{2}1 Ag1; humo. 3; reddish black well humified silty woody peat. Sharp contact in to:
11.24 to 10.35	4.11 to 5.00	Gg3 Ga1; sandy gravel. Flint clasts up to 40mm in diameter, sub-angular to sub-rounded.

Table 4: Lithostratigraphic description of borehole WS403, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Depth (m OD)	Depth (m bgs)	Description
15.73 to 13.33	0.00 to 2.40	Made Ground including concrete, brick rubble, ash and industrial waste.
13.33 to 13.13	2.40 to 2.60	2.5Y 4/1; As3 Ag1 Dh+; dark grey silty clay with a trace of detrital herbaceous material. Sharp contact in to:
13.13 to 12.33	2.60 to 3.40	Gley1 4/1; As3 Ag1 Dh+; dark grey silty clay with a

Depth (m OD)	Depth (m bgs)	Description
		trace of detrital herbaceous material. Diffuse contact in to:
12.33 to 11.91	3.40 to 3.82	2.5Y 4/1; Ag3 As1 Sh+; dark grey silty clay with some slightly organic lenses. Sharp contact in to:
11.91 to 11.83	3.82 to 3.90	7.5YR 2.5/1; Ag2 Sh2; black very silty peat. Sharp contact in to:
11.83 to 11.73	3.90 to 4.00	2.5Y 4/1; As2 Ag2; dark grey silt and clay.
11.73 to 10.73	4.00 to 5.00	Gg3 Ga1; Flint clasts up to 60mm in diameter, sub-angular to well-rounded.

Table 5: Lithostratigraphic description of borehole WS405, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Depth (m OD)	Depth (m bgs)	Description
14.86 to 13.36	0.00 to 1.50	Made Ground including concrete, brick rubble and industrial waste.
13.36 to 12.86	1.50 to 2.00	2.5Y 4/1; As3 Ag1 Sh+; dark grey silty clay with occasional traces of organic matter.
12.86 to 12.11	2.00 to 2.75	2.5Y 4/1; As2 Ag2; dark grey silt and clay. Sharp contact in to:
12.11 to 12.06	2.75 to 2.80	7.5YR 2.5/1; Ag2 Ga1 Sh1; black organic sandy silt. Diffuse contact in to:
12.06 to 11.86	2.80 to 3.00	2.5Y 4/1; Ga3 Gg1 Dh+; dark grey gravelly sand with a trace of detrital herbaceous material. Flint clasts up to 25mm in diameter, sub-angular.
11.86 to 10.86	3.00 to 4.00	Gg3 Ga1; sandy gravel. Flint clasts up to 40mm in diameter, sub-angular to sub-rounded.

Table 6: Lithostratigraphic description of borehole WS417, Enfield Distribution Park, East Duck Lees Lane, Ponders End, London Borough of Enfield

Depth (m OD)	Depth (m bgs)	Description
14.89 to 14.19	0.00 to 0.70	Made Ground including concrete, brick rubble and industrial waste.
14.19 to 13.89	0.70 to 1.00	2.5Y 4/1; As2 Ag1 Gg1; dark grey silty gravelly clay. Possible disturbed Alluvium (Made Ground).
13.89 to 12.89	1.00 to 2.00	2.5Y 4/1; As3 Ag1; dark grey silty clay.
12.89 to 11.89	2.00 to 3.00	2.5Y 4/1; As2 Ag2 Dh+ Sh+; dark grey silt and clay with a trace of detrital herbaceous material and occasional organic lenses.
11.89 to 11.56	3.00 to 3.33	2.5Y 4/1; Ag3 As1 Sh+; dark grey clayey silt with occasional organic lenses. Diffuse contact in to:
11.56 to 11.29	3.33 to 3.60	7.5YR 2.5/1; Ag2 Sh2 As+ Dl+; black very silty peat with a trace of clay and detrital wood. Diffuse contact in to:
11.29 to 11.24	3.60 to 3.65	2.5Y 4/1; Ag2 As1 Ga1; dark grey sandy clayey silt. Sharp contact in to:
11.24 to 11.11	3.65 to 3.78	2.5Y 4/1; Ag2 Ga1 Gg1; dark grey sandy gravelly silt. Flint clasts up to 40mm in diameter, sub-angular to well-rounded. Diffuse contact in to:
11.11 to 10.89	3.78 to 4.00	Gg2 Ga2; sand and gravel. Flint clasts up to 40mm in diameter, sub-angular to well-rounded.
10.89 to 9.89	4.00 to 5.00	Gg3 Ga1; Flint clasts up to 40mm in diameter, sub-

		angular to well-rounded.

