Wessex Archaeology

1 Stamford Street, London SE1
London Borough of Southwark

Archaeological Evaluation Report

Ref: 53400.02

September 2003

STAMFORD HOUSE
1 STAMFORD STREET
LONDON SE1
LONDON BOROUGH OF SOUTHWARK

ARCHAEOLOGICAL EVALUATION REPORT

Prepared for:

Stanhope PLC
Norfolk House
31 St James's Square
London SW1 4JJ

by

Wessex Archaeology in London
Unit 701
The Chandlery
50 Westminster Bridge Road
London SE1 7QY

REF 53400.02

September 2003

CONTENTS

List of Figures

List of Tables

ACKNOWLEDGEMENTS

The fieldwork was commissioned by Stanhope PLC and Wessex Archaeology would like to thank Mike Knowles for his assistance during the implementation and the undertaking of the fieldwork. The assistance and helpful comments of Sarah Gibson (Southwark Borough Council) are also acknowledged.

The project was managed on behalf of Wessex Archaeology by Lawrence Pontin. The fieldwork was undertaken by Chris Ellis and Steve Thompson. The overall report was compiled by Chris Ellis, Lorraine Mepham (Finds) and Michael J. Allen (Environmental Evidence) with contributions by Michael J. Allen (Molluscs), Chris Stevens (Waterlogged and charred plant remains), Rob Scaife (Pollen and Diatoms/Foramnifera) and Rowena Gale (Waterlogged wood). The environmental samples were processed by Hayley Clark. The drawings were prepared by Marie Leverett.

SUMMARY

Wessex Archaeology was commissioned by Stanhope PLC to carry out an archaeological evaluation at Stamford House, 1 Stamford Street SE1 in the London Borough of Southwark (NGR 531610,180450. The site comprised an approximately rectangular shaped 0.3ha area of land to the south of the southern end of Blackfriars Bridge, London. The requirement for the archaeological evaluation stems from the site's location within an Archaeological Priority Zone, as defined within the London Borough of Southwark Unitary Development Plan, and the results of previous archaeological interventions within the site's vicinity. The evaluation consisted of four evenly distributed and differently sized, machine excavated trenches across the development area. Under guidance from Sarah Gibson (Southwark Borough Council) Trench 2 was not archaeologically excavated but was observed during subsequent demolition ground reduction.

Natural sands and gravels were encountered in three of the four trenches excavated (Trenches 1, 3-4) at various depths, dependent on the degree of post-depositional truncation. These deposits were recorded at –0.74m and –0.67m above Ordnance Datum (aOD) respectively in Trenches 1 and 4, though at +0.74m (aOD) in Trench 3 where preservation was better. The only deposits and finds of archaeological significance were recorded in Trench 1, partially preserved in the northern extent of the trench despite widespread modern disturbance. The archaeological features and deposits included a short section of mortared brick wall of 18th – 19th century date. The wall was sealed by a number of Post-medieval redeposited alluvial clays (backfill) containing Post-medieval material and residual 14th – 18th century pottery. The one residual sherd of Romano-British pottery recovered from the evaluation reflects the general lack of Roman-British finds in the vicinity, the site being *c*. 600m to the west of the core of Romano-British settlement in Southwark.

Below the 18th – 19th century wall a number of alluvial deposits consisting of humic silts and clays overlaid natural sands and gravels and contained 16th – 18th century pottery, ceramic building material (cbm), waterlogged wood deposits (driftwood) and leather fragments. The lower sections of the alluvial deposits were humified in nature and were therefore extensively sampled.

The results of the environmental analyses of the remains from the humic deposits indicate a change from humic to mineral alluvial sediments in the base of the Trench 1 sediment sequence. This is probably due to rising relative sea-level which caused ponding back of river systems and final brackish water inundation. This occurred within the Middle Bronze Age, as dated from a radiocarbon sample from an alder twig at the base of the humic sequence (3141±45 BP) indicating a date for the inception of peat at 1520-1260 BC.

STAMFORD HOUSE
1 STAMFORD STREET
LONDON SE1
LONDON BOROUGH OF SOUTHWARK

ARCHAEOLOGICAL EVALUATION REPORT

1. INTRODUCTION

1.1. Scope of Document

1.1.1. Wessex Archaeology was commissioned by Stanhope PLC (The Client) to carry out an archaeological evaluation at Stamford House, 1 Stamford Street SE1 in the London Borough of Southwark (the Site) (**Fig. 1**). This report summarises the results of the archaeological evaluation.

1.2. The Site

1.2.1. The Site is approximately rectangular in shape and some 0.3 ha in extent. It is bounded to the north by Upper Ground, Blackfriars Road to the east, Stamford Street to the south and Rennie Street to the west. It is 50m south of the southern end of Blackfriars Bridge over the River Thames. The Site now consists of the basement and lower ground levels of Stamford House and Drury House, which were demolished down to slab level prior to the commencement of the archaeological evaluation. The Site is centred on National Grid Ref. 531610 180450.

1.3. Planning Background

1.3.1. Planning Consent has been granted for the redevelopment of the Site with an archaeological condition attached to secure a scheme of archaeological works on the Site prior to its development.

1.3.2. The requirement for the archaeological condition stems from the Site's location within an Archaeological Priority Zone, as defined within the London Borough of Southwark Unitary Development Plan, adopted in July 1995 (Proposal 1 - Borough/Bermondsey/Riverside) and the results of previous archaeological interventions within the Site's vicinity.

1.3.3. Wessex Archaeology produced a specification which detailed the objectives, methods and resourcing of an archaeological evaluation which, dependent on results, could be considered to fulfil the planning condition (Wessex Archaeology. 2003). This was approved by Sarah Gibson, Archaeological Planning Officer of Southwark Borough Council.

2. GEOLOGICAL AND TOPOGRAPHICAL BACKGROUND

2.1. Geology

2.1.1. The underlying drift geology is river gravels, overlying London Clay. Studies of the Thames Estuary have identified four or five distinct phases of rising (transgression) and falling (regression) water levels. These phases have led to the formation of alternating deposits of silt/clay alluvium (linked with transgression phases) and peat (regression phases) which seal the river gravels.

2.1.2. Within the vicinity of the Site, excavations have identified one such peat deposit, known as Tilbury IV, which has been dated from the Late Bronze Age to the Early Iron Age. Radiocarbon dates have been recorded from a peat deposit from another excavation in Stamford Street. The peat laid between 0.0 - +0.15m above Ordnance Datum (aOD) and dates of 1750 – 1440 BC and 1050 – 800 BC respectively were obtained (J. Siddell – pers.comm.) putting the deposit within the Early – Late Bronze Age.

2.2. Topography

2.2.1. Basement levels across the site are as follows

- The south-western corner of the Site had a basement level of *c*.0.20m above Ordnance Datum (aOD) with mass concrete footings extending in places to a further depth of -1.20m (aOD).
- The north-eastern side of the Site had basements *c*. 0.35m (aOD). The form of foundations under this level was not known.
- The north-western and central parts of the site had a basement level of *c*. 3.00 – 3.20m (aOD). The form of foundations beneath this level was not known at the time of the commencement of the evaluation.

3. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 No archaeologically significant structures or finds have been previously recorded within the Site. The general area of western Southwark is known to have been historically wet and marshy and therefore unattractive for long-term occupation before the Post-medieval period. However, there is some evidence of occupation from the prehistoric period, focused on areas of raised ground. Excavations in the near vicinity of the Site have uncovered Neolithic/Bronze Age and Iron Age features as well as finds and cultivation soils, which suggest possible occupation in these periods. Later Medieval occupation along Upper Ground immediately to the north of the Site suggested some potential for medieval structures and deposits within the Site.

3.2 Early maps indicate that the area was first fully developed in the late 17th century or early 18th century, as small mixed commercial and domestic properties (Wessex Archaeology 1999). These remained relatively unaltered until the construction of Stamford House (1911), the Stamford House extension (1928) and the United Africa House (1958), known as Drury House before its recent demolition (*ibid*).

3.3 Borehole and excavation data from adjacent sites suggested that the basements within the southern half of Stamford House and Drury House to the east (excavated to *c*. 0.20 – 0.35m aOD), had truncated the top of river gravels to an unknown depth, with some potential for the truncated remains of prehistoric features to survive beneath this. Elsewhere, the potential existed for the survival of 2m or more of possible archaeological deposits within the central and north-western part of the Site, which appeared to have been less extensively basemented.

4. METHODS

4.1 The methodology undertaken on site was as set out in detail in the Written Scheme of Investigation (Wessex Archaeology 2003) with additional environmental sampling and reporting as agreed with Jane Sidell (English Heritage Regional Science Advisor). It is not necessary to reiterate each point but the salient aspects of the methods employed are outlined below.

4.2 The objectives of the evaluation were to determine, as far as reasonable possible, the presence/absence, location, nature, extent, date, quality, condition and significance of any surviving archaeological deposits, features and palaeo-environmental information within the Site. Archaeological deposits or features may survive beneath the present basement levels, which were associated with past human occupation and activity adjacent to the river Thames.

4.3 A total of four machine excavated evaluation trenches were located across all areas of the Site, both within the deep western and eastern basements and in the shallower basemented area in the centre, north-west and south-east. Initially, five trenches were to be excavated, but in agreement with S. Gibson (Southwark Borough Council**)** it was decided that it would not be required because of the excessive modern disturbance on the Site. However, it was requested that a watching brief was carried out when development work proceeded to reduce the higher ground within the Site down to the lower basement levels i.e. *c*. 0.20 – 0.35m (aOD).

4.4 All trenches were excavated using a 360° tracked mechanical excavator operating under continuous archaeological supervision, down to archaeological deposits (where present) or natural geological deposits.

