Archaeological Evaluation Trenching and Palaeoenvironmental Analysis at Dagenham Dock, London

View of archaeological evaluation trenching at Dagenham Dock (scale = 1m)

ARS Ltd Report 2016/10
January 2016
OASIS ID: archaeol5 – 237746

Compiled By:
Dr Andy McWilliams and Elise McLellan
Archaeological Research Services Ltd
Angel House
Portland Square
Bakewell
Derbyshire
DE45 1HB

Checked By:
Clive Waddington MCIfA
Tel: 01629 814540
Fax: 01629 814657
admin@archaeologicalresearchservices.com
www.archaeologicalresearchservices.com

Archaeological Research Services Ltd

Archaeological Evaluation Trenching and Palaeoenvironmental Analysis at Dagenham Dock, London

ARS Ltd Report 2016/10

Archaeological Research Services Ltd

Contents

Executive Summary 2
1 Introduction 3
2 Background 5
2.1 Archaeological Background 5
2.2 Environmental Background 5
3 Archaeological Evaluation Trenching 6
3.1 Aims and Objectives 6
3.2 Methodology 6
3.3 Results 11
4 Palaeoenvironmental Analysis 15
4.1 Introduction 15
4.2 Methodology 15
4.3 Radiocarbon Dating 16
4.4 Plant Macrofossil Results 18
4.5 Pollen Results 20
4.6 Diatom and Invertebrate Results 23
4.7 Discussion 23
5 Conclusions 25
8 Publicity, Confidentiality and Copyright 26
9 Statement of Indemnity 26
10 Archive Deposition 26
11 Acknowledgements 26
12 References 27
Appendix I: Written Scheme of Investigation 29
Appendix II: OASIS Form 41

List of Figures

Figure 1. Site location 4
Figure 2. Trench location plan (site overview) 7
Figure 3. Trench location plan 8
Figure 4. Trench sections and sediment logs. 9
Figure 5. Trench plan showing locations of timbers 10
Figure 6. Trench 1 south facing section showing made ground deposits. Scale = 2m. 11
Figure 7. Trench 1 looking east, showing clean and uniform surface of upper alluvial clay 12
Figure 8. Trench 1 north facing section showing stratigraphy and peat surface containing a yew timber. Scales = 2m. 12
Figure 9. Trench 1 looking east showing the surface of the lower alluvium. Scales = 1m and 2m. 13
Figure 10. Trench 1 looking east showing the exposed peat surface and Timber 1 (yew). Scale = 2m. 13
Figure 11. Timber 3 (yew) following extraction from Trench 2. Scale = 1m. 14
Figure 12. Summary Pollen Diagram 22

List of Tables

Table 1. Results of radiocarbon dating 17
Table 2. Results of plant macrofossil identification 19

EXECUTIVE SUMMARY

Archaeological Research Services Ltd was commissioned by Hope Construction Materials Ltd to undertake a programme of archaeological evaluation trenching and palaeoenvironmental analysis on the site of the proposed redevelopment of the present Freightliner Rail Services scrapyard site at Dagenham Dock, London. The site had previously been the subject of a desk based assessment (Eadie 2014) and geoarchaeological coring with subsequent assessment of pollen and plant macrofossils (Howard and McLellan 2015). This initial assessment of geoarchaeological cores identified a sequence of well-preserved palaeoenvironmental material, meriting further analysis as a part of this scheme of works.

Two archaeological evaluation trenches were mechanically excavated under archaeological supervision. A stratigraphic sequence was excavated through the made ground, alluvial deposits and peat to the underlying Late Glacial Shepperton Gravels. No archaeological remains were encountered during the evaluation trenching. Well-preserved palaeoenvironmental remains were present, as implied by the borehole results, and well-preserved timbers were encountered within the peat and include remains of yew and oak.

A detailed palaeoenvironmental analysis was undertaken comprising a range of environmental proxies. Pollen and plant macrofossils were successfully identified in the peat deposits, and pollen was successfully recovered from the upper alluvial deposits. Samples were processed for diatom and invertebrate analysis, however both diatoms and invertebrate remains were not preserved in sufficient quantities to merit further analysis. A range of radiocarbon dates was obtained throughout the peat sequence, dating the onset of peat formation to the Early Neolithic c.4042-3804 cal BC and the cessation of peat formation to the beginning of the Late Bronze Age c.1110-925 cal BC.

Analysis of pollen and plant macrofossils identified four main environmental phases. A heavily wooded alder carr environment existed from the onset of peat formation at 4042-3804 cal BC to 2281-2031 cal BC after which a decline in alder lead to a more open environment, although species were still consistent with an alder carr. This more open alder carr environment persisted until the cessation of peat formation at 1110-925 cal BC. A rise in herbaceous species indicates an open environment, with a superabundance of Taraxacum-type (dandelion) pollen indicates areas of disturbed ground, possibly for grazing in this part of the Late Bronze Age. The final phase consisted of a small recovery of tree and shrub species including alder, and a decline in Taraxacum-type in favour of a more mixed herbaceous assemblage.

1 INTRODUCTION

1.1 In April 2015 Archaeological Research Services Ltd. (ARS Ltd) was commissioned by Hope Construction Materials Ltd. to undertake a programme of archaeological evaluation trenching on the site of the proposed re-development of the present Freightliner Rail Services scrapyard site at Dagenham Dock Station into a rail-fed cement depot. The development will involve the construction of bulk stores, warehousing, offices and associated amenities including a weighbridge, bunded fuel tank and lorry wash.

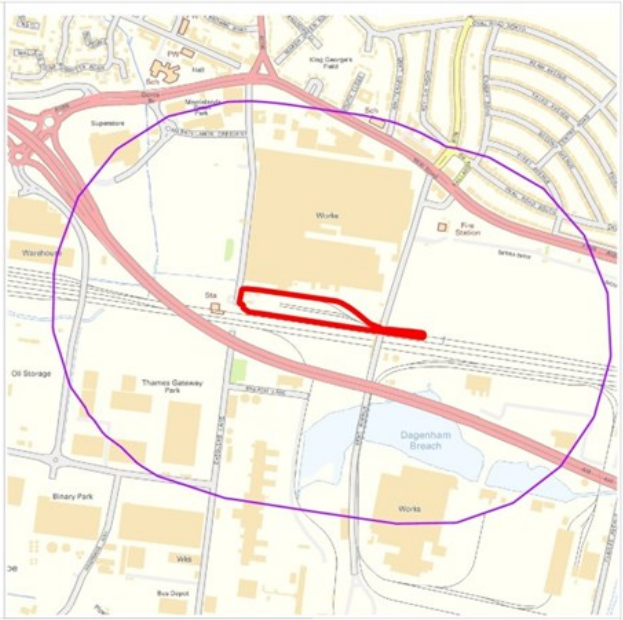
1.2 The aim of the programme of work was, in line with the National Planning Policy Framework (NPPF) paragraph 141 (CLG 2012), to record and enhance understanding of the significance of any heritage assets to be lost during the proposed development in a manner proportionate to their importance, and to make this evidence (and any archive generated) publically accessible.

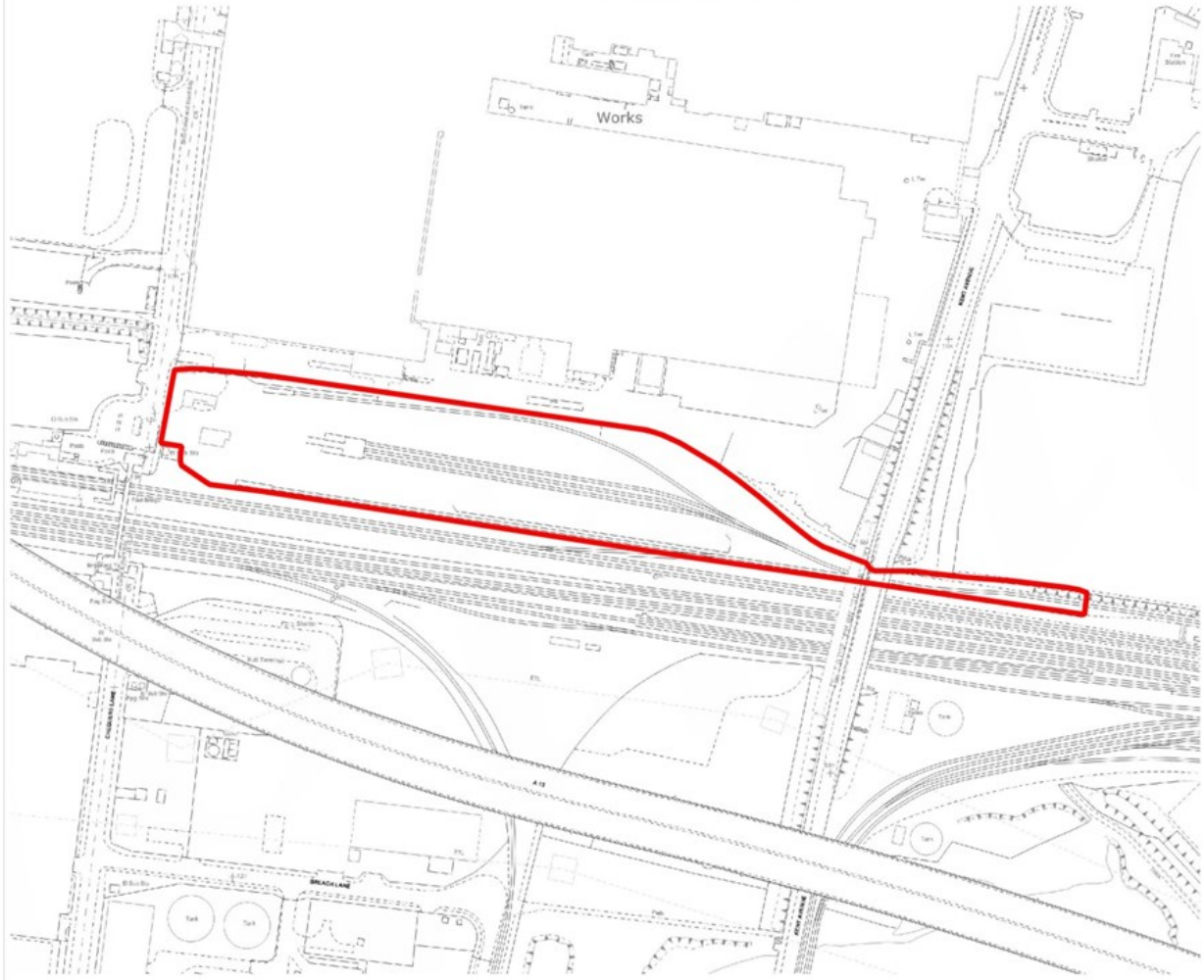
1.3 The development area (DA) covers a narrow rectangular area of *c.*2.1ha and was occupied by a scrapyard run by Freightliner Rail Services Ltd. The DA is bounded to the north by Ford Works industrial units, to the west by Chequers Lane and to the south and east by the London, Tilbury and Southend Railway. The site is centred on NGR TQ 49220 83000 (see Fig. 1).

1.4 The site lies within an Archaeology Priority Area (APA), comprising river valleys and the Thames and Roding floodplain where evidence of prehistoric land use in the form of wooden trackways and other structures have been preserved in the deep sequence of alluvial deposits below layers of peat. Layers of peat and silty clay deposits also contain preserved evidence of past environmental conditions and environmental change. This priority area also extends along the valley of what was the River Beam and its tributaries.

1.5 The underlying solid geology of the site comprises Lambeth Group clays, silt and sand. This is overlain by superficial deposits of Quaternary (Pleistocene and Holocene) Alluvium comprising clay, silts, peats, sands and gravels. During the Pleistocene, the sand and gravel deposits were formed by rivers depositing detrital material to form river terrace deposits. Fine silt and clay from overbank floods has been deposited as floodplain alluvium, with exposed boggy areas developing into peat deposits during periods of marine regression (BGS 2015).

1.6 Previous geoarchaeological and palaeoenvironmental investigations (Howard and McLellan 2015) within the PDA have demonstrated that beneath recent 'made' ground deposits, the area contains extensive alluvial deposits. These deposits have considerable potential for environmental reconstruction of human activity, landscape evolution, vegetation and climate.





Site name: Dagenham, London
Date: July 2014
Drawn by: GE
Scale: Varies

Figure 1:
Site location

Archaeological Research Services Ltd

The Eco Centre
WindmillWay
Hebburn
Tyne and Wear
NE31 1SR

Tel: 0191 4775111

www.archaeologicalresearchservices.com

2 BACKGROUND

2.1 Archaeological Background

2.1.1 The archaeology of the local area was assessed in a desk-based assessment (DBA) which concluded that "prehistoric archaeology of the wider study area and its vicinity provides evidence for human occupation from the Palaeolithic period through to the Iron Age. The most significant remains uncovered within the wider study area are of Neolithic and Bronze Age date, but the PDA has the potential to host remains from the full range of periods. The Neolithic Dagenham Idol (HER: MLO5743) is of international significance and was found, probably preserved in peat, *c*.350m from the PDA. The associated palaeoenvironmental remains also heighten the significance of the prehistoric archaeology as there is the rare potential to gain an understanding of past human activity and the environment within which it took place." (Eadie 2014).

