DEEP FOUL SEWER MAIN, OLYMPIC PARK

An Archaeological Evaluation and Watching Brief Report

NGR: TQ 537650 183850:

On behalf of the Olympic Delivery Authority

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RPS Planning
1st Floor West
Cottons Centre
Cottons Lane
London
SE1 2QG

Telephone: 020 7939 8000
Facsimile: 020 7939 8098/99

AOC Archaeology
Unit 7
St Margarets Business Centre,
Moor Mead Road
Twickenham
Middlesex
TW1 1JS.
Telephone: 0208 843 7380
Facsimile: 0208 892 0549

Approved by (Print Name)	Approved by (Signature)	Date

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SUMMARY (NON-TECHNICAL)

This report presents the results for a programme of archaeological watching brief, borehole excavation and evaluation carried out by RPS Planning and Development and AOC Archaeology Group along the extent of the proposed Deep Foul Sewer at the Olympic Park, East London (NGR TQ 537650 183850). The report was commissioned by the Olympic Delivery Authority.

Following the recommendations of the Deep Foul Sewer Main Written Scheme of Investigation for an Archaeological Evaluation and Watching Brief, a single evaluation trench was excavated at the location of the proposed pump station within PDZ3 and watching briefs and geoarchaeological borehole sampling was undertaken at the proposed locations of six shafts along the length of sewer, which extends across much of the park.

The stratigraphic sequence exposed within the evaluation trench illustrated that beneath thick deposits of Victorian and modern made ground there were limited alluvial clay and peaty deposits, similar to those found throughout the Olympic development site.

A total of ten 50cm long and three 100cm long core samples were collected from bore holes at proposed sewer shafts P1, P3, P4, P11 and P13. A single bulk sample was also recovered from a peaty alluvial deposit of identified significance within the evaluation trench. A rapid assessment of the litho- and bio-stratigraphic remains was completed. The assessment of the environmental deposits depicted a variety of changing environments across the site, but failed to uncover evidence of prehistoric or historic activity within the area.

CONTENTS

SECTION 1: INTRODUCTION

1.1 This document is a report for an Archaeological Evaluation, a Geoarchaeological Borehole Survey and Watching Brief prior to and during the construction of the Olympic Parks deep foul sewer main, which will cross the Olympic Park, East London.

1.2 Professional archaeological services were provided by RPS Planning and Development (RPS) and AOC Archaeology Group (hereafter AOC) to the Olympic Delivery Authority (ODA) in respect of the Olympic, Paralympic and Legacy Transformation Planning Applications.

1.3 The site is centred on National Grid Reference (NGR) TQ 537650 183850 and is within the London Boroughs of Newham, Tower Hamlets, Waltham Forest, and Hackney. Overall the site covers an area of 37 hectares.

1.4 The site is bounded to the north and west by the west bank of the River Lea, and by the City Mill River to the east and north-east. The Great Eastern Railway embankment forms the southern boundary whilst the Northern Outfall Sewer, used for a northwest/southeast pedestrian/cycle link called the *Greenway* bisects the site

1.5 The Olympic, Paralympic and Legacy Transformation planning applications have been divided into 15 Planning Development Zones (PDZ). The Deep Foul Sewer runs from north to south crossing Planning Development Zones 2 - 6 of the Olympic Park (Fig 1) and is being constructed to provide a primary service to many of the key elements of the site.

1.6 The sewer will be constructed by boring a 1200mm diameter tunnel through the underlying bedrock, along the 1.8km route falling from a depth of -2.80m AOD the northern end to -8.21m AOD at the southern end. Access to the sewer will be from 13 shafts (P1 - P13), each between 4.5m and 5m in diameter, and from a pumping station in PDZ3 (PSP) where the shaft will be 12.5m in diameter. There will be a high level rising main connecting the pumping station with the northern outfall sewer which crosses PDZ3.

1.7 Because the sewer tunnel will be bored through bedrock, there will be no impact on archaeological deposits from this element of the works. However the construction of the 13 shafts, the pump station shaft and the rising main were thought to potentially impact archaeological remains and it is at these locations that the archaeological investigations were targeted.

1.8 The Written Scheme of Investigation (RPS-AOC 2008) detailed how the Evaluation was to be undertaken. All works were undertaken by a team of professional archaeologists.