4.5 The trenches were of varying size so as to allow stepping down at an equivalent 45 degree angle to the probable depth of natural gravels *c*. 1.00m (aOD). Consequently trenches located on present basement levels of *c*. 3.00m (aOD) were designed so as to allow stepping down to a depth of 3.00m. Trenches at the lower basement level of *c*. 0.20 – 0.35m (aOD) were designed to be excavated to a depth of 1.00m. Consideration of ascertaining the nature of deposits beneath these levels were to be considered following initial machining and hand excavation.

4.6 A plan and representative section of each trench was recorded by means of drawings and photographs. All natural alluvial clays, sands and gravel deposits were visually inspected for artefacts. All spoil from the trenches was scanned, both visually and with a metal detector. All trench heights were tied into an Ordnance Survey bench mark on the southwest end of Blackfriars Bridge (9.98m aOD).

4.7 The main stratigraphic sequence was sampled to evaluate the preservation of palaeo-environmental data and assess the potential for providing information about the tidal foreshore development (cf. Siddel *et al.* 2000). In particular, importance was attached to assessing the potential of determining fresh vs brackish water conditions in relation to defining the tidal reach of the Thames at datable horizons (See **Appendix 3** for detailed assessment reports).

4.8 The accompanying documentary records from the evaluation have been complied into a fully cross-referenced and indexed archive in accordance with Appendix 6 of *Management of Archaeological Projects* (2nd Edition, English Heritage 1991). The archive is currently stored at the offices of Wessex Archaeology, Old Sarum, Salisbury, Wiltshire, under the project code **SFO 03**. The contents of the archive are listed in **Appendix 1**.

5. RESULTS

5.1 INTRODUCTION (Fig. 1)

5.1.1 Archaeological deposits were only encountered in Trench 1. Natural geology was recorded in the base of Trenches 3 and 4. Natural geology was not recorded in Trench 5 due to modern disturbance down to at least *c.* –1.80m (aOD). The stratigraphic/geological sequence derived from the trenches is summarised below with a detailed description tabulated in **Appendix 2**. Context numbers are given in bold.

5.2 MODERN DISTURBANCE (Fig.1)

5.2.1 This was encountered in all the evaluation trenches excavated and is derived from the construction and use of the earlier large structures built on the Site in the 1920s and 1950s, with subsequent changes. The deep basements in the north-east and south-western parts of the Site have obviously truncated any archaeological deposits that may have been originally present in these areas. In the areas of Trenches 4 and 5, modern deposits were encountered down to –0.67m and –1.80m(+) (aOD) respectively. In the higher ground of Trenches 1 and 3 the modern overburden extended down to 2.16m and 0.74m (aOD) respectively, though concrete stantion cuts in Trench1 extended down to the base of the trench at –1.61m (aOD) and beyond. Backfilled (redeposited) alluvial clays (**101, 102, 107**) contained animal bone, shell, cbm, clay pipe and pottery of 14th-18th century date.

5.3 STRUCTURAL REMAINS

5.3.1 Only Trench 1 had structural remains recorded within it. This comprised a 2.22m long, 0.80m high, section of a north/south aligned brick wall (**103**), in the north section of the trench. (**Fig. 2**). This was recorded at 2.36 – 1.56m (aOD). The wall elevation exposed in the trench section illustrated a predominantly 'header' bond with the bricks measuring 8.5" x 4.25" x 2.5" in size. They were laid with a creamy white 'gritty' lime mortar (*c.* 10mm thick). A single step foundation, of two courses of bricks was recorded at the base of the wall. A 1.0m wide opening in the wall's west end may have been an original doorway opening, subsequently damaged by a Post-medieval pipe trench. The wall was below deposits **102** and **100**, which contained 16th - 19th century pottery. The wall probably dates from the 18th – 19th centuries.

5.4 ALLUVIAL GLEYED AND HUMIFIED CLAY DEPOSITS

5.4.1 Preserved alluvial clays were only recorded in the northern extent of Trench 1 (**Fig. 2**). In the south of the trench a homogenous light yellowish brown clay (**109**) (not illustrated) was recorded at 2.16 – 1.46m (aOD). Otherwise, alluvial clays (**108, 110-11, 113-114**) were recorded at 1.36 to –0.74m (aOD). These included homogenous blue/grey gleyed alluvial clays (**108, 111, 113**) with few coarse components except degraded unworked wood fragments of various sizes, including branches and twigs. The upper zone of **108** also contained animal bone, cbm, leather offcuts, shell and 16th/17th century pottery. Layer **110** was a humified clay layer with a very dark orange/brown colour and abundant wood fragments. Layer **114** was also a humified alluvial clay.

5.5 NATURAL SANDS AND GRAVEL DEPOSITS

5.5.1 These were recorded in Trenches 1, 3 and 4. In Trench 1 (**111-112**) they occurred at –0.74 to –1.60m (aOD) and included bluish grey sandy clay (111) directly overlying natural gravel (**112**) at –0.86m (aOD). The deposit was characterised by a moderately well sorted, coarse, sub-angular to sub-rounded flint gravel (<40mm) in a light to mid bluish grey coarse sand matrix. The natural geology recorded in Trench 4 (**401**) appeared at –0.67 to –1.04m (aOD) and was more a gravelly sand. It was characterised by a light grey coarse sand matrix with moderately well sorted, moderate to common sub-angular to sub-rounded flint gravel (<40mm).

5.5.2 The greatest survival of natural sands and gravels was recorded in Trench 3 however, where they were recorded at 0.74 to –0.92m (aOD). This comprised a number of overlying sands (**301, 303**) and gravels (**302, 304, 305-306**) of 0.15 – 0.20m thickness indicative of changing energy flows within the river regime. All had a characteristic yellow or yellowish brown colour, both sand matrices and gravel inclusions, with very distinctive dark orange/brown to reddish brown iron staining in places.

6. FINDS

6.1. Introduction

6.1.1. The evaluation produced a very small quantity of finds, all from Trench 1. These have been quantified by material type within each context; this information is presented in **Table 1**. The assemblage is largely of Post-medieval date.

Table 1: All finds by context

Context	Animal Bone	CBM	Clay Pipe	Pottery	Shell	Leather
100			14/82	18/419		
101	1/10	1/175	11/43	4/186		
102	7/81		1/5	5/79		
107				1/52		
108	3/181	9/1034		8/116	3/70	3/18
TOTAL	**11/272**	**10/1209**	**26/130**	**36/852**	**3/70**	**3/18**

6.2. Pottery

6.2.1. Apart from a single Romano-British sherd (whiteware body sherd, from context **100**), all of the pottery is of late medieval or Post-medieval date. The assemblage covers a very limited range of common types, with a potential date range that spans the period from the late 14th century onwards (see **Table 2**).

Table 2: Pottery by context

Context	Ware code	Ware name	Date range	No. sherds	Forms/comments
100	BORD	Border Ware	1550-1700	5	flanged dish; lid-seated pipkin or chamberpot
100	MOCH	Mocha Ware	C19	1	chamberpot
100	PEAR	Pearlware	C19	2	
100	SWSG	White saltglaze	1720-80	2	tea bowl or tea cup
100	PMR	Redware	C17+	7	
100	OXID	Whiteware	Roman	1	
101	TGW	Tinglazed earthenware	C17/C18	2	plate; ointment pot
101	PMR	Redware	C17+	2	convex bowl
102	BORD	Border Ware	1550-1700	5	lid seated pipkin or chamberpot
107	TUDG	Tudor Green ware	1380-1500	1	jug
108	PMR	Redware	C17+	1	burnt
108	BORD	Border Ware	1550-1700	7	tripod pipkin (burnt)

6.3. Clay Pipes

6.3.1. The clay pipe fragments include two datable bowls from modern disturbance layer **100**, dating respectively to 1640-60 and 1700-70; the later bowl has moulded maker's initials of WS on the spur.

6.4. Other Finds

6.4.1. Other finds comprise Post-medieval brick and tile, sheep and cattle bone, oyster shell and three small scraps of leather, probably offcuts.

7. ENVIRONMENTAL EVIDENCE

7.1. Aim

7.1.1. Following on-site discussion with Sarah Gibson (Southwark Borough Council), Jane Sidell (English Heritage Regional Science Advisor) was consulted about the efficacy of sampling the truncated levels of an organic alluvial silt sequence that overlay natural sands and gravels at the base of Trench 1. It was agreed that within available resources a palaeo-environmental assessment supported by radio carbon dates would be produced.

7.1.2. The main stratigraphic sequence was sampled to evaluate the preservation of palaeo-environmental data and assess the potential for providing information about the tidal foreshore development (cf. Siddel *et al.* 2000; 2002). In particular importance was attached to assessing the potential of determining fresh vs brackish water conditions in relation to defining the tidal reach of the Thames at datable horizons.

7.2. Samples

7.2.1. Two contiguous monoliths (1000 and 1001), were taken through the base of the exposed alluvial sequence in Trench 1 (**Fig.2**) and following description were subsampled. Samples were removed for consideration of pollen at 2, 4 and 8cm intervals, of which eight were selected for assessment.

7.2.2. The remaining undisturbed sediment above the natural sand (context **111**) was completely removed as seven bulk samples of between 200 and 350ml. These comprised three samples from the upper alluvial deposit (contexts **108**, **113**), which were processed for molluscs and waterlogged material. Four samples from the lower sequence (organic silts and alluvium with wood fragments; contexts**110** and **114**) were processed and assessed for waterlogged remains.

7.3. Summary of Environmental Evidence

7.3.1. A detailed assessment of the environmental evidence is provided in **Appendix 3.** The following section provides a brief overview only.

7.3.2. Assemblages of palaeo-environmental data do not survive in the organic silt horizon, and pollen is poorly preserved. The deposit is a fine detrital peat forming on dry alder and light-wood covered floodplain. This deposit has been radio carbon dated to 1520-1260 BC.

7.3.3. The sequence is sealed by fine-grained minerogenic alluvium. Although there is some truncation, the pollen evidence indicates that any erosion was minimal and the assemblages from the humic silts to minorogenic silts indicate a gradual change of increasing wetness.