2.2 Environmental Background

2.2.1 Geoarchaeological boreholes established that there is a tripartite sedimentary stratigraphy, as observed elsewhere within the lower Thames, and comprises an upper and a lower silty clay alluvium separated by a peat. The peat varies in thickness across the site, and comprises a wood peat and silty peat. It is moist and contains visible macrofossils and affords high potential for environmental reconstruction (Howard and McLellan 2015).

2.2.2 Three dimensional modelling based on the geoarchaeological borehole data illustrated that all three units extend across the site. Although the thickness of the peat does vary, it forms a continuous unit across the PDA. The peat is likely to have developed within a wetland mire in the backswamp of the floodplain rather than within discrete palaeochannels.

2.2.3 The lower silty clay rests upon and infills the irregular topographic surface of the Shepperton Gravels, which were formed in a braidplain environment during the Late Glacial. Such irregular topography has been observed elsewhere regionally (Green *et al*. 2014).

2.2.4 Waterlogged yew wood was recovered during evaluation trenching, in addition to smaller yew macrofossils and yew pollen identified in the palaeoenvironmental assessment of the boreholes. Yew trees (*Taxus baccata*) have been found at a number of excavated sites in the London Thames area (Sidell 2001). Yew has also been found at Erith in southeast London where it appeared in an outcropping of a buried forest. Older sources record similar finds. Spurrell (1889) notes the presence of yew in the alluvium at Crossness and the diarist Samuel Pepys observed yew at Blackwell Dock (Latham and Matthews 1972). The presence of Yew in a lowland river valley is unusual today but appears to have been less so in the past. The Thames examples, where dated, fall within the Late Neolithic and Early Bronze Age (Sidell 2001). Yew has an established ritual

significance (Green 2005) and may have given Dagenham a ritual importance. The Neolithic Dagenham Idol was found close to the site and its deposition there suggests cult practises took place in association with the Dagenham wetlands.

3 ARCHAEOLOGICAL EVALUATION TRENCHING

3.1 Aims and Objectives

3.1.1 The objective of the archaeological evaluation trenching was to identify any archaeological material in, on or under the peat layer within the PDA and to record it significance.

3.1.2 The palaeoenvironmental analysis was intended to provide a detailed record of the palaeoenvironmental sequence and the record of vegetation change through time prior to the disturbance of these deposits by the piling associated with the new development.

3.2 Methodology

3.2.1 Two deep evaluation trenches were excavated within the PDA to investigate the potential for any buried archaeological remains (see Figure 2 and Figure 3). Both trenches were to measure 6m long by 2m wide at their base, however, practicalities in the field resulted in both trenches being slightly bigger. Trench 1 measured 6.7m long by 2.2m wide at its base and trench 2 measured 7.3m long by 2.4m wide at its base. The increase in dimensions was necessary in order to accommodate the mechanical excavator blade so that it could excavate out the deposits.

3.2.2 The reinforced concrete was removed mechanically and the made ground was removed to create a bench approximately 1.2m below the surface. Subsequent layers were carefully removed in *c*.0.1m spits by machine under archaeological supervision to the lower alluvial deposits and underlying gravel. The methodology followed the Risk Assessment, Method Statement and Written Scheme of Investigation included as Appendix I.

3.2.3 The stratigraphy of the deposits was recorded in a section drawing for both trenches at 1:20 scale (Figure 4). A plan of each trench was produced at the same scale (Figure 5). Sediment samples were taken where appropriate and samples of wood were taken where it was found to be present within the peat. A photographic record including working shots was taken during the excavation.

3.2.4 The trenches were mechanically backfilled after excavation and recording had been completed. This was completed under archaeological supervision. The excavated material was replaced in the correct order and compacted. Trenches were enclosed within fences and the area was left safe.

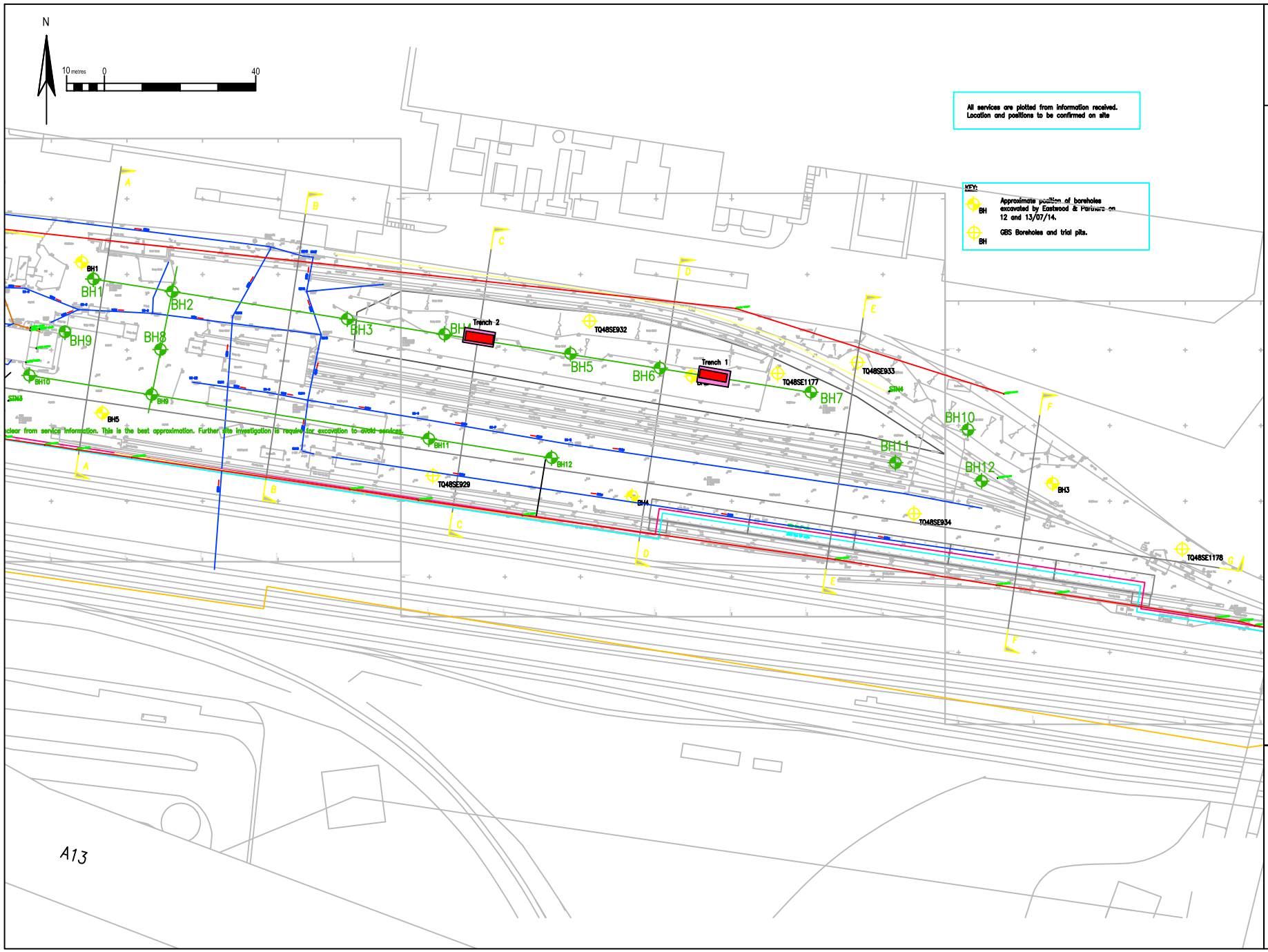


Figure 2: Final Trench Location Plan (site overview), Dagenham, London

Key:

Final trench (red) breakout (pink)

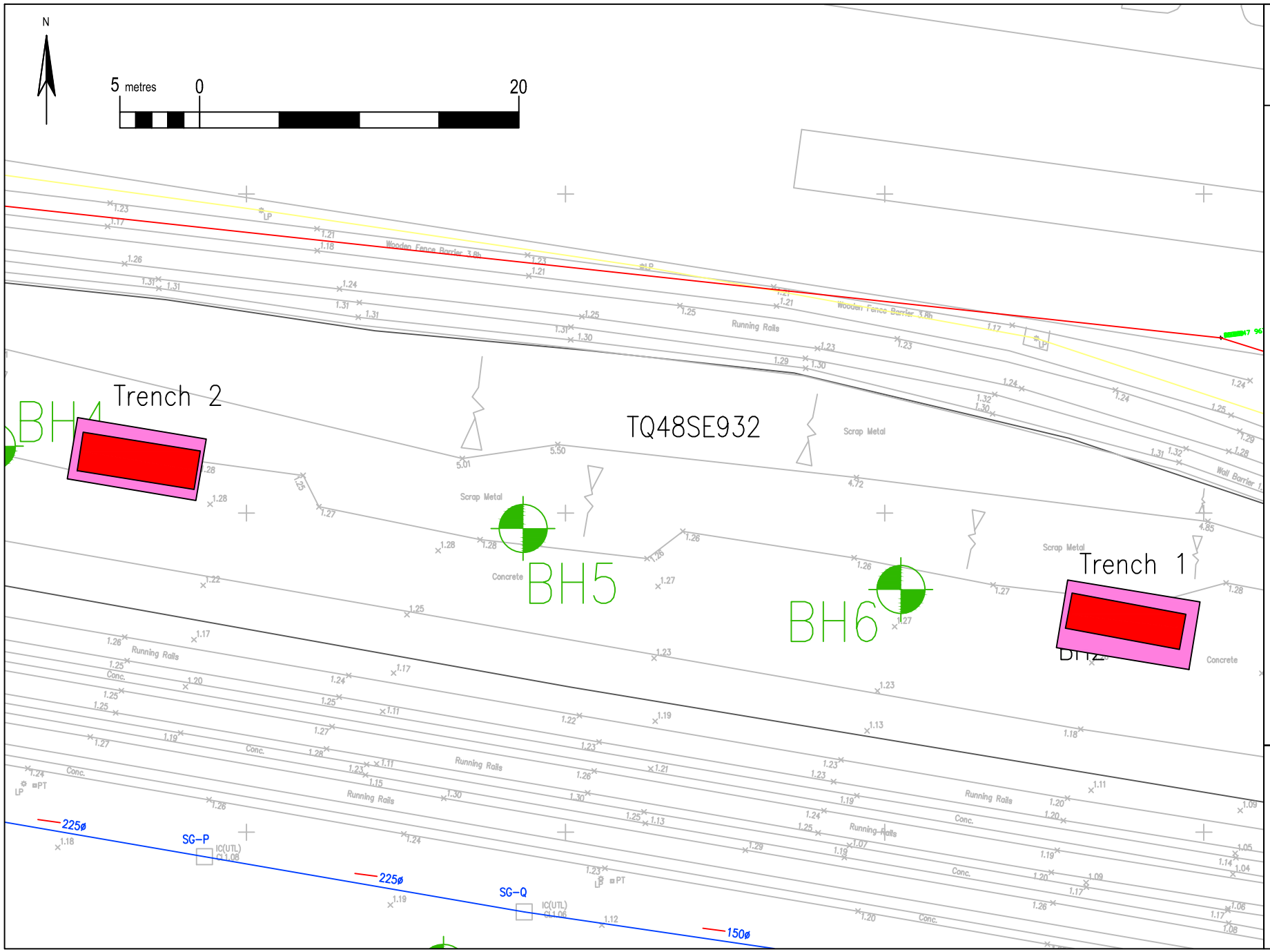


Figure 3: Final Trench Location Plan, Dagenham, London

Key:

Final trench (red) breakout (pink)