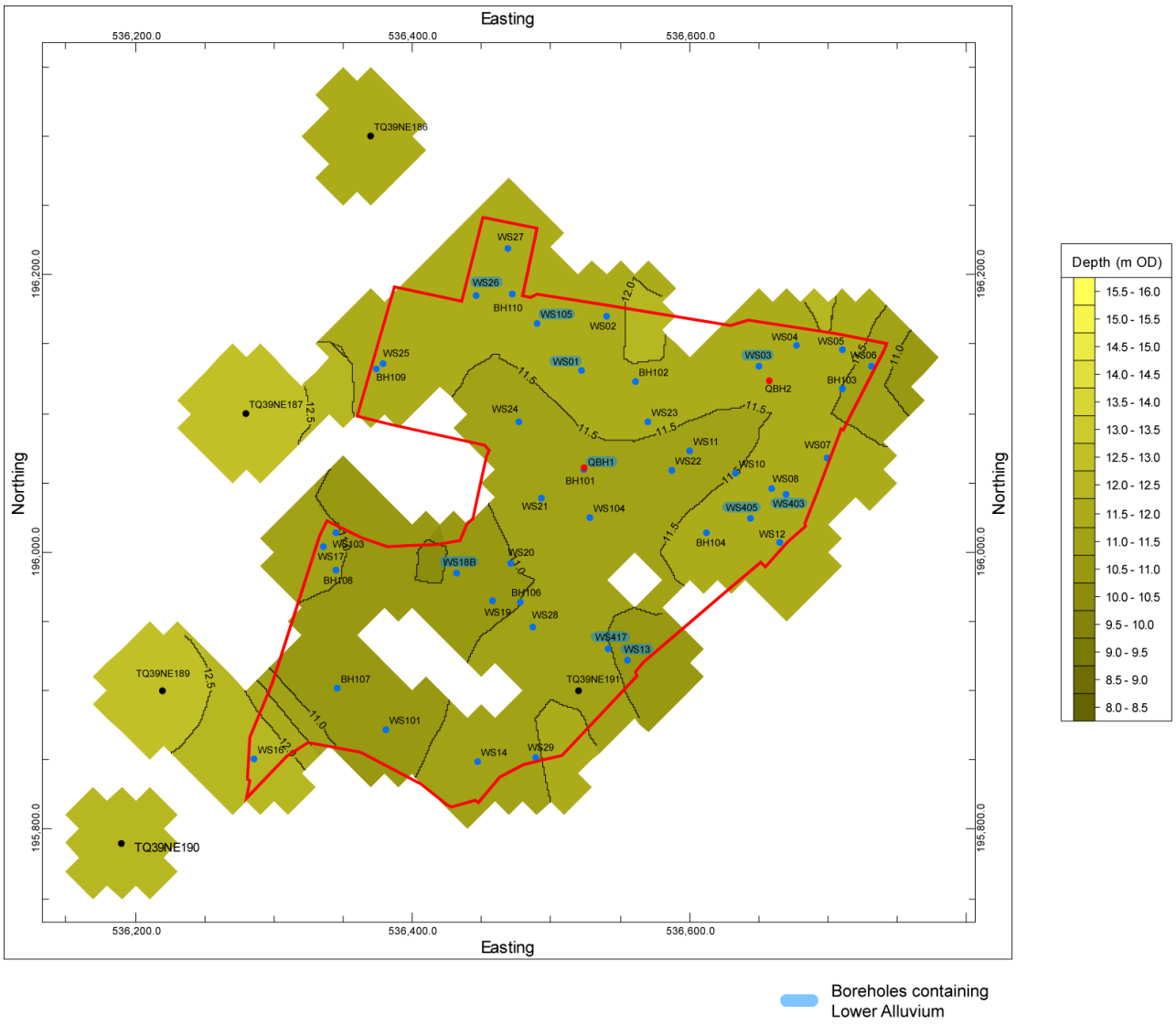

Figure 5: Top of the Gravel (m OD) (site outline in red)