7.3.4. The date of the overlying alluvium is probably of the Roman Period or slightly earlier, however, a closer date will not be possible to determine with any certitude. We may infer from the assessment of the environmental assemblages that this may be later prehistoric. The environmental data (snails and waterlogged remains) seem to indicate that freshwater conditions prevailed on the Site within the then tidal reach of the Thames.

8. CONCLUSIONS

8.1.1. Natural sands and gravels were encountered in three of the four trenches excavated (Trenches 1, 3-4) at various depths, dependent on the degree of post depositional truncation. These deposits were recorded at –0.74m and –0.67m (aOD) respectively in Trenches 1 and 4, though at +0.74m (aOD) in Trench 3 where preservation was better.

8.1.2. The only deposits and finds of archaeological significance were recorded in Trench 1, partially preserved in the northern extent of the trench despite widespread modern disturbance in the area. The archaeological features and deposits included a short section of mortared brick wall of 18^{th} – 19^{th} century date. The wall was sealed by a number of Post-medieval redeposited alluvial clays (backfill) containing Post-medieval material and residual 14^{th} – 18^{th} century pottery. The one residual sherd of Romano-British pottery recovered from the evaluation reflects the general lack of Romano-British finds in the vicinity, the site being *c*. 600m to the west of the core of Romano-British settlement in Southwark.

8.1.3. Below the wall a number of alluvial, minerogenic silts and clays overlaid natural sands and gravels and contained 16^{th} – 18^{th} century pottery, cbm, waterlogged wood deposits (driftwood) and leather fragments. The lower sections of the alluvial deposits were humified in nature and were therefore extensively sampled. The results of the environmental analyses indicate the change from humic to mineral sediments is most probably due to rising relative sea-level which caused ponding back of river systems and final brackish water inundation. This occurred within the Middle Bronze Age, as dated from a radiocarbon sample from an alder twig at the base of the humic sequence (3141±45 BP) indicating a date for the inception of peat at 1520-1260 BC.

9. BIBLIOGRAPHY

Andersen, S. Th. 1970. The relative pollen productivity and pollen representation of North European trees, and correction factors for tree pollen spectra. *Danm. Geol. Unders.* Ser I I 96, 99

Andersen, S. Th. 1973. The differential pollen productivity of trees and its significance for the interpretation of a pollen diagram from a forested region, in Birks, H.J.B and West, R.G. *Quaternary Plant Ecology.* Oxford, Blackwell, 109-115

Bennett, K. D., Whittington, G. and Edwards, K.J. 1994. Recent plant nomenclatural changes and pollen morphology in the British Isles, *Quaternary Newsletter* 73, 1-6

Bronk Ramsey C. 1995 Radiocarbon Calibration and Analysis of Stratigraphy: The OxCal Program *Radiocarbon* 37, 425-430

Devoy, R.J.N. 1977. Flandrian sea-level changes in the Thames estuary and implications for land subsidence in England and Wales,. *Nature* 270 (5639), 712-715

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

Devoy, R.J.N. 1980. Post-glacial environmental change and man in the Thames estuary: a synopsis, in Thompson, F.H. (ed.) *Archaeology and Coastal Change* Occasional paper Soc. Antiqs. New ser. 1, 134-148

Devoy, R.J.N. 1982. Analysis of the geological evidence for Holocene sea-level movements in south-east England, *Proceedings Geologists Association* 93, 65-90

Devoy, R.J.N. 2000. Tilbury, The Worlds End site (Grid Reference TQ 64667540)'. in Sidell, J. and Long, A.J. IGCP 437: *Coastal change during sea-level highstands: The Thames estuary*. Publ. Env. Research Centre, University of Durham,40-49

Evans, J.G. 1972. *Land Snails in Archaeology.* London, Seminar Press

Boycott, A.E., 1936. The habitats of freshwater Mollusca in Britain, *Journ. Animal Ecology* 5, 116-86

Davis, A., Scaife, R. Sidell, J. and Wilkinson K. unpubl. Environmental assessment (from post excavation assessment of 127 Stamford Street). MoLAS

Gale, R. and Cutler, D. 2000 *Plants in Archaeology,* Westbury and Royal Botanic Gardens, Kew

Hodgson, J.M. 1976. *Soil Survey Field Handbook.* Harpenden, Soil Survey Technical Monograph No. 5

Mook, W.G. 1986. Business meeting: recommendations/resolutions adopted by the twelfth International Radiocarbon Conference. *Radiocarbon* **28**, 799

Moore, P.D. and Webb, J.A. 1978. *An illustrated guide to pollen analysis*. London, Hodder and Stoughton

Moore, P.D., Webb, J.A. and Collinson, M.E. 1991. *Pollen analysis.* Second edition. Oxford: Blackwell Scientific

Pearson, G.W. and Stuiver, M. 1986. High-precision calibration of the radiocarbon timescale, 500-2500 BC, *Radiocarbon* 28, 839-862

Pearson, G.W., Pilcher, J.R., Baillie, M.G.L., Corbett, D.M. & Qua, F. 1986. High precision ^{14}C measurement of Irish oaks to show the natural ^{14}C variations from AD 1840-1510 BC. *Radiocarbon* 28, 911-34

Sidell, J., Wilkinson, K. Scaife, R. and Cameron, N. 2000. *The Holocene evolution of the Thames; archaeological excavations (1991-1998) for the London Underground Limited Jubilee Line Extension project.* London, Museum of London Archaeological Service Monograph 5

Sidell, J., Cotton, J., Rayner, L., and Wheeler, L., 2002 *The Prehistory and topography of Southwark and Lambeth.* Museum of London Archaeol Service Monogr 14

Stace, C. 1991. *New flora of the British Isles*. Cambridge: Cambridge University Press.

Stockmarr, J. 1971. Tablets with spores in absolute pollen analysis, *Pollen et spores* 13, 614-21

Stuiver, M.J. and Pearson, G.W. 1986. High-precision calibration of the radiocarbon time-scale, AD 1950-6000 BC, *Radiocarbon* 28, 805-38

Stuiver, M. and Reimer, P.J. 1986. A computer program for radiocarbon age calculation, *Radiocarbon* 28, 1022-1030

Stuiver, M.A., Long, A. and Kra, R.S. (eds), 1993. Calibration Issue, *Radiocarbon* 35

Tauber, H. 1965. Differential pollen dispersion and the interpretation of pollen diagrams. *Danm. Geol. Unders.* II 89,1- 69

Tauber, H. 1967. Investigation of the mode of pollen transfer in forested areas. *Review Palaeobotany Palynology* 3, 277-287

Thomas, C. and Rackham, J. 1996. Bramcote Green, Bermondsey: A Bronze Age trackway and palaeo-environmental sequence, *Proceedings of the Prehistoric Society* 61, 221-253

Wessex Archaeology 1999 *Stamford House, 1 Stamford Street, London SE1: Archaeological desk-based assessment*. Unpublished client report No. 46606.02

Wessex Archaeology 2003 *Stamford House, 1 Stamford Street, London SE1: Specification for an Archaeological Evaluation*. Unpublished Project Design No. 53400.01

Wilkinson, K.N, Scaife, R.G and Sidell, J.E. 2000. Environmental and sea-level changes in London from 10,500 BP to the present: a case study from Silvertown. *Proceedings of the Geologist's Association* 111, 41-54

APPENDIX 1 – ARCHIVE INDEX

File No.	NAR Cat.	Details	Format	No. Sheets
1	-	Index to Archive	A4	1
1	-	Desk-Based Assessment	A4	23
1	-	Project Specification	A4	11
1	A	Client Report	A4	33
1	B	Day Book (photocopy)	A4	9
1	B	Trial trench records	A4	7
1	B	Context Records	A4	15
1	B	Levels (photocopy)	A4	4
1	B	Graphics Register	A4	1
1	B	Site Graphics	A3	2
1	D	Photographic Register	A4	8
1	E	Environmental Sample Register	A4	1
1	E	Environmental Sample Records	A4	2
1	E	Pollen and Diatom Report	A4	9
1	C	Context Finds Records	A4	5
1	B	CD-Rom Site digital photo's	-	1
2	B	Site Graphics	A1	5
3	-	B+W Negatives	35mm	-
3	-	Colour slides	35mm	-
FINDS	1 BOX			

APPENDIX 2 – TRENCH SUMMARY TABLES

All archaeological deposits/features and contexts from which environmental deposits were taken are shown in **bold**
All (+) indicate deposits/features not fully excavated
'Depth' equals depth from the present ground surface