Trench 1 - West facing section

Trench 2 - East facing section

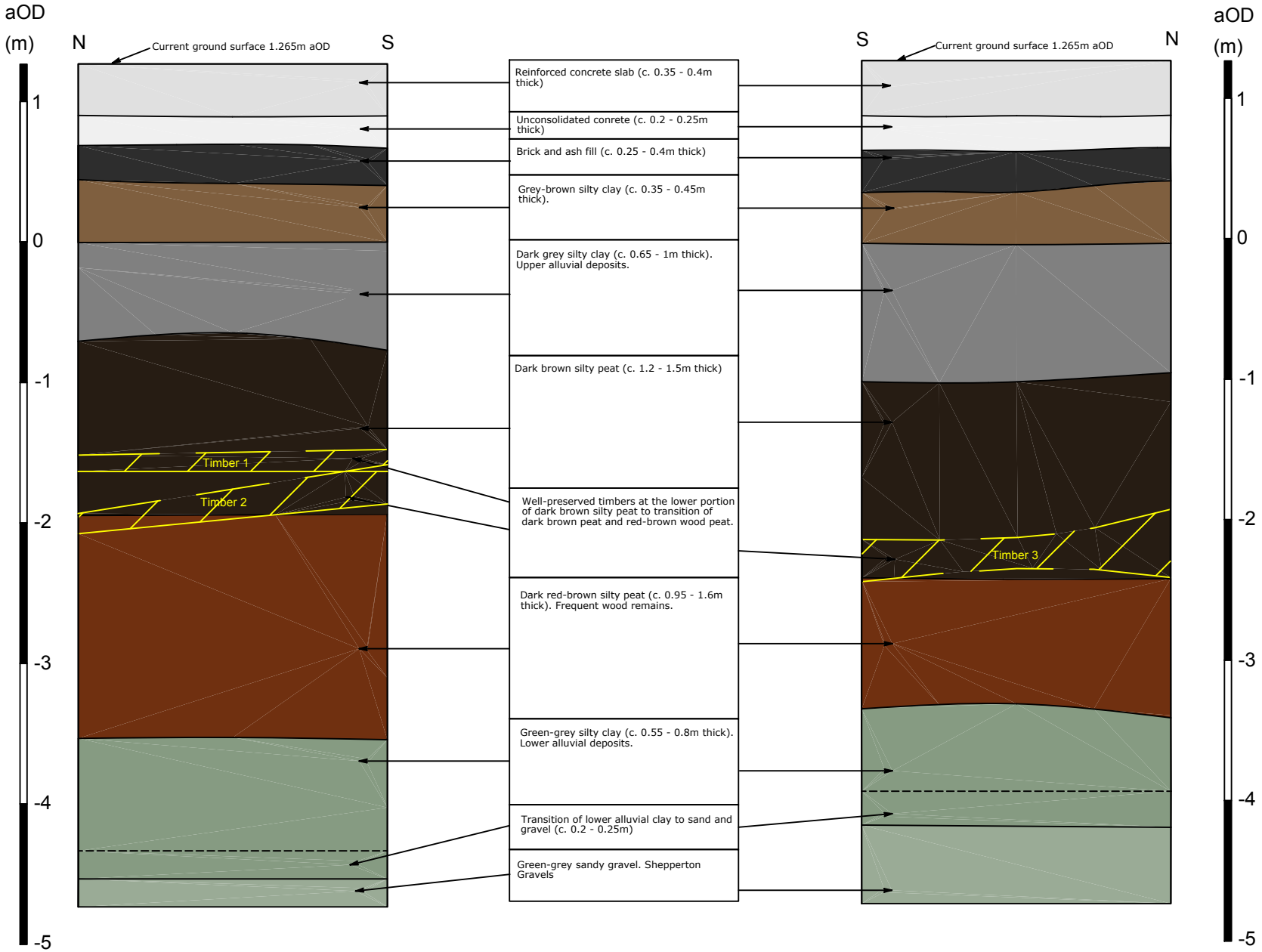
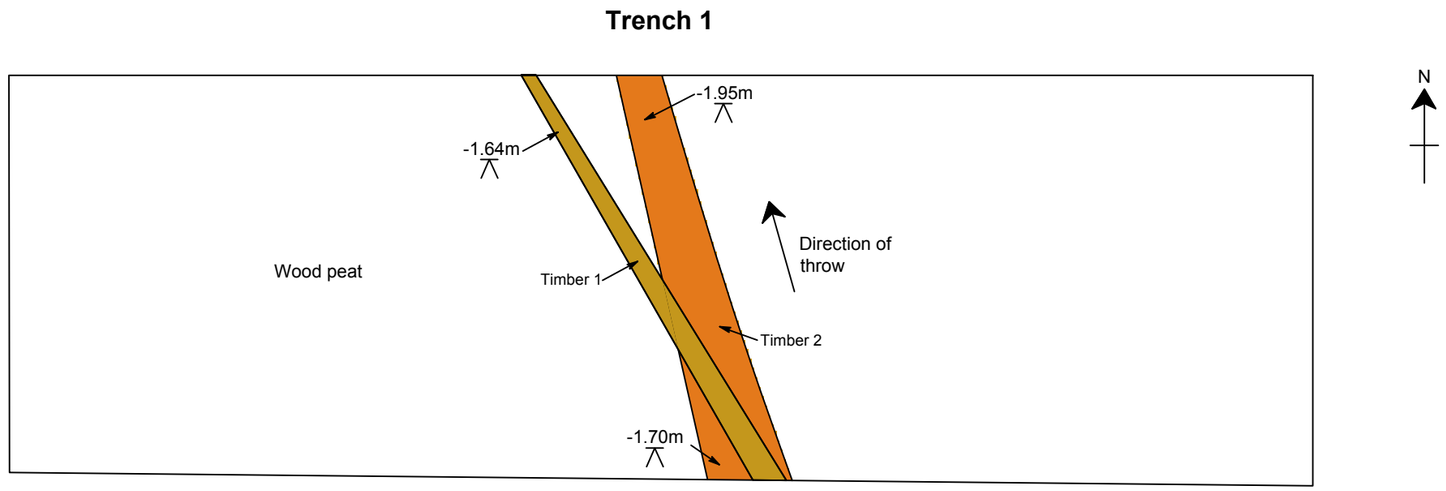
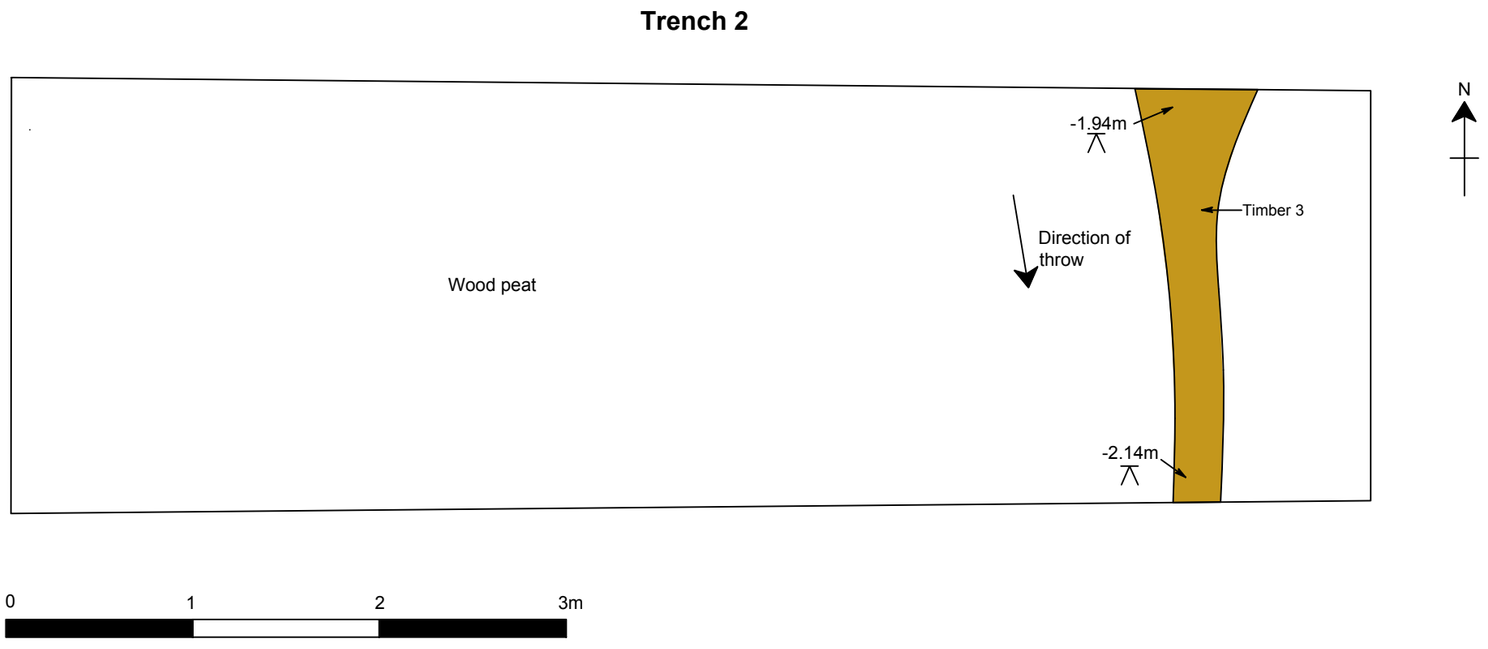


Figure 4. Trench sections with sediment log.

Key:

Figure 5. Plan of trenches with locations of timbers.





Key:

Yew timber

Oak timber

2.95m Height above Ordnance Datum

N

3.3 Results

3.3.1 Section drawings of Trench 1 and Trench 2 (Figure 4) show the observed sediment sequence at these locations. The current ground surface is at a height of 1.265m above Ordnance Datum (AOD). The same stratigraphy was encountered in both trenches, with some variation in the depths of deposits. The hardstanding surface consisted of a reinforced concrete slab (1.265 to 0.87m AOD). Below this were levels of unconsolidated concrete (0.87 to 0.67m AOD) and a dark ash layer with brick (0.67 to 0.57m AOD). The lowermost made ground consisted of a layer of redeposited grey-brown silty clay (0.57 to 0.04m AOD) (Figure 6). The uppermost natural horizon was dark grey, alluvial silty clay with organics (0.04 to -0.99m AOD). This appeared clean, undisturbed and uniform (Figure 7).

Figure 6. Trench 1 south-facing section showing made ground deposits (scale = 2m).

3.3.2 The alluvial clay overlay a dark brown silty peat (-0.99 to -2.34m AOD). This in turn overlay a dark red-brown wood peat (-2.34 to -3.34m AOD). Well-preserved timbers were encountered in the lower part of the silty peat close to the transition with the wood peat (Figure 8). Softer, less well-preserved wood was present through the wood peat. A green-grey lower alluvial clay (-3.34 to -3.94m AOD) was present below the peats (Figure 9). The lower alluvial clays transitioned (-3.94 to -4.24m AOD) into the underlying glacial sand and gravel (-4.24 to -4.74m AOD). The alluvial silty clay and the peat are therefore situated below current relative sea level.

Figure 7. Trench 1 looking east, showing clean and uniform surface of upper alluvial clay.

Figure 8. Trench 1 north-facing section showing stratigraphy and peat surface containing a yew timber across the trench (scales = 2m).

Figure 9. Trench 1 looking east showing the surface of the lower alluvium (scales = 1m and 2m).

Figure 10. Trench 1 looking east showing the exposed peat surface and Timber 1 (yew) (scale = 2m).

3.3.3 Several large timbers were observed around the transition between the upper dark brown silty peat and the lower dark red-brown wood peat (Figure 10). The location of the timbers within the trenches and the height from the surface can be seen in the plan (Figure 4). The timbers have been identified as a yew (Taxus baccata) and an oak (Quercus) from Trench 1 and a yew from Trench 2 (Figure 11). In Trench 1 a smaller yew (timber 1,-1.64m AOD) overlay a larger oak (timber 2, -1.7 to -1.95m AOD). The yew timber from Trench 2 (timber 3) was larger than that found in Trench 1 and also slightly lower (-1.94 to -2.14m AOD).The two timbers from Trench 1 had fallen in a south to north direction. The timber in Trench 2 had fallen north to south.

Figure 11. Timber 3 (yew) following extraction from Trench 2 (scale = 1m).

4 PALAEOENVIRONMENTAL ANALYSIS

4.1 Introduction

4.1.1 A sequence of 12 boreholes was recovered from Dagenham Dock in the course of a geoarchaeological assessment in November 2014. These cores revealed a deep stratigraphic sequence of peats and alluvial clays, with a high potential for palaeoenvironmental analysis. An initial assessment of boreholes 1 and 5 (Howard and McLellan 2014) identified borehole 1 (BH1) as the best preserved sediment core sequence, and the most conducive to further assessment. The analysis of multiple environmental proxies, in the form of pollen, plant macrofossils, diatoms, and invertebrates, was undertaken to develop a rigorous record of past environmental conditions.

4.2 Methodology

4.2.1 The core samples from borehole 1 (BH1) were cleaned, and the lithostratigraphic sequence was described (Howard and McLellan 2014). All depths were noted in metres below the top of the core sequence, located at 1.2m AOD.

Plant Macrofossils

4.2.2 Plant macrofossils were assessed from 25ml sub-samples at 14 locations corresponding to the pollen sampling locations within the peat deposits. No plant macrofossil samples were taken from clay deposits, as there was no preserved plant macrofossil material. All levels are given in metres relative to the top of the borehole. The sub-samples were dis-aggregated in water and washed through a nest of 5mm, 1mm and 300µm sieves. Waterlogged wood remains from the 5mm fraction were kept wet and examined using a high powered binocular microscope at 100x and 200x magnification. The remaining sieved material was scanned for plant macrofossils using a low power binocular microscope. Seeds were identified using keys and plates from Cappers *et al*. (2012) and Anderberg (1994). Buds and catkins were identified following Tomlinson (1985). Plant taxonomic nomenclature follows Stace (1997).

Pollen

4.2.3 Pollen sub-samples were taken from twenty-five levels from bore hole 1 (BH1) which had the best-preserved sediment sequence of all the boreholes. Ten samples were taken from the upper alluvial clay, one from the boundary between the upper alluvial clay and peat deposits, 14 samples from the peat deposit sequence, and a single sample from the lower alluvial clays. These samples were processed at the Quaternary Scientific (QUEST) laboratory at Reading University following standard acetolysis procedures and were mounted in glycerol jelly. Pollen counting was completed at the analysis level, with 300 land pollen grains counted for each sub-sample. Pollen was identified with reference to keys and photographs from Moore and Webb (1991) and Faegri and Iversen (1989).

Diatoms and Invertebrates

4.2.4 Due to the small volume of sediment contained in the core, samples taken for plant macrofossils were also assessed to determine the potential for invertebrate analysis. Four 1mm^3 samples were taken to assess the potential for diatom analysis, and these samples were also processed at the QUEST laboratory at Reading University.