1.9 This report conforms to the requirements of Planning Policy Guidance: Archaeology and Planning (DoE, 1990) (PPG 16). It has been prepared in accordance with current best archaeological practice and local and national standards and guidelines:

- English Heritage – Management of Archaeological Projects (EH 1991).

- Institute of Field Archaeologists – Standards and Guidance for Archaeological Field Evaluations (IFA 1994)
- Institute of Field Archaeologists – Code of Conduct (IFA 1997).
- English Heritage Greater London Archaeology Advisory Service Archaeological Guidance Papers 1-6.

SECTION 2: GENERAL OBJECTIVES

2.1 The Institute of Field Archaeologists (IFA, 2001) states that the purpose of an Archaeological Evaluation is to:

- **Determine, as far as is reasonably possible, the nature of the archaeological resource within a specified area using appropriate methods and practices. These will satisfy the stated aims of the project, and comply with the Code of Conduct, Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology, and other relevant by-laws of the IFA.**

2.2 Furthermore the purpose of the investigation is detailed as being:

- **To gain information about the archaeological resource within a given area or site (including presence or absence, character, extent, date, integrity, state of preservation and quality), in order to make an assessment of its merit in the appropriate context, leading to one or more of the following:**

- **the formulation of a strategy to ensure the recording, preservation or management of the resource;**

- **the formulation of a proposal for further archaeological investigation within a programme of research.**

2.3 The protection of archaeological sites forms a significant planning consideration. English Heritage, Greater London Archaeology Advisory Service, noted (1998) that:

- **In the case of evaluation work the planning applicant should be aware that this is only the initial stage of investigation, carried out in support of a planning application to enable an informed decision. Evaluation will seek to define and characterise the archaeological remains on a site. Should significant archaeological remains be discovered and the proposed scheme has an impact on those remains, further archaeological work will be necessary, in the form of either a mitigation strategy for preservation in situ, full excavation or a combination of the two.**

2.4 A field evaluation will thus augment any previous desk-based assessment, and provide all parties, particularly the LPA, with sufficient material information upon which to base informed decisions incorporating adequate heritage safeguards.

2.5 A field evaluation will result in a detailed archive of information that can be used to answer archaeological research questions concerning the buried archaeological heritage of the area or site being investigated, either in support of a planning application or to discharge the relevant archaeological planning condition.

2.6 The fieldwork will provide an assessment of the damage already done to archaeological deposits by previous developments and will also provide an evaluation of the potential effect of the new proposals outlined in the planning application. The evaluation methodology was in accordance with the advice set out in the Department of the Environment, *Planning Policy Guidance 16, Archaeology and Planning* (November, 1990) and will conform to the advice given in the English Heritage (London Region) *Archaeological Guidance Papers* (English Heritage, 1998).

2.7 Finally, it should be noted that, as defined by English Heritage Greater London Archaeology Advisory Service (1998):

- **the objective [of field evaluations] is to define remains rather than totally remove them. Full excavation will therefore be confined to those deposits which have been agreed with the Local Planning Authority archaeological advisor through a project design or site meeting. Within significant levels partial excavation, half-sectioning, the recovery of dating evidence, sampling and the cleaning and recording of structures will be preferable to full excavation.**

2.8 Such excavation as takes place will not be at expense of any structures, features or finds which might reasonably be considered to merit preservation *in situ*.

SECTION 3: GEOLOGY AND TOPOGRAPHY

3.1 The British Geological Survey Sheet 256, North London, indicates that the site lies on alluvium overlying the Lea Valley Gravels. The Lea Valley Gravels were deposited in the Palaeolithic period and overly two further gravels deposits; the Kempton Park Gravels and the Taplow Gravels. Tertiary bedrock in the area is London Clay and Woolwich and Reading Beds.