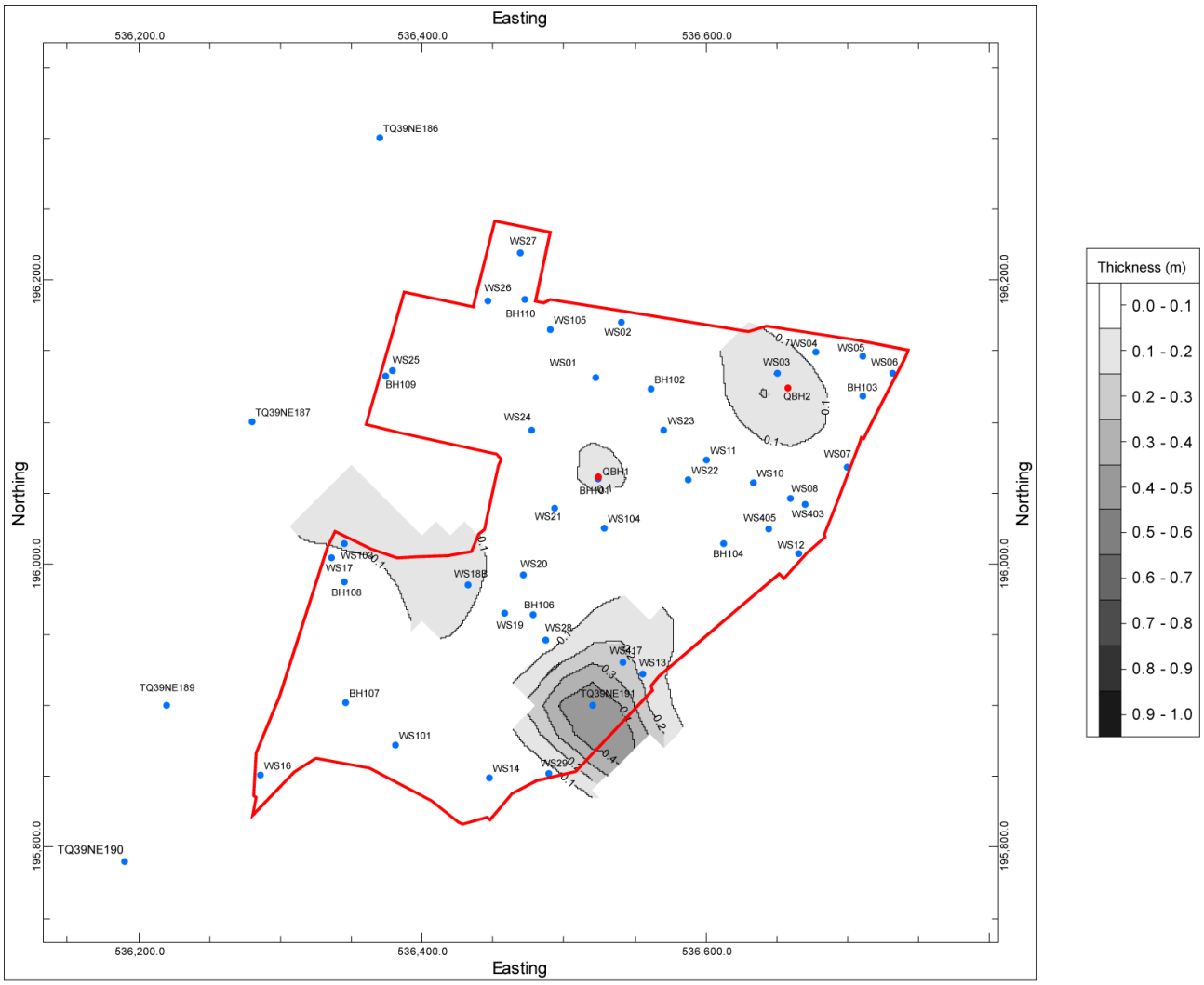

Figure 6: Thickness of the Peat (m) (site outline in red)