4.3 Radiocarbon Dating

4.3.1 A total of seven radiocarbon dates were obtained from identified plant macrofossils as a part of the palaeoenvironmental analysis (Table 1). Six dates were obtained from the borehole itself, while an additional date (BH1/4) was obtained from the heartwood of Timber 3, a yew tree recovered from archaeological evaluation trench 2. This date was obtained to determine the timing of yew colonisation of the peat surface. The remaining six dates were obtained targeting stratigraphic changes or changes within the pollen sequence. The full age range is quoted as "cal BC" at the 95% confidence level.

4.3.2 The base of the peat sequence (sample BH1/7) was dated to *c*.4042-3806 cal BC, and the top of the peat sequence was dated to *c*.1110-925 cal BC. Two additional dates were obtained from within the peat sequence at the boundary of pollen zones BH1a and BH1b, as well as at the location of a stratigraphic change in the peat within zone BH1a (see Figure 12). No dateable material was recovered from the upper alluvial clays, therefore this portion of the core sequence remains undated.

4.3.3 These ages are comparable to peat deposits from several other cores taken from similar locations in the Thames Estuary. A series of auger hole cores were retrieved by Museum of London Archaeology at Choats Road, *c.*580m to the south-west of Dagenham Dock (MOLA 2006). Radiocarbon dates were obtained from the top and bottom of the "upper peat" identified in these cores (MOLA Ref: BHA110A). The onset of peat formation here was dated to the Late Mesolithic *c*.4700-4440 cal BC, continuing through the Neolithic and Bronze Ages until the Early Iron Age *c.*800-520 cal BC. The Choats Road core contained a slightly longer peat sequence, but in both locations the onset of peat formation occurred in the Late Mesolithic and continued into the Bronze Age, and in the case of Choats Road the Early Iron Age.

4.3.4 Elsewhere in the Lower Thames Valley, comparable peat deposits have been identified, such as at Hornchurch Marshes (Branch *et al*. 2012). Peat formation at Hornchurch Marshes began in the Late Mesolithic at *c.*4300 cal BC and ceased at *c.*1900 cal BC. Comparable peats were also recorded by Green *et al.* (2014) between *c.*4200 cal BC and 1400 cal BC at a site in Barking, approximately midway between Hornchurch Marshes and Dagenham Dock. Peat formation begins during the Late Mesolithic at Hornchurch Marshes and at Barking, occurring slightly later during the Early Neolithic at Dagenham Dock. The timing of peat cessation is more varied, separated by several hundred years between the three sites. Variation in

Laboratory Number	Sample	Depth (m)	Material	$\delta^{13}C$	Radiocarbon Age BP	Calibrated Date (68% confidence)	Calibrated Date (95% confidence)
Beta - 411922	BH1/3	-1.72m	Indeterminate waterlogged twig	-27.3 ‰	2850 +/- 30 BP	Cal BC 1045 to 975	Cal BC 1110 to 925
Beta - 399409	BH1/1	-1.74m	Indeterminate charcoal twig	-22.6 ‰	810 +/- 30 BP	Cal AD 1215 to 1260	Cal AD 1165 to 1270
SUERC-64466 (GU39354)	BH1/6	-2.59m	Waterlogged wood, *Betula*	-28.1 ‰	3740 ± 37 BP	Cal BC 2201-2050	Cal BC 2281 to 2031
Beta - 399410	BH1/2	-3.42m	Waterlogged wood, *Populus* or *Salix*	-28.8 ‰	2930 +/- 30 BP	Cal BC 1205 to 1055	Cal BC 1220 to 1020
SUERC-64465 (GU39353)	BH1/5	-3.45m	Waterlogged wood, *Alnus*	-27.7 ‰	4672 ± 37 BP	Cal BC 3516 to 3373	Cal BC 3626 to 3364
SUERC-64467 (GU39355)	BH1/7	-3.80m	Waterlogged wood, *Alnus*	-28.6 ‰	5149 ± 37 BP	Cal BC 4036-3823	Cal BC 4042-3806
SUERC-61342 (GU37920)	BH1/4	Trench 2	*Taxus* tree heartwood	-26.2 ‰	4002 ± 30 BP	Cal BC 2567 to 2479	Cal BC 2578 to 2469

Table 1. Results of radiocarbon dating. Samples BH1/1 and BH1/2 (in grey) were deemed to be intrusive and were excluded from further analysis. All samples were taken from borehole 1 (BH1) at the same heights as pollen and plant macrofossil samples, with the exception of sample BH1/4. Sample BH1/4 was obtained from the heartwood of timber 3 (yew), recovered from archaeological evaluation trench 2. All depths are given in metres AOD.

the timing of sea level regression, exposing the ground surface and creating a more terrestrial environment resulting in peat formation across the Lower Thames Valley, accounts for the variation in age of the onset of peat formation. Variation in the date of peat cessation is more complicated as reduced peat accumulation rates, compaction and erosion may have resulted in the loss of upper peat deposits at some sites.

4.4 Plant Macrofossil Results

4.4.1 All plant macrofossil results are presented in Table 2. Plant macrofossil samples were grouped into phases based on similarity of identified species, indicating period of similar local environmental conditions. All heights are given in metres AOD.

Phase 4 -1.55m to -1.80m (4 samples)

4.4.2 These four samples were taken from the youngest (uppermost) layer of the peat deposit, the absence of *Alnus* sp. (alder) and presence of other tree species such as *Fagus sylvatica* (beech) and *Quercus* (oak) in this level indicates drier soil conditions in at least some areas of the site as peat formation ceased. One of the two *Carex* sp. seeds was identified as *Carex pilulifera* (pill sedge), which also preferentially grows in drier, although still acidic soil conditions. Drier conditions are also attested to by the lack of preserved, identifiable material in the uppermost two samples. No identifiable botanical macrofossils were recovered from either level, the only intact material being an unidentifiable bark fragment. Although peat deposition continued during this phase, conditions were less conducive to preservation. Some wet conditions were present, likely in the form of standing water in pools or shallow streams, as three *Potamogeton coloratus* (fen pondweed) seeds were also recovered from the lowest sample.

Phase 3 -2.40m to -2.45m (1 sample)

4.4.3 This sample is dominated by preserved alder wood, consisting of two preserved twigs and three larger fragments. Due to the variety of roundwood and stemwood found that it is likely that the preserved alder fragments represent a true abundance of alder trees rather than multiple fragments of the same original material. An alder bud scale and seed were also identified. A *Calluna* sp. (heather) twig indicates drier areas of bog colonized by heather. A *Rumex* sp. seed (sorrel) and *Silene* sp. seed (campion) were also identified, however these species are present in a wide variety of environments.

Phase 2 -2.60m to -2.55m (1 sample)

4.4.4 The three *Quercus* (oak) fragments identified at this level may be from the same original material. A *Corylus* (hazel) fragment was also identified, while pollen data from this level indicates the Salicaceae fragment identified is likely *Salix* (willow). *Salix* and *Corylus* commonly occur in carr environments, *Quercus* is also common at the boundaries of carrs and in drier patches of *Alnus* (alder) woodland. No seeds or fruits were found at this level.

Sample Depth (top) metres AOD	**Macrofossil Phase**	**Pollen Zone**	**Wood Macrofossils**							**Plant Macrofossils**														
			Alnus	Salicaceae	*Quercus*	*Corylus*	*Betula*	*Fagus*	Bark (undifferentiated)	*Alnus* (bud scale)	*Alnus* (seed)	*Calluna* (twig)	*Rumex* sp.	*Rubus* sp.	*Carex* sp.	*Persicaria* sp.	*Chenopodium* sp.	*Silene* sp.	*Rosa* sp.	*Potamogeton*	*Phalaris aruninaceae*	*Schoenus nigricans*	Poaceae indet.	*Lycopus europaeus*
-1.55m	Phase 4	BH1c																						
-1.60m		BH1b							1															
-1.65m					2		1									1								
-1.75m								1							2					3				
-2.40m	Phase 3		5							1	1	1	1					1						
-2.50m	Phase 2	BH1a		1	3	1																		
-2.60m	Phase 1		3	1			2																	
-2.65m			4								2											1		
-2.70m			3	1										2	1						1			
-3.30m				1										6	2	1							1	
-3.45m			2			2	1							3										
-3.60m			6								1			2	1				1					
-3.70m			4				1			1				2	1									1
-3.75m			3								1				3	1								

Table 2. Results of plant macrofossil identification. Phases based on macrobotanical fossils are shown in relation to pollen zones.

Phase 1 -2.60m to -3.80m (8 samples)

4.4.5 These eight levels all contain species typical of *Alnus* (alder) carr environments. Wood remains are dominated by *Alnus*, along with Salicaceae (willow/poplar) and *Betula* (birch). The identified seeds and fruits are also typical of alder carr. *Rubus* sp. (blackberry/bramble) seeds dominate the assemblage, along with indeterminate *Carex* (sedge) seeds. *Persicaria* sp. and *Lycopus europaeus* (gipsywort) indicate the presence of standing water or extremely wet soil conditions in some local areas. *Phalaris aruninaceae* (reed canary-grass) and *Schoenus nigricans* (black bog-rush) are also typical of alder-willow carr. Despite the stratigraphic change identified in the peat core, the macrobotanical remains recovered from these seven early levels indicate a period of continuous alder carr with wet soil conditions.

4.5 Pollen Results

4.5.1 Pollen was well preserved in all samples with the exception of the sample from the silty clay deposits underlying the peat. No pollen was preserved in this sample, and it was excluded from further analysis. The preserved pollen sequence therefore commences at the onset of peat formation and continues throughout peat deposition and the subsequent deposition of alluvial silty clay. Pollen in the remainder of samples was well preserved and unlikely to be biased by taphonomic processes.

4.5.2 Pollen results were grouped using CONISS stratigraphically constrained cluster analysis (Grimm 1987) into four assemblage zones, zone BH1a to zone BH1d, where zone BH1a is the lowest, earliest phase and zone BH1d is the highest, most recent phase (Figure 12).

Zone BH1a – -3.80m to -2.55m – Lower Peat Deposits
4042-3806 cal BC to 2281-2031 cal BC

4.5.2 Pollen zone BH1a is characterised by species typical of alder carr environments, and is strongly dominated by *Alnus* (alder) pollen, which ranges between 39% and 54% of the land pollen assemblage. *Quercus* (oak) and *Tilia* (lime) are present to a lesser extent, with very low levels of other tree species such as *Pinus* (pine), *Ulmus* (elm), *Taxus* (yew), and *Betula* (birch). *Quercus* and *Tilia* are most abundant at the earliest depth (-2.55m AOD), likely representing a vestige of mixed forest present prior to the transition to alder carr.

4.5.3 Shrub species are continuously present, including Corylus (hazel) at 5-10% and both Salix (willow) and Rosaceae at <5%.The presence of Rosaceae type pollen may reflect the presence of *Rubus* sp. bramble, as *Rubus* sp. seeds were identified in plant macrofossil analysis at these depths. Ericaceae (heather) pollen is present at low levels, but is much higher (<10%) in the lowest sample at -2.55m AOD, another indication of a slightly drier environment at this time.

4.5.4 Herbaceous species remain largely constant throughout this zone, including mainly Chenopodiaceae, *Ranunculus*-type. *Rumex* sp, *Plantago* major/media and

Urtica sp. Some open areas may be indicated by Poaceae (grass) and Cyperaceae (sedge). However, this may also reflect open areas of marshy ground or the edges of standing water where Cyperaceae are common. Poaceae may indicate drier grassy areas, but may also be due to the presence of reeds. Areas of standing water are further attested to by the presence of *Utricularia* pollen in this zone. There is a small peak in microcharcoal at -3.60m AOD, although burning activity does not seem to have caused increased opening of forest cover or increased presence of species which colonise burned areas. Zone BH1a represents a fairly continuous period of extremely alder-dominated carr with small indications of a transition at -2.55m AOD from a more open, mixed environment.

Zone BH1b – -2.50m to -1.65m –Upper Peat Deposits
2281-2031 cal BC to 1110-925 cal BC

4.5.5 The most common tree species in pollen zone BH1b remains *Alnus* (alder), however it is supressed to roughly half of the levels of the previous zone. This is primarily in favour of shrub and herbaceous species which become much more significant in this zone. Small rises occur in other tree species, including *Ulmus* (elm) and *Taxus* (yew). This zone has a continuous presence of *Taxus*, as the decline of alder permitted yew to more regularly colonise the bog surface.

4.5.6 Shrub species *Corylus* (hazel), *Salix* (willow), Rosaceae and Ericaceae (heather) are all slightly more abundant in this zone than the previous zone. The shrub community is also more varied in this zone, with low levels of *Hedera* (ivy), *Juniperus* (juniper), *Ilex* (holly), *Rhamnus* (buckthorn), *Sambucus* (elder), *Frangula* (alder buckthorn) and *Lonicera* (honeysuckle). This increase in shrub populations is likely also due to the decline in the dominance of alder. Poaceae and Cyperaceae counts also rise during this zone.

Zone BH1c – -1.50m to -1.2m –Lower Silty Clay
Beginning at 1110-925 cal BC

4.5.7 Zone BH1c corresponds to the beginning of silty clay deposits overlying the peat, and displays an extreme change in vegetation. Zone BH1c displays the characteristics of an open, meadow environment very different from previous alder carr. Some tree species persist at low levels such as *Quercus* and *Corylus*, and *Alnus glutinosa* (alder) remains present at low levels as well. *Pinus* (pine) increases through this zone to a maximum of 5-10%, where it was previously only present in isolated instances.