Trench No. 1	**Ground Level (m aOD): 3.16**	**Dimensions: 10.60 x 9.30m Max. depth: 4.77**
Context	**Description**	**Depth (m)**
100	Modern disturbance – concrete slab overlying very dark brown silty clay with rubble backfill within wide and deep cuts for concrete stantions (0.45 – 0.65m wide).	0 – 1.80
101	Modern backfill – light greyish brown clay with rare flints (<30mm), cbm and post-medieval pottery. Backfill to stantion base cut. Above 102.	1.10 – 1.70
102	Modern backfill – very mixed layer of dark greyish-brown 'gritty' silty clay with common post-med brick, charcoal; also clay pipe, shell, slate, pottery. Backfill to stantion base cut. Below 101.	1.70 – 1.90
103	Brick wall – a short section of Post-medieval wall (18th/19th century), aligned north/south in north of trench. Predominantly 'headers' in wall elevation. Bricks 8.5" x 4.25" x 2.5" in size with a creamy white 'gritty' lime mortar (*c*. 10mm thick). Sealed below **105**.	0.80 – 1.70
104	Modern backfill – fill of stantion base cut. A small dump of redeposited mid brown clay with rare mortar frag's and sub-angular flint gravel (<40mm). Moderate charcoal flecks and lumps. Good definition all round due to lighter colour. Cut by stantion cut 115.	1.70 – 2.00
105	Modern backfill – dark blue/grey redeposited clay. Contained common degraded wood mottles and wood frag's up to 0.20m long (<50mm, mostly 15mm diameter). Also contained shell, tile frag's, pottery. Overlies wall **103**. Below **104**.	1.70 – 1.95
106	Modern backfill – dark orange/brown silty clay with very common mid-grey clay mottles. Contained rare wood frag's (<15mm diameter). Very distinctive iron stained clay in NE corner of Tr.1 only. Fill of modern stantion base cut. Below 102.	1.80 – 2.04
107	Modern backfill – very dark grey coarse 'gritty' clay with rare sub-angular flint (<40mm). Contained rare tile frag's, pottery, shell. Fill of modern stantion base cut. Below **106**.	2.04 – 2.20
108	Alluvium – light blue/grey gleyed clay with sparse to moderate degraded wood frag's (<40mm diameter). Contained pottery, tile, shell, bone, leather. Below **105**.	1.80 – 3.16
109	Alluvium – light yellowish brown clay, homogenous, sterile, no inclusions or finds. Only recorded to the south of modern stantion trench cut recorded in the centre of the trench. Above 105, below modern disturbance.	1.00 – 1.70
110	Humified clay – very dark reddish brown silty clay with abundant degraded wood frag's, inc. twigs and branches (<0.10m, mostly <20mm diameter). Below 113.	3.40 – 3.60
111	Alluvium – blue/grey sandy clay with rare sub-angular flints (<40mm, esp at basal 0.10m). rare wood frag's (<20mm diameter, esp. at upper 0.15m). Grades into coarse sand at base, admixture with 114 at upper interface and 112 at lower interface. Below 114.	3.90 – 4.02
112	Natural gravel – light to mid bluish grey coarse sand with abundant, moderately well sorted blue/grey to blue/white sub-angular to sub-rounded flint gravel (<40mm). Below 111.	4.02 – 4.77(+)

APPENDIX 2 – TRENCH SUMMARY TABLES

Trench No. 1	Ground Level (m aOD): 3.16	Dimensions: 10.60 x 9.30m Max. depth: 4.77
Context	**Description**	**Depth (m)**
113	Alluvium – light blue/grey gleyed clay with very rare sub-angular flint gravel (<30mm). Common small molluscs in upper *c*. 0.20m of context. Below **108**.	3.16 – 3.39
114	Humic clay – light greyish brown humic clay with moderate to common wood frag's (<20mm diameter). Becomes lighter towards base where it blends with 111. Less wood frag's and not as dark brown as 110 above. Below 110.	3.60 – 3.86
115	Modern cut for concrete stantion base in the NE of the trench. Cuts 104. Filled with 101-102, 106-107.	0.80 – 2.18

Trench No. 3	Ground Level (m aOD): 3.06 0- 3.24	Dimensions: 7.00 x 7.00m Max. depth: 3.14
Context	**Description**	**Depth (m)**
300	Modern disturbance – a 0.24m thick deposit of reinforced concrete capping a dark grey mixed backfill layer of clay and sand with common brick and concrete frag's, iron obj's, breeze blocks, etc.	0 – 2.32
301	Natural sand – mid to dark orange/brown medium sand. Very distinctive due to iron staining. Some modern material compressed into upper 0.10m. Below 300.	2.32 – 2.52
302	Natural gravel – mid orange/brown and reddish brown. Well sorted fine sub-angular to sub-rounded flint gravel (<30mm). Matrix of coarse mid-dark orange/brown sand. Discernible through iron staining. Below 301.	2.32 – 2.52
303	Natural sand – pale yellow fine sand. No coarse components, pure sand. Lenses of *c*. 5mm thickness discernible. Iron staining in upper levels. Below 302.	2.52 – 2.68
304	Natural gravel – pale yellow fine sand matrix, darker than 305. Moderate to common sub-angular to sub-rounded flint gravel (<40mm). Discernible through darker and redder colour than other deposits. Below 304.	2.68 – 2.80
305	Natural gravel – pale yellowish brown very coarse sand matrix with common sub-angular to sub-rounded flint gravel (<60mm). More sandy and less coarse than 306. Below 304.	2.80 – 3.02
306	Natural gravel – light yellowish brown very coarse sand matrix with abundant, well sorted, sub-rounded flint gravel (<80mm, mostly <40mm). Very good interface with 305 due to this layers relative abundance of coarse components. Some dark orange/brown iron staining in places.	3.02 – 3.14 (+)

APPENDIX 2 – TRENCH SUMMARY TABLES

Trench No. 4	Ground Level (m aOD): 0.38	Dimensions: 5.60 x 5.50m Max. depth: 1.42
Context	**Description**	**Depth (m)**
400	Modern – concrete slab overlying 'scalpings', a modern bedding layer for the modern basement floor.	0 – 1.05
401	Natural sand – a light grey coarse sand matrix with moderate to common blue/white sub-angular to sub-rounded moderately well sorted flint gravel (<40mm).	1.05 – 1.42 (+)

Trench No. 5	Ground Level (m aOD): 0.20	Dimensions: 7.0 x 7.0 Max. depth: 1.40
Context	**Description**	**Depth (m)**
500	Modern concrete and disturbance – concrete slab overlying modern 'hoggin', a loose dark orange/brown gravel incorporated as a base to the modern basement concrete slab floor. Machine excavation of a slot in the middle of the trench to *c*.-1.80m (aOD) failed to uncover any archaeological stratigraphy or natural geology.	0 – 1.40 (+)

APPENDIX 3 – DETAILED ENVIRONMENTAL REPORT

Contents

Tables

1 RESULTS

1.1. Sedimentary sequence

1.1.1 The undisturbed sediments were cleaned, examined and described following the terminology outlined by Hodgson (1976), to provide more detailed interpretation of the sequence formation.

1.1.2 The sequence can be summarised as follows (see Table 1 below) :

context **108**: alluvial silt with aquatic shells
context **113**: alluvial silt with bands of aquatic shells
context **110**: humic and organic silt, with highly humified matter, probably a former semi-terrestrial surface
context **114**: massive alluvial clay penetrated by alder roots
context **111**: sandy parent material penetrated by fine alder roots

1.1.3 It indicates a cessation or reduction in sedimentation (context 110) and the organic development and vegetation growth. This semi-terrestrial surface is later slighted, and inundated by fine-grained alluvial sediments probably from over-bank flooding along the Thames foreshore.

Table 1: Sediment descriptions and pollen sample location

NB. Samples in **bold** sampled for pollen assessment and diatom presence

Depth (mm)	***OD to top of unit***	***Context***	***Pollen***	***Diatoms/ Forams***	***C14***	***Wood***	***S = snail P =plant***	*Summary Description*
Monolith 1000								
0-110	0.13m	108	0cm **4cm** 8cm	0cm **4cm** 8cm			S 0-110	Dark grey (10YR 4/1) stonefree massive silty clay with zones of medium distinct dark greenish grey (gley 1 3/10GY) gley, common fine charcoal, abundant molluscs including Planorbids, *Pisidium* sp. and *Lymnaea/Bithynia*. Gradual boundary.
110-260	0.20m	113	12cm 16cm **20cm** 24cm	16cm **20cm** 24cm			S 110-260	Dark olive grey (5Y 3/1) stonefree massive silty clay with many molluscs (as above), waterlogged plant matter (?*Phragmites*) present. Clear boundary.
260-330	- 0.13m	113	28cm 32cm	32cm			SP260-330	Greyish green (gley 1 4/2) stonefree silty clay oxidising to dark greyish brown (10YR 4/2) silty clay, mollusc free alluvium, with some fine charcoal. Sharp boundary.
330-350	- 0.20m	110	34cm		35cm			Very dark grey (7.5YR 3/1) humic and organic silty clay with no vegetation matter apart from woody (very dark reddish brown) elements visible, but with common medium, well-defined, highly humified patches (rotted woody fragments) and medium pieces of roundwood with larger roundwood fragment s*c.* 16mm diameter at base (520-560mm). Sharp boundary.
Monolith 1001								
350-560			**36cm** 38cm 40cm 42cm **44cm** 46cm 48cm 50cm **52cm** 54cm	**36cm** 40cm **44cm** 48cm **52cm**	54cm	48-58cm 52-56cm	P350-400 P400-550	
560-760	- 0.43m	114	56cm **60cm** 64cm **68cm** 72cm	56cm **60cm** 64cm **68cm** 72cm		65cm 70-74cm	P560-660 P660-7600	Very dark grey (5Y 3/1) massive clay with many roundwood pieces (14mm diameter), rare waterlogged plant matter (leaf), clear boundary.
760-1050	- 0.63m	111	76cm 80cm 88cm 96cm 104cm	60cm **88cm** 96cm		root 88cm		Dark greenish grey (gley 2 4/2) oxidising to dark greyish brown (2.5Y 4/2) sandy loam with common vertical roundwood pieces to 4mm diameter possible roots) to a depth of 900mm, beyond which the sandy clay loam is uniform and inclusion free excepting some small rounded flint pieces. Natural sand facies.

1.2 Waterlogged and charred plant remains

1.2.1 The samples were processed for the recovery of both waterlogged remains and molluscs. Laboratory flotation was undertaken with flots retained on a 0.25mm mesh and residues on a 0.5mm mesh. All the material floated and no residue was left. The flots were scanned under a low power stereo-binocular and the presence of waterlogged material and molluscs noted. The results are summarised below (**Table 2**).

1.2.2 The waterlogged material was briefly identified and the samples stored within Industrial Methylated Spirits (IMS). Those containing molluscs were dried for further analysis.

1.2.3 All the samples produced waterlogged material, although only those from the upper non organic alluvium (contexts **108** and **113**) produced any quantity of identifiable material. The identifiable, seeds and plant macrofossils are recorded in **Table 2**.