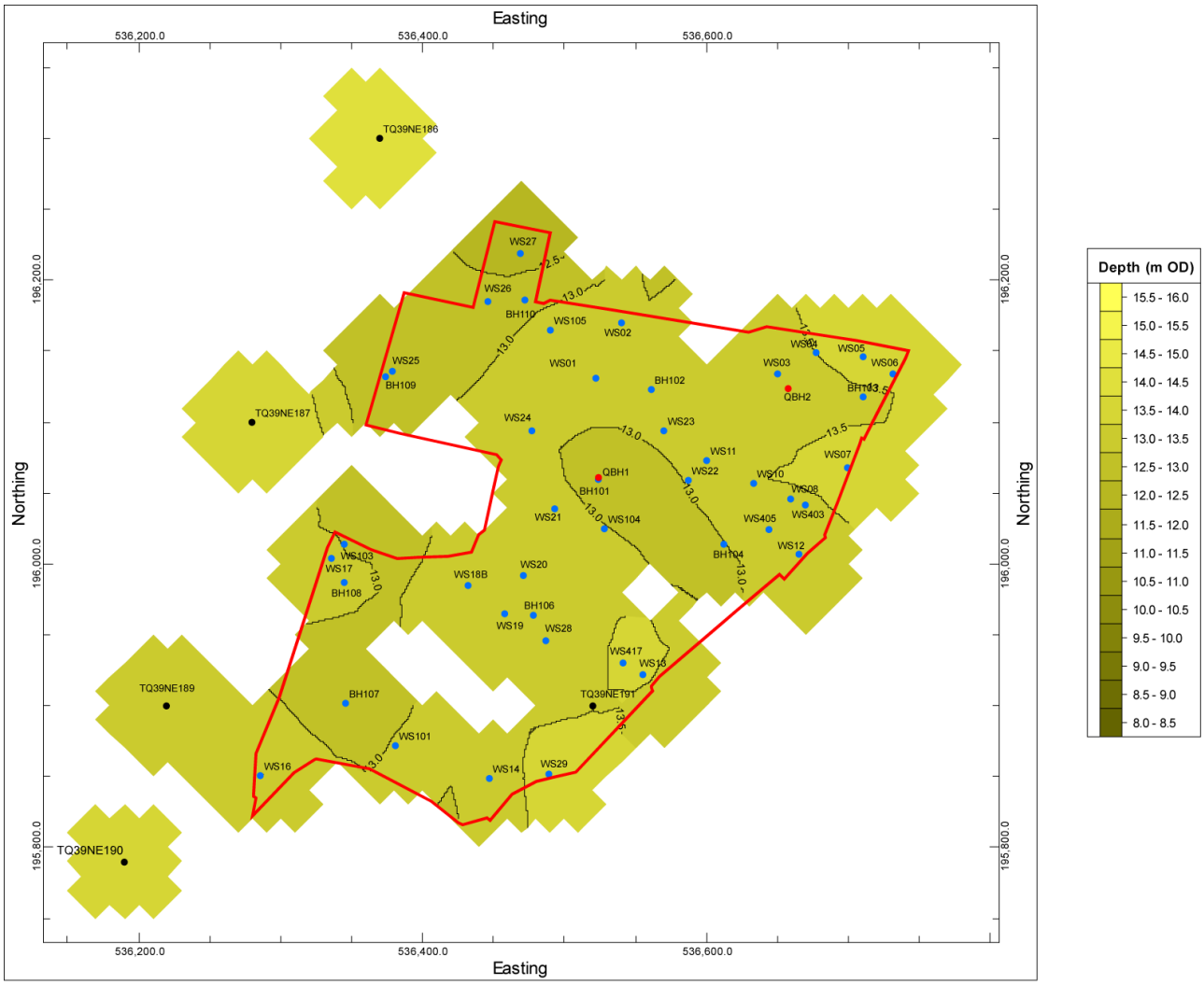

Figure 7: Top of the Upper Alluvium (m OD) (site outline in red)