4.5.8 The zone is dominated by Latuceae, mainly *Taraxacum* (dandelion) which reaches over 50% of the land pollen assemblage. *Taraxacum* prefers disturbed environments such as waste ground and pasture, and this shift to *Taraxacum* dominated assemblages indicates some form of disturbance, possibly human in origin. This may be the result of grazing, however several species such as *Ranunculus*, *Rumex* and *Plantago* which are also associated with grazing and pasture do not significantly increase in this period. Other herbaceous species remain largely unchanged, it is possible that the superabundance of Latuceae grains in these samples has masked changes in other herbaceous species.

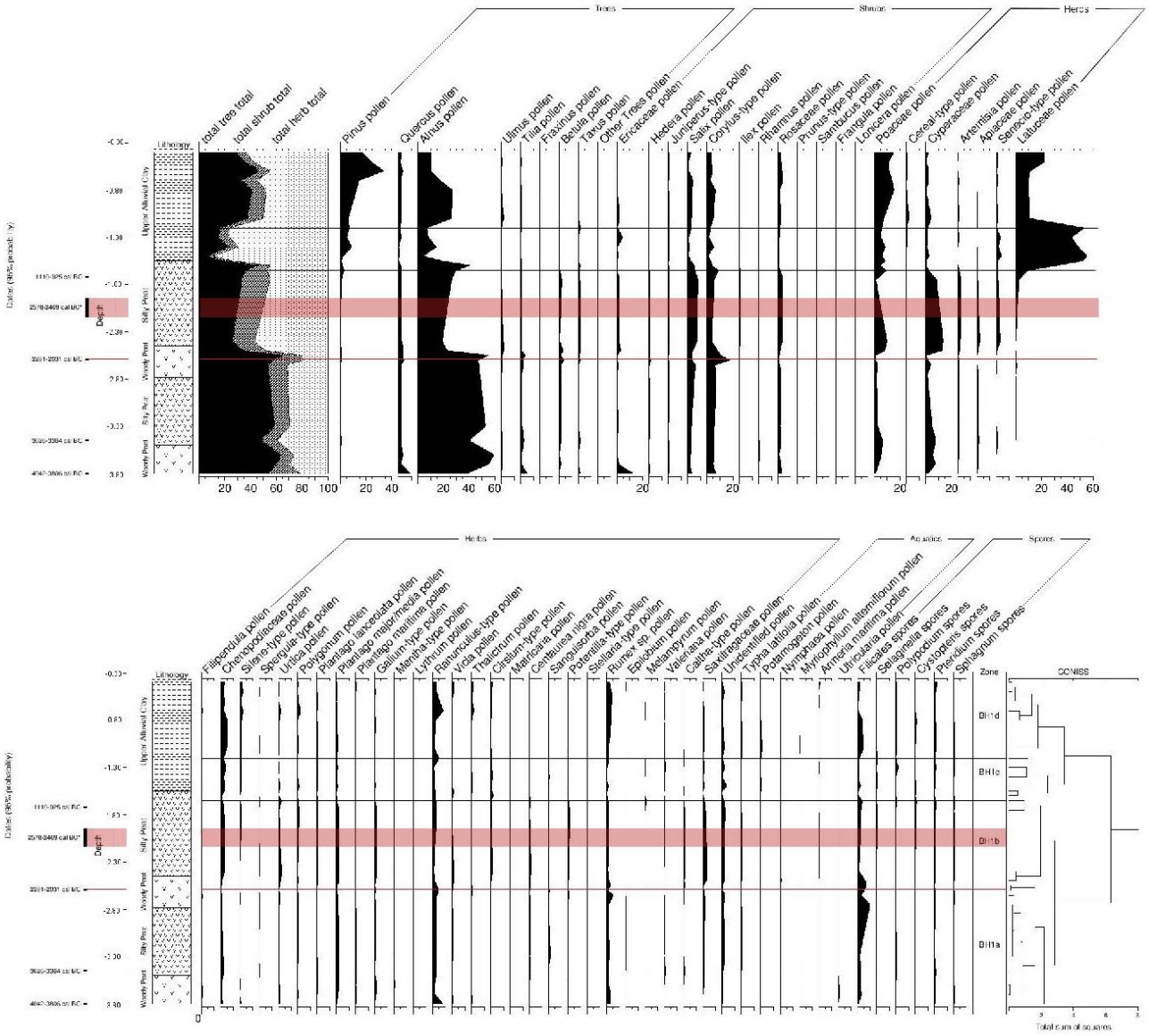


Figure 12. Summary Pollen Diagram

*Radiocarbon date obtained from a yew timber recovered during archaeological evaluation trenching. As this sample was taken from a separate location, the depth in relation to the borehole core is approximate. Additionally, the date was obtained from the heartwood of the tree to date the timing of the colonization of the peat, whereas the depth of the timber reflects the level of the peat surface at the time of the tree's death.

Zone BH1d –-1.1m to -0.40m – Upper Silty Clay

4.5.9 Zone BH1d is characterised by a rise in *Pinus* (pine) pollen, increasing towards the latter half of the zone. The beginning of this rise is visible in the previous zone, but becomes much more pronounced in zone BH1d. *Alnus* (alder) recovers in this zone to >30%, and *Quercus* is present in low levels. Other tree species occur only in isolated instances. *Salix*, *Corylus* and Rosaceae occur in similar abundance to other zones, with isolated instances of other shrubs. Latuceae is still common in this phase (>20%) but tree species have recovered. Areas of the environment remained open, as Poaceae is highest during this zone, as are several herb species including Chenopodiaceae, *Silene*-type, *Ranunculus*-type, *Vicia*, and *Rumex*.

4.6 Diatom and Invertebrate Results

4.6.1 Four samples were prepared to assess the potential for diatom analysis from the lower alluvial clays, the base of the peat sequence, the top of the peat sequence and the upper alluvial clays. None of the four samples yielded sufficient preserved diatoms for analysis.

4.6.2 The 25ml bulk samples processed for plant macrofossil remains were also examined to assess the potential for invertebrate analysis. The small volume of sediment, constrained by the size of the borehole, resulted in very few invertebrate remains. The bulk of the samples yielded no invertebrate remains, with five samples yielding one or two. Due to the small number of remains recovered, invertebrate analysis of the core sediments was deemed unlikely to yield representative results.

4.7 Discussion

4.7.1 The base of the peat sequence provides the earliest preserved pollen and macrobotanical remains. The onset of peat formation in the Lower Thames Valley, dated here at *c*.4042-3806 cal BC but varying throughout the region, corresponds to period of marine regression (Bates and Whittaker, 2004). Lower relative sea level resulted in drier, more terrestrial local conditions and the deposition of organic peat sediments in place of the pre-existing pond/wetland. Subsequent changes in sea level and inundation caused the cessation of peat formation and the onset of deposition of the upper alluvial clays, dated here to *c*.1110-925 cal BC.

4.7.2 The results of the pollen and macrobotanical analyses agree well on the timing and nature of environmental change. In the lower peat, pollen zone BH1a and macrofossil phases 1 and 2 (see Table 2) indicate an environment of alder-dominated carr with *Alnus* (alder) as the most abundant species in both pollen and plant macrofossils. Higher levels of *Quercus* (oak) and *Tilia* (lime) and lower

levels of *Alnus* indicate the potential presence of a more mixed woodland prior to the establishment of alder carr.

4.7.3 Species identified in pollen zone BH1a are consistent with species common in alder carr environments. The plant macrofossil remains consist of many of the same species, with the addition of *Rubus* sp. seeds, indicating brambles formed a part of the shrub community throughout pollen zone BH1a.

4.7.4 Pollen levels in pollen zone BH1a are relatively stable, with the exception of a small drop in arboreal pollen, corresponding with a stratigraphic change in the composition of the peat at 4.65m. This level was radiocarbon dated to *c*.3626-3354 cal BC. The drop in arboreal pollen is entirely due to a reduction in *Alnus* in favour of herbaceous taxa, the latter of which are likely to have increased in abundance and diversity due to increased light reaching the understorey. This perhaps indicates a brief period of drier conditions followed by a recovery of *Alnus*.

4.7.5 The transition to pollen zone BH1b, dated at *c*.2281-2031 cal BC, is characterised by a decline in *Alnus* in favour of herbaceous species, largely grasses and sedges. An unusual characteristic of this zone is the presence of *Taxus baccata* (yew) pollen. *Taxus* pollen is present in isolated instances in zone BH1a, but is only continuously present in zone BH1b. T*axus* is not known to colonise modern fen environments, but has been recorded in several palaeoecological records from mid-Holocene peatlands. Branch *et al*. (2010) documented *Taxus* pollen and macrofossils at Hornchurch Marshes, also in the Lower Thames Valley, as did Green *et al.* (2014) at Barking. The presence of *Taxus* pollen at Dageham Docks further attests to the presence of ecological conditions with no modern analogue, in this case a peat surface colonised by *Taxus*.

4.7.6 *Taxus* colonisation occurs several centuries earlier at Hornchurch Marshes, but broadly overlaps with *Taxus* presence at Dagenham Docks. Branch *et al.* (2010) document *Taxus* colonisation at Hornchurch Marshes commencing *c.*2900 cal BC and ending *c.*1900 cal BC. *Taxus* is present slightly later at Dagenham Docks, mainly during pollen zone BH1b between *c*.2281-2031 cal BC and 1110-925 cal BC. *Taxus* occurs even earlier at Barking, between *c.*3000 and 2000 cal BC (Green *et al.* 2014). An additional radiocarbon date was obtained from the heartwood of a *Taxus* timber recovered during archaeological evaluation trenching at Dagenham Docks. The heartwood of this timber dates to *c*.2578-2469 cal BC, several hundred years earlier than *Taxus* pollen was consistently present in the pollen diagram, although it was present in isolated instances. This indicates *Taxus* was colonising the fen surface at the end of the Neolithic and was locally present even in the earliest pollen zone where only isolated *Taxus* pollen grains were identified.

4.7.7 Branch *et al.* (2010) hypothesise that the presence of *Taxus* colonising the peat surface indicates drier, more terrestrial conditions on the peat bog surface, perhaps due to reduced flooding or a further reduction in sea level. Green *et al.* (2014) also record drier conditions during *Taxus* colonisation at Barking, where

Ulmus (elm) also colonised the drier fen surface. Drier conditions are also evident at Dagenham Docks during the period of *Taxus* presence. *Alnus* is reduced from the previous pollen zone in favour of grasses and sedges, indicating an opening of the canopy that *Taxus* may also have exploited.

4.7.8 Botanical macrofossils from phases 3 and 4, associated with pollen zone BH1b, are similarly indicative of drier conditions and a reduction in the dominance of *Alnus*. No *Taxus* macrofossils were identified, although *Taxus* timbers were identified at Dagenham Docks during archaeological evaluation trenching. The final sample of macrofossil phase 4 coincides with the following pollen zone, zone BH1c, however no environmental change was detected in the botanical macrofossils as no material was preserved in this uppermost sample.

4.7.9 The transition to pollen zone BH1c, at *c*.1110-925 cal BC, is characterised by a reduction in *Alnus* and other arboreal pollen in favour of herbaceous taxa, dominated by *Taraxacum*-type. This change corresponds to a change in the lithostratigraphy from peat to alluvial clays. The deposition of mineral-rich clay sediments significantly altered the ecology of the area, reducing alder carr and encouraging a more open environment dominated by herbaceous species. *Taraxacum*-type is superabundant in this pollen zone, partially masking other changes. An increase in *Pinus* (pine) pollen remains evident, along with the first occurrence of cereal-type pollen in the Middle to Late Bronze Age. The presence of cereal-type pollen may also be related to the deposition of alluvial clays, rendering the environment more conducive to agriculture than the previous peat surface. Archaeological remains in the vicinity are also much more frequent in the Bronze Age than the Neolithic Period. Bronze Age remains including roundhouse and post-built structures have been found in archaeological excavations in the vicinity of Dagenham Docks (Boyer 2005).

4.7.10 The transition to pollen zone BH1d, undated due to the lack of remains in the upper alluvial clays, is characterised by a reduction in *Taraxacum*-type, and a recovery of arboreal pollen, largely represented by *Alnus* (alder) and *Pinus* (pine). Cereal pollen is consistently present, although in low abundance, throughout the phase, attesting to continued human agricultural activity from the Late Bronze Age onwards.

5 CONCLUSIONS

5.1 Palaeoenvironmental analysis of deposits at Dagenham Dock yielded a sequence of pollen and plant macrofossil remains characterising the landscape and dating environmental change from the Late Mesolithic to the Late Bronze Age. This sequence included evidence of a unique ecosystem of yew colonisation of fen peats, which has been previously identified in palaeoenvironmental records, but is not known to occur in modern environments. This palaeoenvironmental record is therefore of significance both in reconstructing the local environmental history of Dagenham Dock, as well as contributing to a growing body of literature concerning Neolithic and Bronze Age yew presence in the fens of the Lower Thames Valley.

5.2 Archaeological evaluation trenching did not identify archaeological remains, however several large timbers were encountered, including a large yew timber which confirmed the local presence of yew as identified in the palaeoenvironmental analysis proxies.