Upper Alluvium (context 108 and 113)

1.2.4 Three samples from the upper alluvium produced small amounts of waterlogged material, but high proportion of which were identifiable, i.e. seeds and buds. They also produced a few small fragments of wood charcoal and sample from the upper part of **113** (sample 1003) produced one rachis fragment of free-threshing wheat (*Triticum aestivum* sensu lato).

1.2.5 The waterlogged remains were predominantly of species associated with wet ground and scrub/woodland, although some open conditions were also indicated. All produced evidence for buttercup (*Ranunculus* sp.), and common nettle (*Urtica dioica*), as well as possible buds of willow (*Salix* sp.), pondweed (*Potomogeton* sp.) and water-plantain (*Alisma* sp.). Other remains included seeds of watersides such as water-pepper (*Persicaria hydropiper*), and winter cress (*Barbarea vulgaris*) a species also associated with hedges. While seeds of elder (*Sambucus niger*) are indicative of hedges or scrub.

1.2.6 Samples from the alluvium context **113**, also produced seeds of orache (*Atriplex* sp.), tormentil (*Potentilla* sp.) and bramble (*Rubus* sp.). That from the lower part of the context **113** (sample 1008), also produced seeds of water-celery (*Apium nodifolurum*) and cones of alder (*Alnus glutinosa*) and a probable seed of *Ceratophyllum demersum*, a species associated with ponds, ditches and slow-flowing rivers. Water crowfoots (*Ranunculus* subgen *Ranunculus*) are present in the upper part of **113** and in **108** and tend to be found within open exposed environments with slow flowing water.

*Organic silt (context 110) and alluvial clay (context **114**)*

1.2.7 The remaining samples from the lower parts of the sequence produced high numbers of fragments mainly of roots, but also some wood and bark from alder (*Alnus* sp.), but very little other identifiable material.

1.2.8 The dark humic organic clay, context **110** also produced some seeds of buttercup (*Ranunculus* sp.) and one of thistle (*Cirsium/Carduus* sp.). In addition it contained a few seeds associated with more scrub or woodland conditions seeds of guelder rose/wayfaring tree (*Viburnum opulus/lanata*) and elder (*Sambucus niger*).

1.2.9 Samples from the base of the organic silt (**110**, sample 1005), and top of alluvial clay (**114**, sample 1006) both produced single finds of elder seed. The lower part of alluvial clay **114**, contained the alder roots, wood and bark, but contained no identifiable seeds.

Table2: Assessment of the charred plant remains and charcoal

KEY: + present ++ frequent +++ very frequent ++++ highly frequent

Sample	1007	1006	1005	1004	1008	1003	1002
Context	114	114	110	110	113	113	108
Monolith	1001	1001	1001	1001	1000	1000	1000
Depth (cm)	66-76	56-66	40-56	35-40	26-33	11-26	0-11
Original Sample Size	0.35 ltr	0.30 ltr	0.20 ltr	0.30 ltr	0.35 ltr	0.30 ltr	0.20 ltr
Flot Size	150 ml	150 ml	200 ml	150 ml	20 ml	30 ml	30 ml
No Residues	-	-	-	-	-	-	-
Charred free-threshing rachis frg.						**1**	
Charcoal					+	+	+
Musci						1	
Ceratophyllum demersum					1		
Ranunculus subgenus Ranunculus				3	3		
Ranuculus subgenus Batrachium					1	2	2
Urtica dioica					1	3	1
Alnus glutinosa female cones frgs.					2		
Chenopodium album					1		
Atriplex sp.					1	1	
Persicaria hydropiper							1
Rumex sp.					1		
Rumex sp. (bracts)						1	
? Salix sp. (buds)					2	5	2
Babarea vulgaris						1	1
Rubus sp.					1	1	
Potentilla sp.					1	1	
Apium nodiflorum					1		
Mentha sp.							
Sambucus nigra		1	1	1		5	6
Viburnum opulus/lantana				2			
Cirsium/Carduus sp.				1			
Articum sp.						1	
Alisma sp.					1	1	2
Potamogeton sp. Medium					1	2	7
Carex sp. (trigonous)					1	1	
Wood fragments	++++	++++	+++	+++	++	+	+
Bark Fragments	++	++	++	+			
Insects	-	-	-	+	++	++	++
Fishbone					1 eel		
Vivianite							+

1.3 **Waterlogged wood**

1.3.1 Five samples of waterlogged wood removed from the monolith sequence (**Table 3**) were examined and identified to genus level.

1.3.2 The wood consisted of degraded roundwood and tree root. Thin sections were prepared using standard methods (Gale and Cutler 2000) and examined using a Nikon Labophot-2 microscope at magnifications up to x400. The anatomical structures were matched to reference slides of modern wood.

Table 3: Summary of waterlogged wood samples

Sediment facies	*context*	*depth (mm)*	*identification and description*
Organic silt, highly humified	110	at 480-500	alder (*Alnus glutinosa*), probably roundwood
		at 520-560	alder (*Alnus glutinosa*), roundwood
Alluvial clay	114	at 650	alder (*Alnus glutinosa*), 3 pieces of root, the thickest piece 15mm in diameter with 5 growth rings
		at 700-740	alder (*Alnus glutinosa*), 7 pieces, probably root, the thickest 8mm in diameter
Sand (Natural)	111	at 88cm	alder (*Alnus glutinosa*), root, diameter 6mm, about 3 growth rings

1.4 **Pollen (Fig.3)**

1.4.1 The full sedimentary sequence was sampled at 4 and 8cm intervals (**Table 1**), and a total of 30 samples were retained. Samples were taken at 4cm intervals through the main alluvial facies (contexts **108**, **113** and **114**), at 2cm intervals through the organic silts (**110**), and at 8cm intervals through the sandy parent material (**111**). Eight samples spanning the full sequence were selected for assessment.

1.4.2 These samples comprised humic peat/silts overlain by minerogenic ?alluvium and underlain by a humic sandy silt (see above). It was anticipated that these sediments might yield palaeo-environmental information on the character of the floodplain environment at the time of sediment deposition and of local dry-land vegetation communities within the pollen catchment. Thus, an initial pollen assessment has been undertaken to ascertain whether

a) sub-fossil pollen and spores are present,
b) a preliminary indication of the age of the sediments as a prelude to radiocarbon dating and,
c) potential of the site for producing a more detailed palaeo-environmental reconstruction.

1.4.3 The samples were also examined for diatom preservation which might provide a useful indication of the salinity of the depositional environment i.e. tidal/brackish water or freshwater. This report gives the results of this preliminary pollen and diatom study.

1.4.4 Sampling and description of the stratigraphy was carried out by Dr. M.J. Allen (Wessex Archaeology). Standard techniques were used on samples of 2ml volume (Moore and Webb 1978; Moore *et al.* 1991). Absolute pollen frequencies were calculated using added exotics to known volumes of sample (Stockmarr 1971). Pollen was identified and counted using an Olympus biological research microscope fitted with Leitz optics. The pollen sum counted for each level was variable depending on the state of preservation and the absolute pollen frequencies present. Total pollen sums of between 50 and 150 grains per level were counted.

1.4.5 A standard pollen diagram (**Figure 3**) has been constructed and plotted using Tilia and Tilia Graph. Percentages have been calculated as follows:

Sum =	% total dry land pollen (tdlp) (incl. *Alnus*)
Marsh/aquatic =	% tdlp + sum of marsh/aquatics
Spores =	% tdlp + sum of spores
Misc. =	% tdlp + sum of misc. taxa.

1.4.6 Taxonomy in general follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1991) for plant descriptions. These procedures were carried out in the Palaeoecology Laboratory of the Department of Geography, University of Southampton.

Pollen Preservation

1.4.7 Pollen was very variably preserved in the different lithogenic units examined. Pollen was absent in the basal sample at 88cm, a coarser humic silt with sand (natural). Organic detritus was, however, present indicating the Holocene age of the sediments. The overlying humic peats and humic silt/clay had variable preservation. Context **114** (68cm and 60cm) contained adequate pollen frequencies allowing assessment pollen sums of 150 grains per level to be readily obtained. However, context **110** (organic silt) had small absolute pollen numbers in the order of 2-10,000 grains/ml and counts were obtained only with extreme difficulty.

1.4.8 These samples contain much lignified, vascular wood debris which was not removed by acetolysis preparation. Thus, these levels, although represented in the pollen diagram are only based on rather unsatisfactory pollen total of *c.* 50 grains per sample. This clearly results from the poor pollen preserving conditions of the depositional habitat under a floodplain woodland with high chemical and biological activity. This is a well documented phenomenon for areas of the Thames, with middle and later Holocene dated floodplain peat. The data from these levels should therefore be treated with caution although some useful indications of the past, palaeo-vegetation have been obtained. Above this, the increasingly wetter depositional habitat with increasing minerogenic content resulted in more favourable pollen preserving conditions with absolute pollen frequencies increasing to 68,000 grains/ml in the upper-most sample at 4cm. Taxonomic diversity also increases in these upper levels of contexts **113** and **108** (alluvium). This is also due to the changing taphonomic circumstances with airborne as well as fluvially transported pollen present.

The Pollen Data and Pollen Zonation

1.4.9 Two local pollen assemblage zones have been recognised. These are characterised and described from the base of the profile at 68cm upwards.

1.4.10 ***Zone 1:*** *68cm to 28cm (contexts 114 and 110); Quercus-Alnus-Corylus avellana type. (5 levels).* Trees and shrubs are dominant but with declining percentages throughout the zone. *Quercus* (oak; 56%) is dominant with *Alnus* (alder; 55%) and *Corylus avellana* type (hazel; 18%). There are small numbers of *Tilia cordata* (lindens/lime; peak to 8% at 60cm). Sporadic occurrences of *Betula* (birch), *Pinus* (pine) and *Ulmus* (elm) occur. There are generally few herbs, but with a steadily increasing presence of Poaceae (grasses) expanding to high values in Zone 2 above. There are few wetland taxa with small numbers of Cyperaceae (sedges; <5%). Spores comprise notably of a peak *Pteridium aquilinum* (bracken) in the upper part of the zone. *Polypodium vulgare* is present here but not in Zone 2 above.