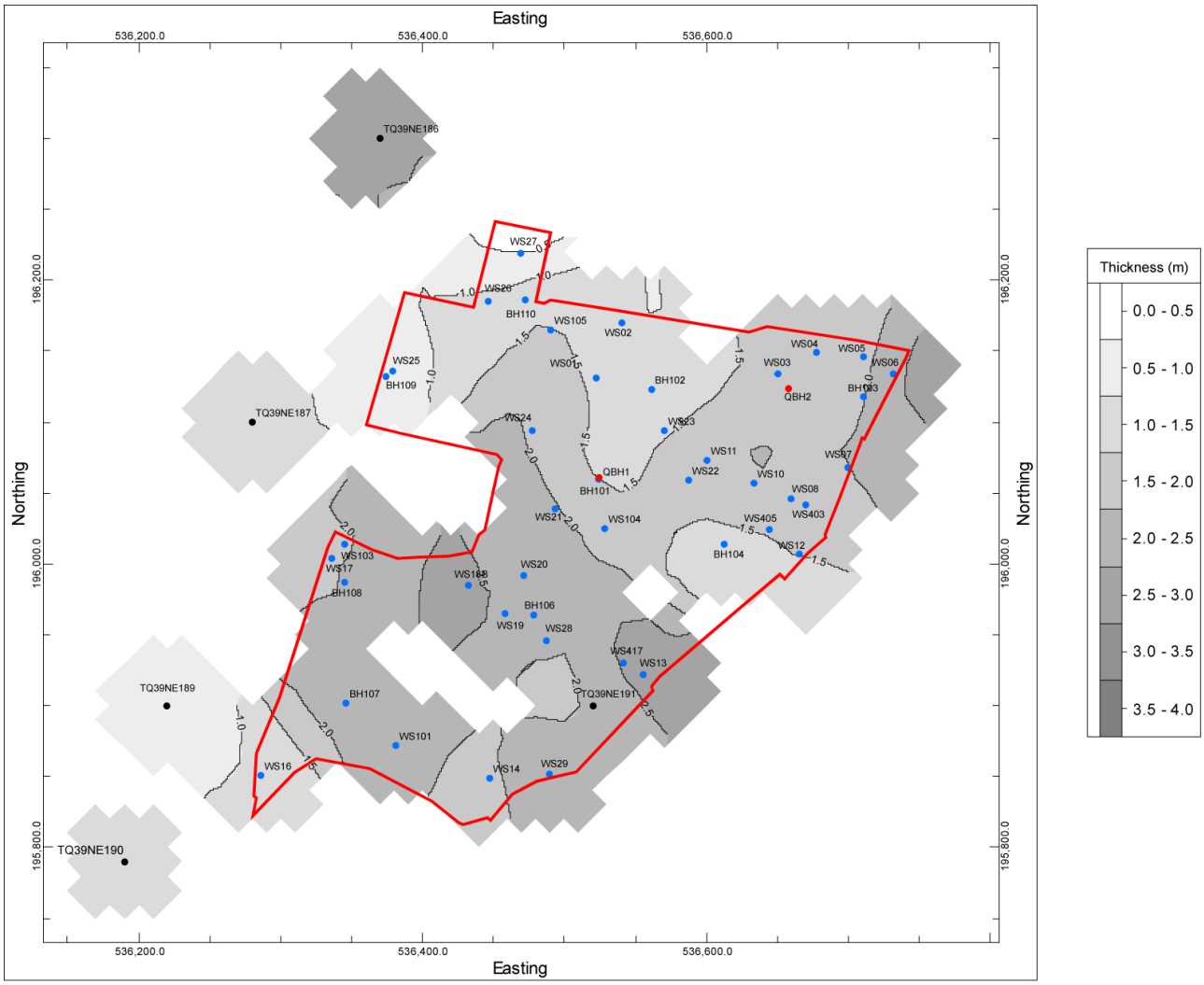

Figure 8: Thickness of the Holocene Alluvium (m) (site outline in red)