8 PUBLICITY, CONFIDENTIALITY AND COPYRIGHT

8.1 Any publicity will be handled by the client.

8.2 ARS Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

9 STATEMENT OF INDEMNITY

9.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

10 ARCHIVE DEPOSITION

10.1 A digital and paper archive will be prepared by Archaeological Research Services Ltd, consisting of all primary written documents, plans, sections, photographs and electronic data, and it is due to be submitted to the Greater London Historic Environment Record (GLHER).

10.2 A copy of the report will be uploaded as part of the OASIS record.

11 ACKNOWLEDGEMENTS

11.1 Archaeological Research Services Ltd would like to thank all those involved with this work, including Mike Young, Nick Weeks and Trevor Harrison of Hope Construction Materials Ltd, Emma Hepplewhite at Fairhurst consultancy, Adam Single and John Gould of Greater London Archaeology Advisory Service (South East) and Sylvia Warman at Historic England.

12 REFERENCES

Anon. 1951. *Festival of Britain: souvenir guide to the industries of Dagenham*. London, Industries working committee for the Festival of Britain.

Anderberg, A. L. 1994. *Atlas of seeds and small fruits of Northwest-European plant species with morphological descriptions*. Stockholm, Swedish Natural Science Research Council.

Appleton, B., Greene, V., Smith, A., French, S., Kane, B., Fox, L., Downing, A., Gilland, T.and Close, D. 2015. *Trees and Shrubs that Tolerate Saline soils and Salt Spray Drift*. Virginia Cooperative Extension, Virginia Tech and Virginia State University Publication 430-031.

Bates, M.R. and Whittaker, K. 2004. Landscape evolution in the Lower Thames Valley: implications for the archaeology of the earlier Holocene period. In Cotton, J and Field, D (eds.) *Towards a New Stone Age: aspects of the Neolithic in south-east England*. York, CBA Research Report 134.

Boyer, P. 2005. *An archaeological evaluation on former allotments at Hedgemans Road, Dagenham, London Borough of Barking and Dagenham*. Pre-Construct Unpublished Report.

Branch, N. P., Batchelor, C. R., Cameron, N. G., Coope, G. R., Densem, R., Gale, R.,Williams, A. N. 2012. Holocene environmental changes in the Lower Thames Valley, London, UK: Implications for understanding the history of Taxus woodland. *The Holocene* 22 (10): 1143-1158.

Cappers, R. T., Bekker, R. M., & Jans, J. E. 2012. *Digitale Zadenatlas van Nederland/Digital seed atlas of the Netherlands*. Barkhuis

Coles, B. 1990. Anthropomorphic wooden figures from Britain and Ireland. *Proceedings of the Prehistoric Society* 56: 315-333.

Devoy, R.J.N. 1979. Flandrian sea-level changes and vegetation history of the Lower Thames Estuary. *Philosophical Transactions of the Royal Society of London*, B, 285: 355-407.

Eadie, G. 2014. *A Historic Environment Desk-Based Assessment of Land near Dagenham Dock, London*. ARS Ltd Report No. 2014/94.

Faegri, K., Iversen, J. 1989. *Textbook of Pollen Analysis*. (revised by Faegri K., Kaland P.E. and Krzywinski K.J. New York, Wiley.

Green, C.P., Batchelor, C.R., Austin, P.J., Brown, A.D., Cameron, N.G. and Young, D.S. 2014. Holocene alluvial environments at Barking, Lower Thames Valley. *Proceedings of the Geologists Association* 125: 279-295.

Green, M.J. 2005. *Exploring the World of Druids*. London, Thames and Hudson.

Greensmith, J.A. and Tucker, E.V. 1973. Holocene transgressions and regressions on the Essex coast outer Thames estuary. *Geologie Mijnbouw* 52: 193-203.

Grimm, E.C. 1987. CONISS: a FORTRAN 77 program for stratigraphically constrained cluster analysis by the method of incremental sum of squares. *Computers and Geosciences* 13: 13-35.

Hang, R.D., Schoenau, J.J., Van Rees, K.C.J. and Steppuhn, H. 2011. Examining the salt tolerance of willow (Salix spp.) bioenergy species for use on salt-affected agricultural lands. *Canadian Journal of Plant Science* 91 (3): 509-517.

Latham, R.C. and Matthews, W. 1972. *The Diary of Samuel Pepys, Volume VI*. London, G. Bell.

Moore, PD, Webb, JA, & Collinson, ME. 1991. *Pollen Analysis*. London, Wiley-Blackwell.

Museum of London Archaeology 2006. *ABACUS Park Plots B & C, Dagenham Docks; an archaeological evaluation and geoarchaeological report*. Museum of London Archaeology unpublished report ACU06.

Shawcross, J.P. 1904. *A History of Dagenham in the County of Essex*. London, Skeffington and Son.

Sell, P. and Murrell, G. 2006. *Flora of Great Britain and Ireland: volume 4, Campanulaceae-Asteraceae*. Cambridge, Cambridge University Press.

Sidell, J. 2001. Archaeology and the London Thames: past, present and future. *Archaeology International* 5: 12-15.

Spurrell, F.C.J. 1898. On the estuary of the Thames and its alluvium. *Proceedings of the Geological Society* 11: 210-30.

Stace, C. 1997. *New Flora of the British Isles*. Cambridge, Camrbidge University Press.

Tomlinson, P. 1985. An aid to the identification of fossil buds, bud-scales and catkin-bracts of British trees and shrubs. *Circaea* 3: 45-130.

Archaeological Research Services Ltd

Freightliner Site, Goods Yard, Dagenham Dock Station

Written Scheme of Investigation for Archaeological Trenching

February 2015

1. Introduction

1.1. Project Background

1.1.1 This Written Scheme of Investigation (WSI) has been prepared by Archaeological Research Services Ltd (ARS Ltd) on behalf of Hope Construction Materials Ltd. It relates to a programme of archaeological trenching on the site of the proposed re-development of the present Freightliner Rail Services scrapyard site at Dagenham Dock Station in London into a rail-fed cement depot linked to Hope Works in Derbyshire. The development will involve the construction of bulk stores, warehousing, offices and associated amenities including a weighbridge, bunded fuel tank and lorry wash.

1.1.2. Hope Construction Materials Ltd. has been granted planning permission (REF: 14/00948/FUL) for the proposed development. Condition no. 23 of the planning permission requires that:

"A) No development other than demolition to existing ground level shall take place until the applicant has secured the implementation of a programme of archaeological work in accordance with a Written Scheme of Investigation which has been submitted by the applicant and approved in writing by the Local Planning Authority and a report on that evaluation has been submitted to the Local Planning Authority.

B) If heritage assets of archaeological interest are identified by the evaluation under Part A, then before development (other than demolition to existing ground level) commences, the applicant shall secure the implementation of a programme of archaeological investigation in accordance with a Written Scheme of Investigation which has been submitted to and approved in writing by the Local Planning Authority.

C) No development or demolition shall take place other than in accordance with the Written Scheme of Investigation approved under Part B.

D) The development shall not be occupied until the site investigation and post investigation assessment has been completed in accordance with the programme set out in the Written Scheme of Investigation approved under Part B and the provision for analysis, publication and dissemination of the results and archive deposition has been secured.

1.1.3. This WSI is designed to secure the implementation of a programme of archaeological evaluation in fulfilment of condition (B) outlined in section 1.1.2 above. The aim of the programme of work is, in line with the National Planning

Policy Framework (NPPF) paragraph 141 (CLG 2012), to record and enhance understanding of the significance of any heritage assets to be lost during the proposed development in a manner proportionate to their importance, and to make this evidence (and any archive generated) publically accessible.

1.2. Location and Land-Use

1.2.1. The proposed development area (PDA) covers a narrow rectangular area of *c.*2.1ha and is presently occupied by an operational scrapyard run by Freightline Rail Services Ltd. The PDA is bounded to the north by Ford Works industrial units, to the west by Chequers Lane and to the south and east by the London, Tilbury and Southend Railway. The site is centred on NGR TQ 49220 83000 (see Figure 1 below).

1.2.2. The site lies within an Archaeology Priority Area (APA), defined as follows:
*'**River Valleys/Floodplain.** This area lies largely in the southwestern part of the Borough on the Thames and Roding floodplain where evidence of past land use, particularly from the prehistoric period, survives as wooden track ways and other structures which can be preserved in the deep sequence of alluvial deposits. These peat and silty clay layers also preserve evidence reflecting past environmental conditions, and show how these have changed overtime. The area also extends along the valley of what was the River Beam and its tributaries.'*

1.2.3. The underlying solid geology of the site comprises Lambeth Group clays, silt and sand. This is overlain by superficial deposits of Quaternary (Pleistocene and Holocene) Alluvium comprising clay, silts, peats, sands and gravels. During the Pleistocene, the sand and gravel deposits were formed by rivers depositing detrital material to form river terrace deposits. Fine silt and clay from overbank floods has been deposited as floodplain alluvium, with boggy areas developing into peat deposits (BGS 2014).

2. Archaeological background

2.1 An archaeological desk-based assessment (DBA) was carried out by ARS Ltd and submitted with the planning application for a proposed re-development of the present Freightliner Rail Services scrapyard into a rail-fed cement depot. It concluded that, dependent upon the scheme's foundation design and impact depths, there is the potential for the development to impact upon palaeoenvironmental deposits, prehistoric remains, and medieval and post-medieval remains below modern ground level (Eadie 2014). Any palaeoenvironmental remains and prehistoric archaeology are likely to be of high significance, whilst the medieval and post-medieval remains are likely to be of lower significance.

2.2. An auger hole located immediately to the west of the site indicates that there is a depth of *c.*1m of made ground under the present hardstanding. However, the exact stratigraphy of the deposit sequence across the site and the character of its archaeological remained unknown. The impact of the proposed development thus depends on the character of the buried palaeoenvironmental and archaeological remains. The application site is located in an area where buried peats, palaeochannels and other alluvial deposits have been regularly encountered during archaeological investigations, suggesting that there is a high potential for important geoarchaeological and palaeoenvironmental evidence to be present.

2.3. Bronze Age and Iron Age sites and spotfinds, including the Pools Lane causeway, are also recorded close by to the north indicating human activity there from the period. Structures from the prehistoric period such as timber trackways are often found preserved within peat layers in this part of the Thames valley. The internationally important archaeological find of the Dagenham Idol Neolithic wooden figurine was found 750m east of the site in 1921, probably in a peat deposit.

2.4. In response to the results of the DBA, a programme of geoarchaeological (stratigraphic) recording, sampling and palaeoenvironmental assessment was recommended and carried out. In total, 12 boreholes were drilled across the PDA by Site Analytical Services Ltd (SAS, 2014) using a windowless sampling system. The locations of individual boreholes were designed to provide a broad coverage across the entire site, although in some cases the position of individual boreholes had to be adjusted to take into account local utility services. The entire Holocene sequences of three boreholes (BH1, BH5 and BH12) were recovered and each sequence comprised full sequences of undisturbed sediments (Howard and McLellan 2015).

2.5. The entire sequences recovered from BH1 and BH5 were opened and described to assess the stratigraphy. Sedimentological properties were described using a range of standard geological criteria. The stratigraphy was as follows. The topmost sections consisted of *c.*1.6m of made ground overlying between 0.2m and -1.15m OD of upper alluvium. Peat was encountered immediately below between -1.10m and -4.7m OD. Below the peat, lower alluvium was noted, between -3.6m and -4.75m OD. The Shepperton gravels were encountered at the base, found from -4.5m OD. In addition to identifying the geology, samples were taken from BH1 for pollen and macroscopic plant analysis and radiocarbon dating.

2.6. The results from the pollen and macroscopic plant analysis and radiocarbon dating indicated that the peat formation present across the PDA is dated at its earliest to 1220-1020 BC and continued at the site until 1165-1270 AD under stable ecological conditions. The ecology of the site during peat formation consisted of alder carr, whose development was the result of increased wetness likely related to changes in relative sea level and marine transgression. A return to drier conditions in the 13th century AD caused peat formation to cease and a change from wooded carr to open meadow plant species.

2.7. The presence of waterlogged yew wood and pollen at the site is of interest as it is an unusual environment for colonisation of this species. The presence of yew is made additionally intriguing by the proximity of the PDA to the site of discovery of the Neolithic Dagenham Idol which, although the Idol predates the yew found in the analysis, it establishes Dagenham as a ritually important site.

2.8. The dating of the peat development from the Bronze Age to the High Medieval Period demonstrates that the sedimentary sequence provides evidence for significant build-up of sediments on the valley floor during the middle and Late Holocene. Therefore, the PDA has potential for the recovery of archaeological remains, including organic structural remains and/or artefacts. Given the high

quality of pollen and macrofossils recorded during this assessment, any archaeological remains encountered have the potential to be well-preserved.

3. Aims and Objectives

3.1. The objective of the archaeological trenching is to identify any archaeological cultural material in, on and under the peat layer within the PDA. If significant remains (e.g. trackways) are found, ARS Ltd will consult with the Greater London Archaeology Advisor (South East) on how to proceed.

3.2. Empirical evidence from other sites in lowland Britain indicate that humans regularly frequent river valley locations, especially adjacent to palaeochannels and upon gravel islands, but that the complexity of river valley evolution can often make the identification of sites difficult, especially if they are buried beneath later alluvial sediments.