1.4.11 ***Zone 2:*** *28cm to 4cm (contexts 108 [lower], 113); Poaceae (2 levels).* This zone is characterised by a substantial expansion of herbs dominated by Poaceae (grasses) which attains highest values in the top level (48%). Herb diversity is also greater than in preceding Zone 1. Cereal type pollen, large Poaceae grains (>45u but not thick walled cereal types) are present and a single record of possible *Secale cereale* (rye) occurred at 20cm. *Chenopodium* type (goosefoots, oraches and glassworts) and *Plantago lanceolata* (ribwort plantain) are present. Trees and shrubs are reduced from Zone 1 although *Quercus* and *Alnus* remain the main taxa present. *Fraxinus excelsior* (ash) and *Salix* (willow) are incoming (<2%) in this zone. Spores of ferns (esp. *Pteridium aquilinum*) decline from Zone 1.

Interpretation and Discussion

1.4.12 It is unfortunate that pollen preservation is highly variable since a clearer representation of the peat forming community would be desirable. However, some useful data has been obtained even though pollen count totals were less than adequate for some levels. Interpretation of the sequence can be viewed in terms of the autochthonous (on-site) habitat and changes brought about by fluctuation in the water table consequent upon regional eustatic changes and the vegetation of the drier and surrounding interfluves.

Dating and sea Level changes

1.4.13 The pollen diagram presented here has been divided into two local pollen assemblage zones. This division, in part, reflects the changing stratigraphy from a more humic deposit to a grey minerogenic alluvial sediment. These stratigraphical changes most likely resulted from late Holocene rising base-levels brought about by regional and local eustatic changes. These eustatic changes are now well documented and this transition from humic sediments to alluvial deposits is a characteristic of the stratigraphy in this region representing late-prehistoric rising base-levels caused by regionally increasing relative sea level during the late-prehistoric, Late Bronze Age and Iron Age periods (Devoy 1977; 1979; 1980; 1982; 2000; Sidell *et al.* 2000; Wilkinson *et al.* 2000). Higher values of Chenopodiaceae pollen in Zone 2 may derive from salt marsh, halophytic communities nearby or downstream.

1.4.14 The distinct transition from organic to inorganic sediments indicates that this transgressive change was accompanied by an erosive episode which may have truncated the upper humic sediment/peat surface. More detailed pollen work would be required to verify this but it can be noted that the palynological changes across this horizon are not abrupt thus indicating that sediment loss and time-span involved may not be great. Typically, for this region, Neolithic and Bronze Age peats formed on the floodplain under alder carr woodland of varying degrees of wet/dryness. This woodland became diminuted by increasing local wetness as sea levels ponded back the local river systems creating wet poor grass-sedge fen and reed swamp. This, in many instances, was superceded by more extensive alluviation on the floodplain (Wilkinson *et al*. 2000; Scaife in Sidell *et al.* 2000) during the Late Bronze Age to Romano-British periods depending on altitude (metres above Ordnance Datum). It is suggested that this profile represents the late Holocene (late prehistoric and early historic), final increase in relative sea level. This saw changes from an established, floodplain woodland of dry character (hence the poor pollen preservation) dominated by alder but with oak and hazel, to a more open herb dominated grass rich habitat.

1.4.15 Alternatively, late-prehistoric woodland clearance may also have resulted in rising water tables and increased soil erosion, sediment run-off and floodplain alluviation. Both eustatic and anthropogenic events are well documented and may have occurred at the same time, in the Late Bronze Age to Iron Age.

The vegetation of the drier zones

1.4.16 It is likely that oak and hazel were constituents of the floodplain community (during Zone 1) but may also have formed woodland on the interfluves along with lime (*Tilia cordata*), or on deeper soils on the lower valley sides. However, lime was most probably the locally dominant dry-land woodland since, the importance of its pollen in spectra is markedly under represented (Andersen 1970; 1973). This tree is entomophilous and flowers during the summer when other forest trees are in full leaf. Both factors restrict the dissemination of its pollen. This, therefore, implies that it was more important in the environment than the pollen data would suggest. Furthermore, the importance of alder (and possibly oak and hazel) on the floodplain may have also influenced the pollen taphonomy since it is known that floodplain woodland may act as a filter and hindrance to pollen input to the depositional from greater distances from the pollen catchment/interfluves (Tauber 1965; 1967). Although percentages here are small, this is in part due to the values of ?on-site alder and to the possibility that the sample site may have been at some distance from its growth.

1.4.17 The reduction in all trees and shrubs marking the change form pollen Zone 1 to pollen Zone 2 reflects the changing local hydrological conditions discussed above. The change to a more open herb environment (Zone 2) demonstrates change from floodplain woodland to grass dominated floodplain. However, the opening of the environment will have extended the pollen catchment and along with the input of fluvially derived pollen has resulted in a much greater diversity of herb pollen.

1.4.18 This includes possible halophytes from salt marsh habitats (goosefoots, oraches, spurrey, aster) indicating some brackish water/tidal influences and typical weeds which can be indicative of human activity. Of note is the small number of cereal pollen which whilst not regarded here as highly significant, do evidence arable cultivation within the pollen catchment.

1.4.19 The following key points can be extracted from this pollen assessment.

- Although radiocarbon dating will establish the age of the profile, comparison of this sequence with other local data suggest a late prehistoric to early historic age i.e. Late Bronze Age to perhaps Romano-British.
- Pollen was present in 7 of the 8 samples analysed. Pollen was absent in the basal humic sandy silt (context **111**).
- Pollen was generally very sparse in context **110** and counting was laborious even to attain the small counts obtained. This poor preservation is attributed to the dry characters of the floodplain woodland under which these humic sediments accumulated. That is, alder with possibly oak and hazel. Samples contained much wood/vascular debris.
- Two pollen assemblage zones have been recognised. The lower Zone (1) is tree and shrub dominated with oak, alder and hazel most important. *Tilia cordata* is also present and may be under represented in the pollen spectra for a number of reasons (noted above). It seems likely that this was dominant on well drained interfluve soils.
- There is no evidence of human activity during Zone 1 (contexts **108** [lower] and **113**).
- The change from Zone 1 to Zone 2 reflects increasing wetness of the site culminating in grass (?sedge) fen or floodplain grassland.
- The change from humic to mineral sediments is most probably due to rising relative sea-level which caused ponding back of river systems and final brackish water inundation.
- The increasing opening of the habitat increased the pollen catchment as well as introducing a fluvial component through over-bank deposition of sediments. This may include evidence of halophytic/salt marsh plants.
- Zone 2 contains evidence of cereal cultivation, albeit small.

1.5 Diatoms

1.5.1 The eight samples analysed for pollen have also been examined for the presence or absence of diatoms. If present, these microfossils may provide a valuable indication of the saline or freshwater status of the environments in which sediments are deposited.

1.5.2 Preparation used digestion of humic/organic material using Hydrogen Peroxide. Samples were dried on microscope cover-slips and mounted on a microscope slide using Naphrax mounting medium. Examination was carried out at high power x400 and x1000 using a biological microscope (see pollen method above).

1.5.2 Of the samples, 3 contained diatoms at 4cm depth (context **108**), 20cm (context **113**) and 68cm (context **110**). The remaining samples (3, 4, 5, 6 and 8 at 36cm, 44cm 52cm context **110**, at 60cm context **114**, and at 88cm context (**111**) were void.

1.5.3 The 4cm (context **108**) and 20cm samples (context **113**) were found to be very rich with well preserved diatoms. They were rare in sample 7 at 68cm.

1.5.4 The samples at 4cm and 20cm (contexts **108** and **113**) have an apparent mixture of freshwater and more significantly, taxa indicative of salt marsh/tidal conditions. These include the centric *Paralia sulcata* and other centrics.

1.6 Land and aquatic molluscs

1.6.1 Samples of between 0.2 and 0.35 litres were processed by laboratory wash-over flotation with flots and residues retained on a 0.5mm mesh (cf Evans 1972). The flots were rapidly assessed by scanning under a x10 - x 30 stereo-binocular microscope to provide some information about shell preservation and species representation. The numbers of shells and the presence of taxonomic groups were quasi quantified (**Table 4**).

Table 4: Snail assessment from the alluvial sequence

	CONTEXT	114	114	110	110	113	113	108
	SAMPLE	1007	1006	1005	1004	1008	1003	1002
	DEPTH (cm)	66-70	55-66	40-56	35-40	26-33	11-26	0-11
	VOLUME (ml)	350	300	300	300	350	300	200
Species/Taxa	Groups							
Lymnaea sp. (inc *truncatula*)	2 + 4 (1)	-	-	-		A	A	A
Lymneae peregra.	2	-	-	-	-	A	A	A
Bithynia tentaculata	4	-	-	-	-	A	A	A
Bithynia tentaculata (operculum)	4	-	-	-	-	B	B	B
Planorbids	1, 2, 3, 4	-	-	-	-	B	A	A
Pisidiium spp.	1, 2, 3, 4	-	-	-	-	C	A	A
Valvata sp.	3 + 4	-	-	-	-	B	A	A
Theodoxus fluviatlis	4	-	-	-	-	C	B	B
Approx **totals**		0	0	0	0	70	350	250

KEY: A = ≥10 items, B = 9 - 5 items, C = < 5 items, (+) = present

Groups:

Group 1 species = Amphibious species

Group 2 species = Catholic aquatic species, tolerating a wide range of conditions, but excluding those conditions tolerated by the amphibious species.

Group 3 species = Ditch aquatic species, mainly occurring in slow-moving plant-rich streams.

Group 4 species = Moving-water species, found in large streams or ponds where currents or wind effect water movement.