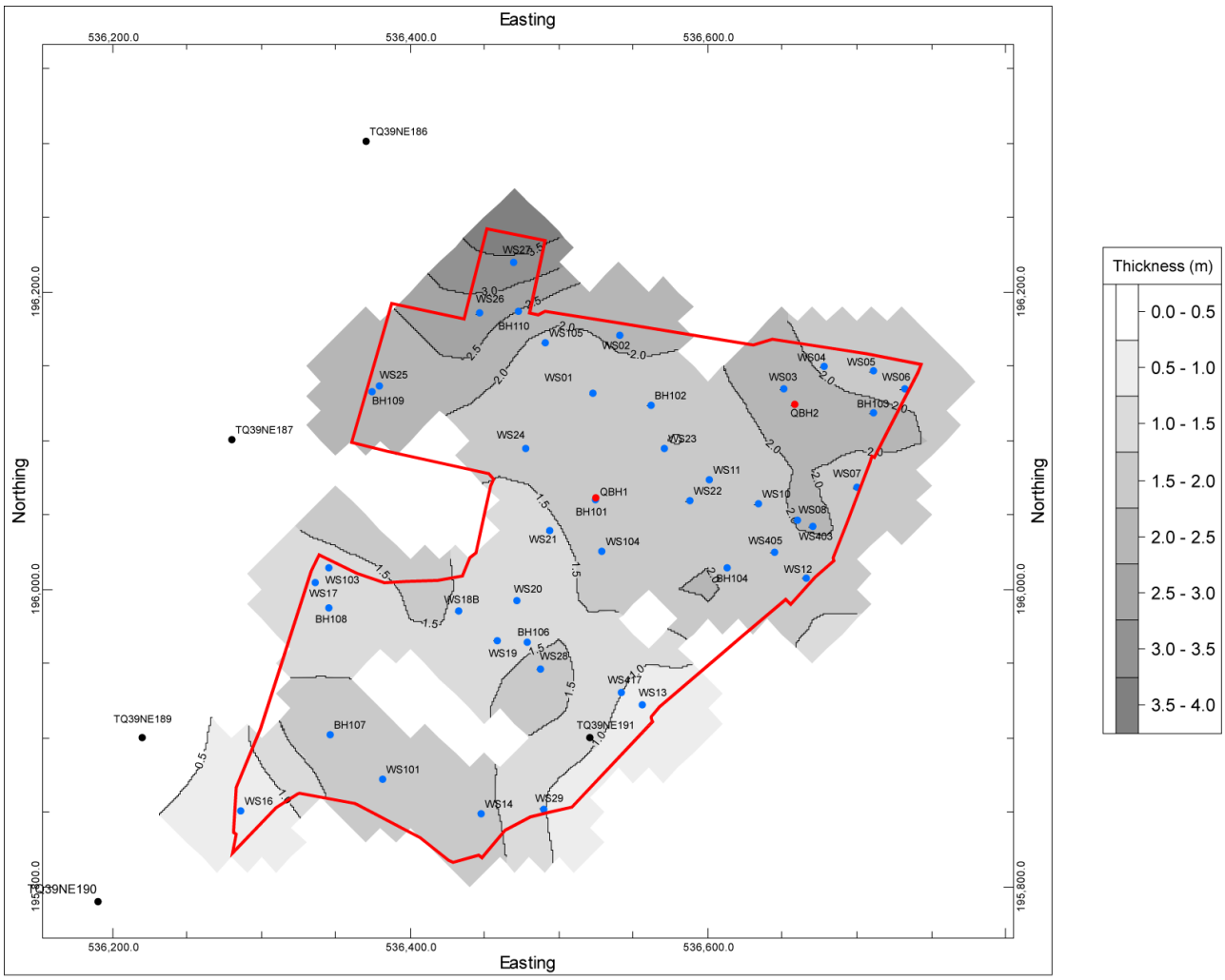

Figure 9: Thickness of the Made Ground (m) (site outline in red)

DISCUSSION AND CONCLUSIONS

The aim of the geoarchaeological investigations at the Enfield Distribution Park site was to (1) clarify the nature of the sub-surface stratigraphy, in particular the presence and thickness of Alluvium and Peat across the site, and (2) to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. In order to achieve this aim, a programme of deposit modelling of the surface elevation and thickness of the major stratigraphic units at the site was carried out, incorporating previous geotechnical borehole descriptions and records from two new geoarchaeological boreholes and three geotechnical boreholes monitored by Quaternary Scientific.