3.3. The regional research context is provided by 'A Research Framework for London Archaeology' (MoLA 2002). Prehistory research priorities under P1, P2 and P3 framework objectives are as follows (MoLA 2002, 19-23).

- Establishing firm regional chronologies tied into national chronological frameworks, taking the opportunity to clarify the extant terrace sequences.
- Understanding what London looked like. Geomorphological mapping of key feature types (such as lake basins, river channels and channel/dry land interfaces, as well as deeply sealed surface-intact sites in the floodplains) is of importance in predicting the likely whereabouts of human activity.
- Examining the influence of landscape, establishing whether the Thames confluences were considered important settings for different types of monument

3.3. The framework objectives under 'the research agenda- major themes' people and society (TS6-Ideology, cult and religion and TS8-Material culture studies) are as follows (MoLA 2002, 86).

- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally or nationally.
- Compiling a synthesis of small finds, to trace domestic life, personal ornament, literacy, etc- using artefactual analysis to characterize domestic space.

3.4. The framework objectives under 'the research agenda- major themes' continuity and change (TC10-Chronologies) are as follows (MoLA 2002, 86).

- Absolute dating should be routine on all prehistoric sites.

3.5. The objectives of the investigation include the following:

- Targeted trench evaluation to identify any archaeological cultural remains in, on and under the peat
- On completion of the on-site archaeological works, post-excavation analysis, reporting, publication and archiving to be carried out.

4. Methodology

4.1. Within the PDA, two trenches will be excavated in order to determine if any potential archaeological remains exist on the site (see Figure 2 below). Both trenches will measure 6m long by 2m wide.

4.2. Hard standing, unstratified modern material and topsoil will be removed mechanically by a machine using a wide toothless ditching bucket, under continuous archaeological supervision. The topsoil and subsequent layers will be removed down to the lower alluvial deposits, approximately 6m deep, in successive level spits. The trenches will be appropriately shored and no standing sections will be left exposed. An understanding of the vertical stratigraphy of the site already exists, however, from the geoarchaeological coring exercise.

4.3. No machinery will track over, or otherwise damage, the excavated area until the area has been signed off by ARS Ltd.

4.4. ARS Ltd will provide suitably qualified and experienced archaeologists to undertake the excavation in accordance with the CIfA (2013a) Standards and Guidance for Archaeological Excavations and Code of Conduct (2014).

4.5. The areas will be appropriately cleaned using hand tools in order to expose the full nature and extent of archaeological features and deposits.

4.6. Any features and deposits will be excavated sufficiently to determine their character, stratigraphy and relationship to other features and attempts made to obtain dating evidence.

4.7. Isolated, discrete features such as pits and postholes not belonging to structures or industrial activities will be 50% sampled, although if they produce artefacts, then provision is made for full excavation.

4.8. Discovery of any human remains will be reported to the coroner and excavated following receipt of the appropriate Ministry of Justice Guidelines.

4.9. Samples will be taken of ecofacts (e.g. timbers) as well as palaeoenvironmental samples from any archaeological features. A minimum of 10l of sample will be taken, or all of the deposit if smaller. Depending on the potential of the sample the project Palaeoenvironmental specialist (Elise McLellan) will assess the sample for the most appropriate form/s of analysis which could be applied in line with the Historic England guidance on 'Environmental Archaeology'. Samples will be stored in appropriate containers and suitable environment (e.g. kept wet and in a cool, dark place if a waterlogged timber for example) until removal from site to the laboratory. Should a timber sample be required from an in situ timber too large to remove from the trench then a suitable sample will be carefully sawn from the piece to allow for potential dendrochronological dating and speciation.

4.10. All site operations will be carried out in a safe manner in accordance with ARS Ltd's health and safety policy. Deep sections such as those across ditches or pits will be shored as necessary, together with the trench sides. A risk assessment will be prepared before commencement on site.

5. Recording

5.1. The site will be accurately tied into the National Grid and located on a 1:2500 or 1:1250 map of the area. The site will be recorded using a single context planning system in accordance with the ARS Ltd field recording manual.

5.2. A full and proper record (written, graphic and photographic as appropriate) will be made for all work, using pro-forma record sheets and text descriptions appropriate to the work. Accurate scale plans and section drawings will be drawn where required at 1:50, 1:20 and 1:10 scales, as appropriate.

5.3. The stratigraphy of the site will be recorded even where no archaeological deposits have been identified.

5.3. All archaeological deposits and features will be recorded with above ordnance datum (AOD) levels.

5.4. A photographic record will be taken in colour digital format that matches the quality of a 35mm SLR film camera and will include, where appropriate, a clearly visible, graduated metric scale. A register of all photographs will be kept. A selection of photographs will also be taken including working shots to demonstrate how the site was investigated and what the prevailing conditions were like during excavation

5.5. Where stratified deposits are encountered, a 'Harris' matrix will be compiled.

6. Finds Processing and Storage

6.1. All processing, conservation work and storage of any archaeological finds that are recovered will be carried out in compliance with the CIfA 'Standard and Guidance for the collection, documentation, conservation and research of archaeological materials' (2013b) and the 'Guidelines for the Preparation of Excavation Archives for Long Term Storage' set out by UKIC (1990).

6.2 Artefact and ecofact collection and discard policies will be appropriate for the defined purpose.

6.3 Bulk finds which are not discarded will be washed and, with the exception of animal bone, marked. Marking and labeling will be indelible and irremovable by abrasion. Bulk finds will be appropriately bagged, boxed and recorded. This process will be carried out no later than two months after the end of the excavation.

6.4 Any small finds will be recorded as individual items and appropriately packaged (e.g. lithics in self-sealing plastic bags and ceramic in acid-free tissue paper). Vulnerable objects will be specially packaged and textile, painted glass and coins stored in appropriate specialist systems. This process will be carried out within

two days of the small find being excavated. Prehistoric pottery will only be lightly cleaned and will not be subject to any abrasion or loss of adhering residues.

6.5 During and after the excavation all objects will be stored in appropriate materials and storage conditions to ensure minimal deterioration and loss of information (including controlled storage, correct packaging, and regular monitoring, immediate selection for conservation of vulnerable material). All storage will have appropriate security provision.

6.6 The deposition and disposal of artefacts will be agreed with the legal owner and the appropriate Regional Collection Museum. All finds except treasure trove are the property of the landowner. Items falling under the 1996 Treasure Act (and subsequent amendments) will be immediately notified to the appropriate Portable Antiquities Scheme officer and/or coroner along with the Greater London Archaeology Advisor (South East).

6.7 All retained artefacts and ecofacts will be cleaned and packaged in accordance with the requirements of the recipient museum.

7. Project Management and Standards

7.1. ARS Ltd is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA). Registered Organisations are continuously assessed to ensure that the highest standards of work are carried out, in compliance with the 'Codes of Conduct' of the Chartered Institute for Archaeologists (2014) and will follow the CIfA 'Standard and Guidance for Field Evaluation' (2013a). In addition to our key management staff, who have achieved the highest grade of corporate CIfA membership, many of our field staff also hold corporate grade membership.

7.2. All staff employed on the project will be suitably qualified and experienced for their respective project roles and have practical experience of archaeological excavation and recording. All staff will be made aware of the archaeological importance of the area surrounding the site and will be fully briefed on the work required by this specification. Each member of staff will be fully conversant with the aims and methodologies and will be given a copy of this written scheme of investigation to read. All members of staff employed by ARS Ltd are fully qualified and experienced archaeologists, this will ensure that appropriate decisions regarding environmental and dating sampling will be made in the field.

7.3. *Project Team*
The project team is as follows.
Project Management: Dr Clive Waddington MCIfA (ARS Ltd)
Project Officer and Surveyor: Richard Durkin (ARS Ltd)
Project Officer & plant macros, wood, and pollen: Elise McLellan (ARS Ltd)
Project Officer and Geoarchaeologist: Dr Andy McWilliams (ARS Ltd)
Geoarchaeologist: Dr Andy Howard MCIfA (Landscape Research and Management)
Pottery Specialists: Dr Clive Waddington, Dr Jane Timby, Paul Blinkhorn
Struck Flint Specialist: Dr Robin Holgate MCIfA (ARS Ltd)

Metalwork Specialist: Dr Jenny Price or equivalent (Durham University Conservation Laboratory)
Plant macrofossils, wood, charcoals and pollen: Elise McLellan (ARS Ltd)
Human Remains: Milena Grzybowska (ARS Ltd)
Faunal remains: Milena Grzybowska (ARS Ltd)

7.4. All site operations will be carried out in a safe manner in accordance with ARS Ltd's Health and Safety Policy. A risk assessment will be prepared before commencement on site.

8. Access

8.1 ARS Ltd will give the Greater London Archaeology Advisor (South East) at least one week's (or less if so agreed) notice of the commencement of fieldwork.

Adam Single
Archaeology Advisor
Greater London Archaeological Advisory Service
English Heritage
1 Waterhouse Square
138-142 Holborn
London
EC1N 2ST
Tel: 0207 973 3748
Email: Adam.Single@english-heritage.org.uk

8.2 ARS Ltd will afford access to the Greater London Archaeology Advisor (South East) or their representative at all times, for the purposes of monitoring the archaeological mitigation.

8.3 ARS Ltd will maintain regular communication with the Greater London Archaeology Advisor (South East) to ensure that the project aims and objectives are met.

9. Post-fieldwork assessment, report and archive

9.1. The aims of the post-fieldwork phase of the project are as follows.

- Produce a concise post-fieldwork assessment strategy
- Prepare an orderly archive of the records of the fieldwork.
- Clean, conserve and prepare artefacts/ecofacts for long-term museum storage.
- Produce a final, interpretative archive report.

Report

9.2. Within three months of the completion of the excavation, ARS Ltd will produce a report, one copy of which will be submitted to the client, and one bound hard copy and a digital copy in PDF/A format will be submitted to the Greater

London Historic Environment Record (GLHER) within fourteen working days of the completion of the report. The report produced will be bound with each page and paragraph numbered and will include as a minimum the following:

- Executive summary on the background to the project and the findings of work undertaken
- Introductory statement
- Aims and purpose of the project
- An outline of the methodology employed
- A location plan showing all excavated areas and any archaeological features with respect to nearby fixed structures and roads
- A descriptive and illustrated developmental account of the excavated and recorded features, including phasing and interpretation of the site sequence
- Specialist assessment of the various categories of artefacts recovered
- Illustrations of all archaeological features with appropriately scaled hachured plans and sections
- Conclusions
- Recommendations for the retention or discard of archive material
- Supporting data – tabulated or in appendices
- Index to archive and details of archive location
- References
- Statement of intent regarding publication
- Confirmation of archive transfer arrangements
- A copy of the approved scheme of works (WSI)
- A copy of the OASIS form.

9.3. An OASIS online record http://ads.ahds.ac.uk/projec/oasis/ will be initiated immediately before fieldwork commences and, as the project proceeds, information will be added to this record. Key fields will be completed on Details, Location and Creators forms. All parts of the OASIS online form will be completed for submission to the GLHER. This will include an uploaded .pdf version of the entire report (a paper copy will also be included within the archive).

9.4. ARS Ltd is a registered contractor on the OASIS system and has uploaded archaeological reports before. A copy of completed OASIS form should be appended to the back of each report submitted.

Archive

9.5. A digital, paper and artefactual archive will be prepared by ARS Ltd, consisting of all primary written documents, plans, sections, photographs and electronic data (in a format to be agreed by the appropriate repository museum). The archive will be deposited in line with the CIfA (2013c) 'Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives' and Society of Museum Archaeologists (1993) 'Selection, Retention and Dispersal of Archaeological Collections. Guidelines for use in England, Wales and Northern Ireland', and will be deposited within two months of the completion of the report. The Greater London Archaeology Advisor (South East) will be notified in writing on the completion of the fieldwork with projected dates for the

completion of the report and deposition of the archive. The date for deposition of the archive will be confirmed in the report and the Greater London Archaeology Advisor (South East) informed in writing on final deposition of the archive.

9.6. All artefacts and associated material will be cleaned, recorded, properly stored and deposited in the archive (see Section 6 above).

9.7. A full set of annotated, illustrative pictures of the site, excavation, features, layers and selected artefacts will be deposited with the archive as digital images on a CD-ROM.

10. Publication, Dissemination and Publicity

10.1. The findings of this site will be published in full on-line with a summary article in the annual 'round-up' of the London Archaeologist and any appropriate county and period-based national journals.

10.2. Agree the level and outlet for publication and dissemination of significant results will be agreed with the Greater London Archaeology Advisor (South East). The scale of publication will be based upon on the significance and interest of the findings.

11. Monitoring

11.1. Reasonable access to the site will be allowed to the Greater London Archaeology Advisor (South East) or their nominee and/or the English Heritage Science Advisor (London) for the purpose of monitoring the archaeological works. Prior notification of a site visit is required from Greater London Archaeology Advisor (South East) and Hope Construction Materials, and ARS Ltd should be notified accordingly.

11.2. The Greater London Archaeology Advisor (South East) may monitor post-fieldwork analysis and research work at any point.

11.3. Changes to the approved methodology or programme of works will only be made with prior written approval of the Greater London Archaeology Advisor (South East).

12. General Items

12.1. *Health and Safety*
All site operations will be carried out in a safe manner in accordance with ARS Ltd Health and Safety Policy and current Health and Safety legislation and the site requirements. Deep sections such as those across ditches or pits will be shored as necessary as will the trench sides. No standing sections of the trench will be left exposed. A risk assessment will be prepared before commencement on site.