1.6.2 Shells were only present in the upper alluvial sequence (contexts **108** and **113**), see Table E2. Shell numbers were very high considering the relatively small volume of samples processed. Shells were abundant (several hundred) in the upper profile (context **108** and top of **113**), and present in suitable numbers for statistically viable analysis in the base of the snail-bearing deposit (base of **113**).

1.6.3 The assemblages were entirely aquatic and no terrestrial or marsh-loving species were present. The assemblage had a relatively restricted taxa, but at least three *Lymnaea* species, three Planorbid species, and several Pisidium species are present. Most of the species or taxa groups include species with either catholic habitat preferences of those preferring moving and which live in water with good current or flow. In contrast few of the species were amphibious, or species of small water bodies or stagnant water. The presence of *Theoduxus fluviatlis* is significant as this only lives in large bodies of fairly rapidly moving water (Boycott 1936, 141), and not in small streams.

1.6.4 There is no discernible change in the assemblage composition through these deposits, only in shell abundance. This may indicate little change in the local fluvial environment, which may suggest a relatively limited period (a few centuries) of accumulation for contexts**108** and **113**.

1.6.5 There is a notable lack of any *Hydrobia* spp. present in these samples which are common on the Thames foreshore, and the Southwark area at present (Allen pers. obs.). The assemblage seems to be one of entirely freshwater species, and similar assemblages seem to have been recovered from St Stephen's East, Westminster (Sidell *et al.* 2000, fig 25).

1.7 Small mammal and fish bones

1.7.1 During the scanning of material a single fishbone of eel was noted from context **113** (sample 1008).

2 ENVIRONMENTAL POTENTIAL

2.1 Sediment sequence

2.1.1 The sediment descriptions allow a basic interpretation of the sequence, the presence of a prehistoric alluviation (context **114**), cessation or reduction in alluviation and the development of an organic horizon in drier conditions. The development of this horizon is, as yet, undated, but in comparison with other similar horizons at about Ordnance Datum in the vicinity (e.g. 127 Stamford Street, Davis *et al.*, unpubl.), is assumed to be probably Late Bronze Age to Iron Age in date. At 127 Stamford Street the top and bottom of a similar, though less humified, sequence were dated to 980-830 cal BC (2770±60 BP, Beta-85222) and 1670-1520 cal BC (3320±60 BP, Beta-85223) respectively. The homogenous, and highly humified nature of this horizon indicates the presence of wet conditions, but essentially of drying out and a biotically active horizon. No pedological features, could, however, be discerned.

2.1.2 There is evidence of possible truncation of the organic silts in the sharp contact and unconformable nature of the overlying alluvium. This may also, therefore, indicate a hiatus and loss within the sediment sequence. Re-establishment of wetter conditions and alluviation is indicated by the deposition of mollusc-bearing alluvium (contexts **113** and **108**). The upper part of the later alluvium (context **108**), is 14-18th century in date but the remaining sequence is undated.

2.2 Radiocarbon dating

2.2.1 Although samples were removed from top and bottom of the organic silt (context **110**) (Table E1), no recognisable plant matter was present, and this was confirmed by the sparse nature of the waterlogged remains. Dating of this matter would have to rely on humic acids, which are know to give an date off-set which is unacceptable in this circumstance.

2.2.2 Waterlogged wood was present, and all was exclusively alder round wood. The samples examined are short-lived material suitable for radiocarbon dating. Further, the presence of alder roots in the alluvium and natural sand, and of twiggy elements in the organic horizon indicate that the woody elements examined are a part of the ecology associated with the development of the organic silt. However, woody fragments were present at the base of this sequence, but none at the top. Only one sample (at 52-56cm. the base of 110), was submitted for AMS dating.

2.2.3 The radiocarbon results are calibrated using OxCal 2.15 (Bronk Ramsey 1995) the maximum intercept method (Stuiver and Reimer 1986) with the datasets from Stuiver and Pearson (1986), Stuiver *et al.* (1993), Pearson and Stuiver (1986) and Pearson *et al*. (1986). All calibrated date ranges are quoted at two standard deviations (95% confidence), with the end points rounded outwards to 10 years (Mook 1986).

2.2.4 The determination from an alder twig from the base of the sequence (3141±45 BP) indicates the inception of peat at 1520-1260 cal BC, i.e. Middle Bronze Age. This is only slightly later (Fig RC1), than the date of 1740-1440 cal BC obtained from the bottom of the 'peat' at 127 Stamford Street. The difference in dates is insignificant and may relate to a number of factors including, local variation in peat inception and the nature of the material dated. If at 127 Stamford Street this was humic acids rather than vegetative material this may record a chronological offset.

Deposit	*Context*	*Material*	*result no*	δC^{13} ‰	*result BP*	*date cal BC*
Stamford House, Blackfriars, Southwark, London						
organic silt	110	*Alnus glutinosa* roundwood	NZA-18152	-28.43	3141±45	1520-1260
127 Stamford Street, Blackfriars, Southwark, London						
top of peat		-	Beta-85222	n/a	2770±60	980-830
bottom of peat		-	Beta-85223	n/a	3320±60	1740-1440

2.3 Waterlogged plant remains

2.3.1 Waterlogged samples taken from this sequence provide the potential to study the vegetation sequence and the nature of the Thames from post-prehistoric to the 18th century.

2.3.2 The earlier part of the sequence (alluvium **114** and the lower part of the organic silt **110**) contained few seeds, and mainly alder roots. It is probable that the waterlogged material results from the rooting of alder from the organic horizon into the underlying alluvium, explaining the absence of seeds from the underlying alluvium. There is no potential for further work here.

2.3.3 Nevertheless the limited evidence for both elder and guelder rose in the upper part of the organic silt (**110**) indicates dry scrub conditions. Buttercup (*Ranunculus* sp.) tends to be found within more open conditions. No seeds of water species were recovered from this context (nor any of the other samples), perhaps indicating relatively dry and biotically active conditions which might explain lack of seed preservation.

2.3.4 The lower part of overlying alluvium silt (context **113**, sample 1008), contained higher numbers of identifiable remains. They showed a mixed range of inputs with some drier open disturbed conditions indicated from the finds of goosefoot and nettle, as well as elements of alder carr and possible buds of willow. Changes occur within and through this alluvial sequence (contexts **113** and 1008).

2.3.5 Seeds of buttercup are present in the lowest sample of context **113**, but none in the upper sample of the same context. The occurrence of both pondweeds (*Potemogeton* sp.) and watercrow feet (*Ranunculus* subgen. Batrachium) increase in the uppermost deposits (the upper part of **113** and **108**). Pondweeds can be indicative of specific water conditions and have the potential to define the nature of the local aquatic conditions. The uppermost part of the sequence (the top of context **113** and context **108**) were dominated by species of streamsides, ponds or slow-flowing rivers. Sedges that are indicative of shallow open parts where water flow is almost at a stand still were thought uncommon.

2.4 Charred plant remains

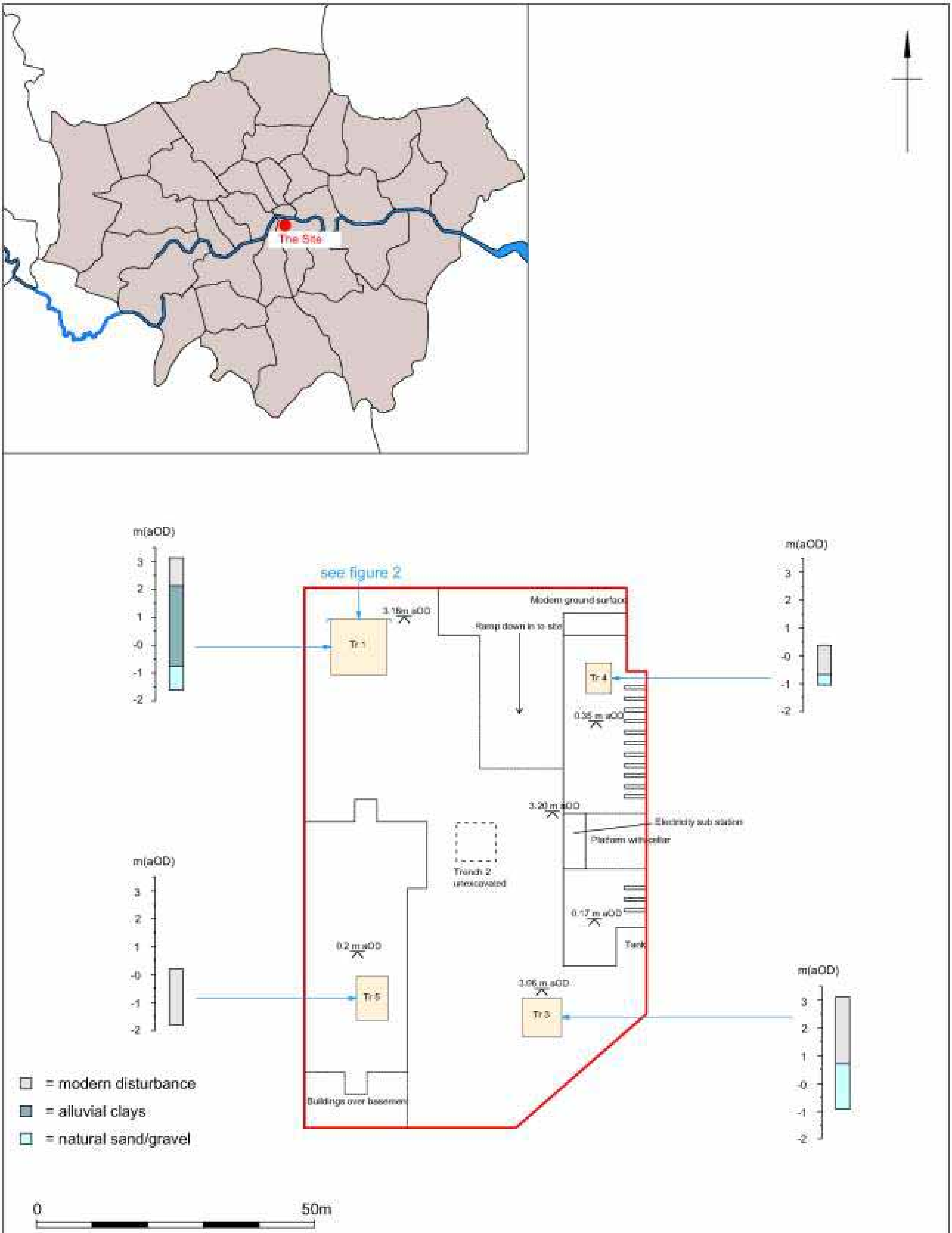
2.4.1 The find of a free-threshing wheat rachis could potentially be of any date from the Neolithic onwards. However while it could conceivably be Roman in date it probably dates from the later Saxon period or to more recent times when free-threshing wheats became a much more dominant crop.