The results of the geoarchaeological investigations have contributed to our understanding of the Holocene stratigraphic sequence in this area of the Lea Valley. Within the site itself a sequence of Lea Valley Gravel is recorded (deposited during the Late Devensian, 10-15,000 years before present), overlain by variable thicknesses of Holocene Alluvium (in places containing Peat), in turn overlain by Made Ground. As stated above, the Enfield Distribution Park site lies within Corcoran *et al*. (2011)'s Landscape Zones 5.5 and 5.6. The new deposit model for the Gravel surface in the area of the site is consistent with the majority of the site lying within Corcoran *et al*.'s Zone 5.5, where it was suggested that the Lea Valley Gravel surface lies at *ca*. 11-12m OD. Within the site itself the Gravel surface lies at between *ca*. 10.5 and 12.5m OD, the highest Gravel surfaces recorded in the northwest (11.5 to 12.5m OD) and falling towards the northeast and south (10.5 to 11.5m OD). West of the site itself the Gravel surface rises to between 12.5 and 13.0m OD, consistent with the mapped area for Landscape Zone 5.6, where Corcoran *et al.* (2011) describe the Leyton Gravel (mapped by the BGS as Kempton Park Gravel and deposited during the Early to Middle Devensian, 30-120,000 years before present) as occurring at *ca*. 17-13m OD.

Corcoran *et al*. (2011) highlight that within Landscape Zone 5.5 'there are virtually no borehole data or archaeological interventions within this zone', and 'there are no borehole data to reconstruct the depositional sequences that exist above the gravels'. Significantly however, Corcoran *et al.* (2011) highlight that the eastern edge of this zone, bordering the King George V reservoir, has 'produced Mesolithic channel deposits with good palaeoenvironmental and landscape reconstruction potential'. Towards the east of the Millmarsh Lane site (Bowsher, 1994) *ca*. 1km to the north and upstream of the River Lea, the Lea Valley Gravel surface was recorded at *ca*. 12.75m OD and was overlain by a sequence of Holocene Alluvium, including Peat or highly organic horizons. An organic horizon at 12.9m

OD was recorded within a north-south aligned palaeochannel at the site, and was subsequently radiocarbon dated to 8120 to 7790 cal BP (6170–5840 cal BC; Mesolithic). Whilst there are no clear channel features within the Gravel surface at the present site, Peat was recorded in selected boreholes either directly overlying the Gravel (TQ39NE191, BH101, WS103 and QBH2) or the Lower Alluvium (QBH1, WS03, WS18B, WS403 and WS417). The Peat is generally between 0.07 and 0.41m thick (with the exception of BGS borehole TQ39NE191, where it is recorded as 0.76m thick) and is recorded at elevations between *ca*. 10.68 and 12.91m OD. Although recorded in localised areas of the site, this horizon would have represented a semi-terrestrial land surface that might have been utilised by prehistoric people, and given its stratigraphic position in the sequence it is possible that this horizon may be of a similar age to that recorded at Millmarsh Lane (Mesolithic).

RECOMMENDATIONS

The boreholes retained from the Enfield Distribution Park site (QBH1 and QBH2) have the potential to provide suitable palaeobotanical and zooarchaeological remains for reconstructing the past environmental conditions (including evidence for human activity) of the site and its environs. It is therefore recommended that an assessment of the sequence from borehole QBH2 (in which the thicker Peat horizon is recorded) is undertaken to evaluate this potential. The assessment should incorporate: (1) rangefinder radiocarbon dating, to provide an age for the onset and cessation of peat formation; (2) organic matter determinations to aid identification of the sedimentary units; (3) assessment of the archaeobotanical remains (pollen, waterlogged wood and seeds) to provide a provisional reconstruction of the vegetation history; and (5) assessment of the zooarchaeological remains (insects and Mollusca) to provide information on the general environmental conditions, climatic change and hydrology of the site. The environmental assessment will also highlight any indications of nearby human activity, and provide recommendations for further analysis (if necessary).

As highlighted above, it was not possible to put down a borehole in the southern area of the site (as proposed within the written scheme of investigation [Young, 2104]) due to the location of existing buildings that are to be demolished at a later date. It is understood (David Josling, BWB Consulting pers. comm.) that further geotechnical investigations will take place in this area following demolition. It is therefore recommended that geoarchaeological monitoring of these investigations is undertaken if the investigations are of sufficient depth (i.e. beyond the base of the Made Ground) to warrant such investigations.

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