12.2. *Timetable*

The trenching is expected to commence in March 2015 and last for approximately two weeks.

12.3. *Insurance Cover*
ARS Ltd has full insurance cover for employee liability, public liability, professional indemnity and all-risks cover.

13. References

British Geological Survey 2014. Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html [Accessed 4th February 2015].

Chartered Institute for Archaeologists, 2013a. *Standard and Guidance for field evaluation*. Reading: Chartered Institute for Archaeologists.

Chartered Institute for Archaeologists, 2013b. *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials*. Reading: Chartered Institute for Archaeologists.

Chartered Institute for Archaeologists, 2013c. *Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives.* Reading, Chartered Institute for Archaeologists.

Chartered Institute for Archaeologists, 2014. *Code of Conduct*. Reading: Chartered Institute for Archaeologists.

Eadie, G. 2014. *An Historic Environment Desk-Based Assessment of Land near Dagenham Dock, London.* ARS Ltd Report No. 2014/94.

Howard, A. and McLellan, E. 2015. *Geoarchaeological and Environmental Assessment of Land at the Freightliner Rail Services Scrapyard, Dagenham Dock, London.* ARS Ltd Report No. 2015/11.

Museum of London, 1999. *General Standards for the Preparation of Archaeological Archives Deposited with the Museum of London.* London.

Museum of London, 2002 *A research framework for London archaeology 2002*. London.

Nixon, T., McAdam, E., Tomber, R. and Swain, H. (eds.), 2002. *A Research Framework for London Archaeology*. Museum of London, London.

Site Analytical Services. 2014. *Report on a Ground Investigation at Dagenham Docks Freightliner Site for Archaeological Research Services.* Report 14/22767.

United Kingdom Institute for Conservation, 1990. *Guidelines for the Preparation of Archives for Long-Term Storage.* London.

14. Figures

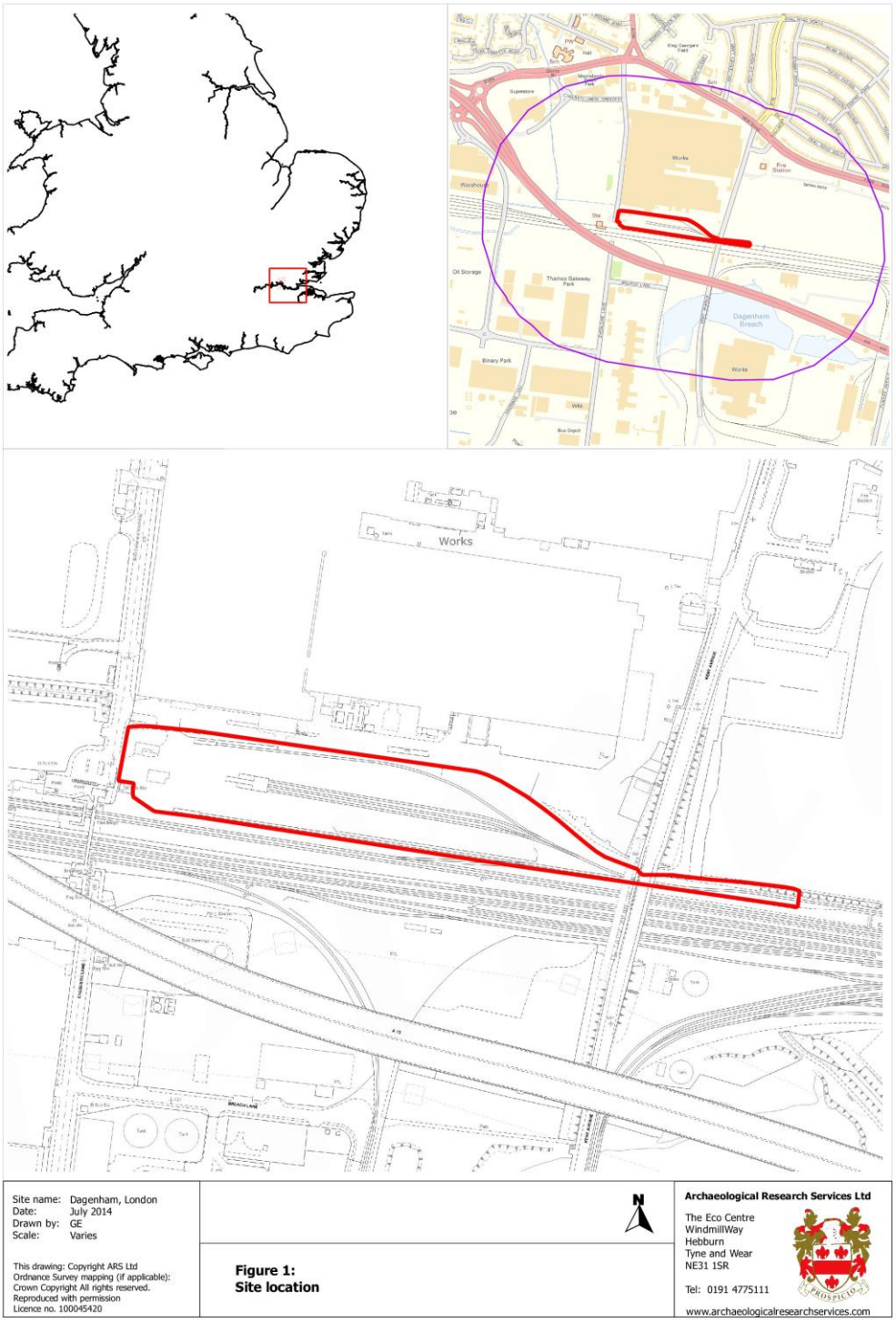
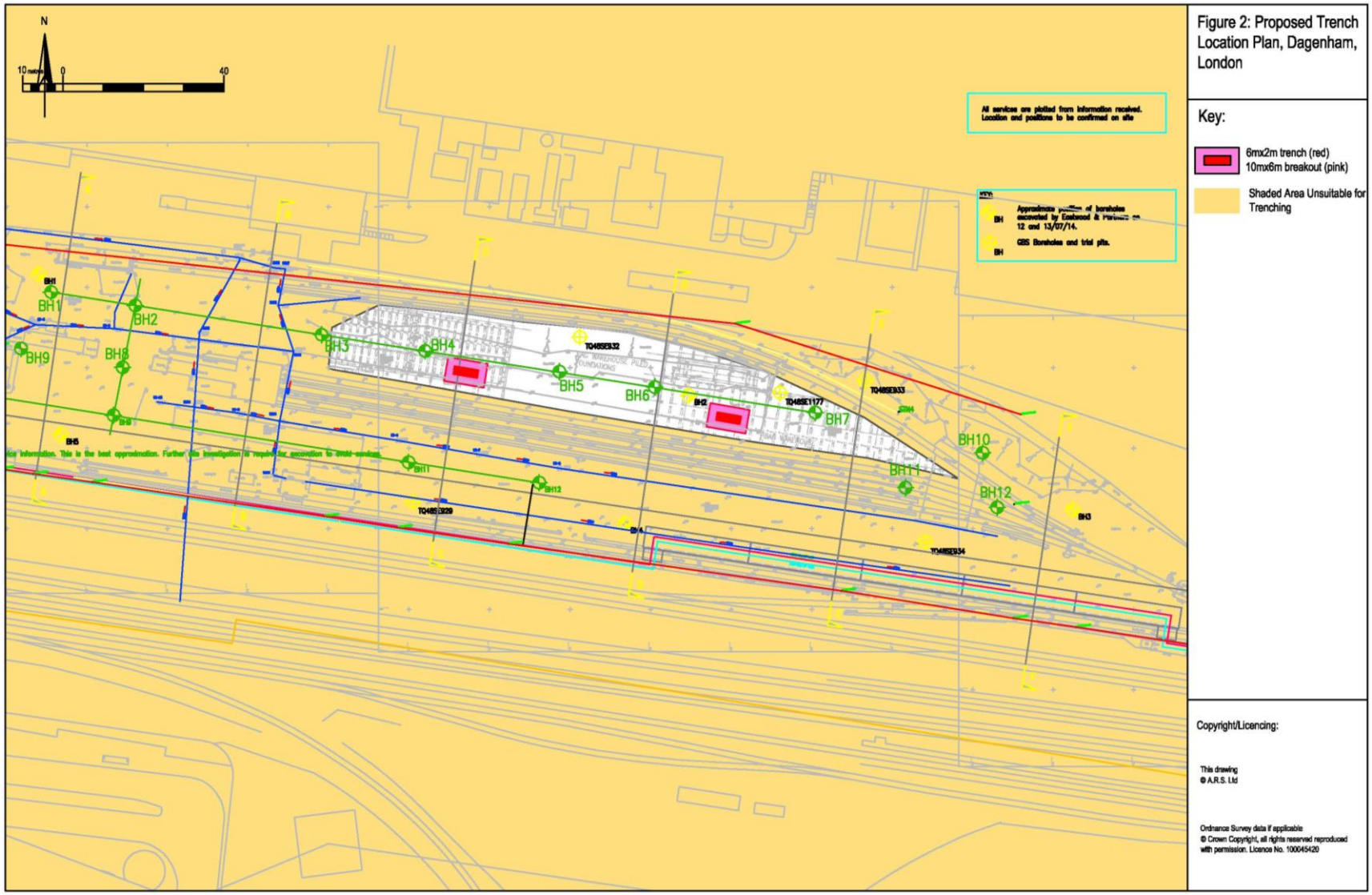


Figure 1: Site Location


N
10 metres
0
40
All services are plotted from information received. Location and positions to be confirmed on site
Approximate position of boreholes excavated by Eastwood & Partners on 12 and 13/07/14.
GBS Boreholes and trial pits.
BH1
BH2
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
TQ48SE932
TQ48SE933
TQ48SE1177
TQ48SE929
TQ48SE934
Figure 2: Proposed Trench Location Plan, Dagenham, London
Key:
6mx2m trench (red)
10mx6m breakout (pink)
Shaded Area Unsuitable for Trenching
Copyright/Licencing:
This drawing © A.R.S. Ltd
Ordnance Survey data if applicable © Crown Copyright, all rights reserved reproduced with permission. Licence No. 100045420

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol5-237746

Project details

Project name	Archaeological Evaluation Trenching and Palaeoenvironmental Analysis at Dagenham Dock, London
Short description of the project	Archaeological Research Services Ltd was commissioned by Hope Construction Materials Ltd to undertake a programme of archaeological evaluation trenching on the site of the proposed redevelopment of the present Freightliner Rail Services scrapyard site at Dagenham Dock Station in London. The site had previously been the subject of a desk based assessment (Eadie 2014) and geoarchaeological coring with subsequent assessment of pollen and plant macrofossils (Howard and McLellan 2015). Two archaeological evaluation trenches were mechanically excavated under archaeological supervision. A stratigraphic sequence was excavated through the made ground, alluvial deposits and peat to the underlying Late Glacial Shepperton Gravels. No archaeological remains were encountered during the evaluation trenching. Well-preserved palaeoenvironmental remains were present, as implied by the borehole results, and well-preserved timbers were encountered within the peat and include remains of yew and oak. A detailed palaeoenvironmental assessment was undertaken on a sediment borehole. Pollen and botanical macrofossils were analysed, samples were taken from diatom and invertebrate remains however poor preservation prevented further analysis of these remains. A sequence of radiocarbon dates was obtained, the sediments date from the Late Mesolithic to the Early Bronze Age. The pollen and botanical macrofossil sequence records a Neolithic alder carr environment with an unusual presence of yew trees. During the Bronze Age the environment transitioned to a much drier and more open meadow and mixed woodland environment.
Project dates	Start: 01-12-2014 End: 30-03-2015
Previous/future work	No / No
Type of project	Field evaluation
Site status	None
Current Land use	Vacant Land 1 - Vacant land previously developed
Monument type	BURIED SOIL HORIZON Early Neolithic
Significant Finds	NONE None
Methods & techniques	"Environmental Sampling"
Development type	Rail links/railway-related infrastructure (including Channel Tunnel)

Prompt	Planning condition
Position in the planning process	After full determination (eg. As a condition)

Project location

Country	England
Site location	GREATER LONDON BARKING AND DAGENHAM DAGENHAM Freightliner Site, Goods Yard, Dagenham Dock Station
Study area	2.1 Hectares
Site coordinates	TQ 49220 83000 51.525664785082 0.15128003827 51 31 32 N 000 09 04 E Point

Project creators

Name of Organisation	Archaeological Research Services Ltd
Project brief originator	Archaeological Research Services Ltd
Project design originator	Archaeological Research Services Ltd
Project director/manager	Clive Waddington
Project supervisor	Andrew McWilliams
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Hope Construction Materials Ltd

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Greater London HER
Digital Contents	"none"
Digital Media available	"Images raster / digital photography"
Paper Archive recipient	Greater London HER
Paper Contents	"none"
Paper Media available	"Context sheet","Drawing","Plan","Report"

Entered by	Elise McLellan (elise@archaeologicalresearchservices.com)
Entered on	12 January 2016

OASIS:

Please e-mail Historic England for OASIS help and advice
 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012
Cite only: http://www.oasis.ac.uk/form/print.cfm for this page