2.5 Pollen

2.5.1 Because of the very poor pollen preservation, it would not be worth carrying out additional pollen work on this profile.

2.6 Aquatic Molluscs

2.6.1 The mollusc assemblages have the potential to define the nature of the local riverine environments. Assessment certainly points to the possibility of these belonging to freshwater facies, rather than a brackish facies within the tidal reach of the Thames. However, freshwater species have been recorded elsewhere in the Thames (e.g. Joan Street, Southwark) in facies which are considered to be formed in brackish water (Sidell *et al.* 2000, 69).

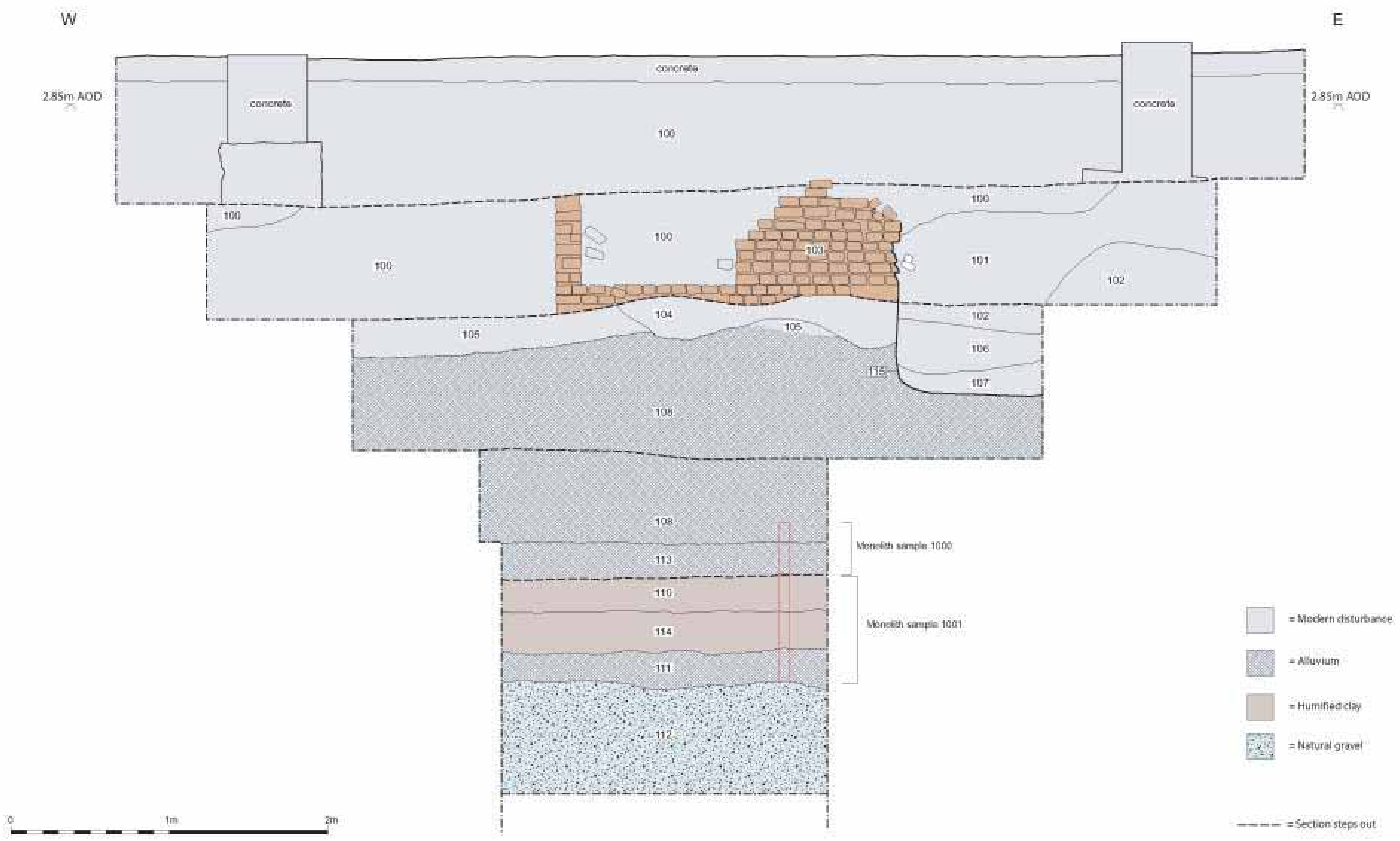


Date:	22/05/03	Revision Number:	0
Scale:	1:2500 and 1:1000 at A4	Illustrator:	MCL
Path:	X:\TENDERS\LONDON\Drawing Office\T7894\Drawing Office\Report Figures\Tenders\03_05\site plan.dwg		

Wessex Archaeology

Site Plan and Location

Figure 1

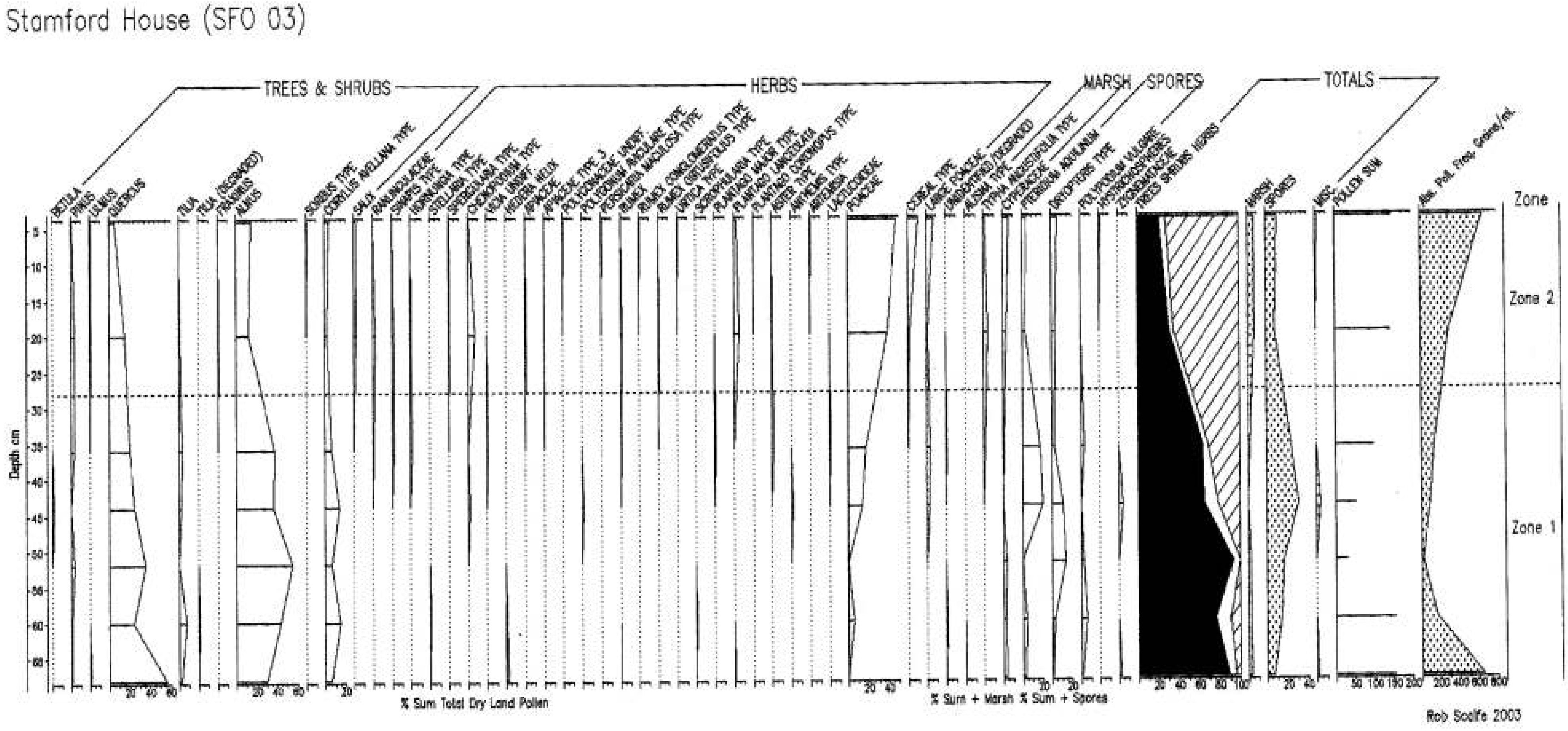


Date:	15/07/03	Revision Number:	0
Scale:	1:25 at A3	Illustrator:	MCL
Path:	X:\projects\London\53400\evaluation\03_07\Figure 2.ai		

Wessex Archaeology

South-facing section across Trench 1

Figure 2



Pollen Diagram

Figure 3

THE TRUST FOR WESSEX ARCHAEOLOGY LTD.
Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel:(01722) 326867 Fax:(01722) 337562
E-mail:info@wessexarch.co.uk www.wessexarch.co.uk