3.2 Boreholes previously undertaken by the ODA in the locations of the proposed sewer main shafts indicate that the depth of made ground and alluvium are variable. Table 1 (below) shows the approximate depths of deposit at each of the shaft locations:

Shaft No	Ground level (AOD)	Depth of made ground	Depth of alluvium	Level at top of gravels (AOD)
P1	12.50m	8.50m	4.50m	-0.50m
P2	11.00m	8.50m	3.00m	-0.50m
P3	9.00m	4.50m	5.50m	-1.00m
P4	11.25m	7.50m	5.25m	-1.00m
P5	8.25m	5.50m	3.50m	-0.75m
P6	8.50m	6.50m	2.50m	-0.50m
P7	7.25m	6.00m	2.00m	-0.75m
P8	7.50m	6.00m	2.00m	-0.50m
P9	8.00m	5.50m	3.50m	-1.00m
P10	4.25m	1.50m	3.00m	-0.25m
P11	4.75m	3.00m	2.50m	-0.75m
P12	3.50m	1.50m	3.00m	-1.00m
P13	9.00m	6.00m	2.00m	1.00m
PSP/Rising Main	4.75m	2.50m	3.00m	-0.75m

SECTION 4: HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

4.1 The following background information is drawn from Desk Based Assessments produced by MoLAS-PCA (MoLAS-PCA, 2007c, d, e, f & g). For a complete background please refer to these documents. A total of 125 evaluation trenches and eight mitigation areas have already been excavated at the Olympic Park and the results are included, as appropriate, in the background below, although, due to their recent completion, not all results are available.

Geoarchaeological and Palaeoenvironmental Background

4.2 The Olympic Park is situated in the Lower Lea Valley, which contains a sequence of Holocene alluvial silts, clays and peat overlying the Pleistocene river gravel deposits. The alluvial deposits vary in complexity across the site, and represent a range of different wetland and dryland landscapes, dating from the Mesolithic period onwards, which existed on the valley floor. Analysis of these alluvial deposits is being undertaken by MoLAS and English Heritage as part of an ongoing research project and further evaluation and analysis of the landscape is being undertaken as part of the ongoing archaeological strategy at the Olympic Park

Prehistoric (650,000BC – AD43)

4.3 Two axes have been found in the southeast part of the site (PDZ2) dating to the Neolithic and Bronze Age. To the west of PDZ3, on land overlooking the Lea Valley, evidence for prehistoric activity has been identified ranging from the Neolithic to the Iron Age. The presence of wooden structures such as trackways and jetties is possible within the site, as is the possibility for evidence of ritual activity, such as the deposition of votive objects (such as the two axes recovered from PDZ2).

4.4 Flint debitage, pottery and animal bone, tentatively dated to the Neolithic have been identified in PDZ 12 (Trench 12.01, MoLAS-PCA 2008a). Later prehistoric activity has been identified in a number of trenches across the Olympic Park, notably A Late Bronze Age/Iron Age landscape with a roundhouse in PDZ 1 (Trench 1.12, MoLAS-PCA 2007h) a human cremation and pits in on the eastern side of PDZ 3 (Trench 3.17, MoLAS-PCA 2008b) and ditches and wattlework on the eastern side of PDZ 3 (Trench 3.35/3.36, MoLAS-PCA 2008c).

Roman

4.5 It is thought that the Roman Road from *Londinium* (London) to *Camulodunum* (Colchester) traverses PDZ3 based on evidence found at sites to the west overlooking the Lea Valley. However, no evidence of the road was found in evaluation trenches in PDZ3, which were specifically targeted along the projected route.

4.6 Associated with the road is evidence for settlement, farmsteads and cemeteries. Various structural remains are also associated with the road, including a Roman ford to the south of the site and a possible bridge or jetty to the northwest of PDZ3. Although the latter does not lie on the projected alignment of the road, it emphasises the importance of the River Lea during the Roman period, both as a crossing point and as an area to be exploited.

4.7 In the Old Ford area recent excavations indicate that buildings fronted on to the Roman Road, with a network of fields laid out behind it (represented by a series of field boundaries). It is possible that the field boundaries extend into the area of PDZ5.

4.8 Other evidence from the Roman period comes in the form of a herringbone pavement (*opus spicatum*) discovered in 1906. The interpretation of this feature is ongoing but is possibly a ford or, more probably, a floor for a significant building.

4.9 Other chance finds come in the form of a coffin at Wick Lane, an urn cemetery in the location of Old Ford Road and a coin hoard, also at Wick Lane. In 1783 a newspaper reported the discovery of a stone sarcophagus containing a sword, spur and padlock approximately 4 – 5 feet below the surface of the marsh.

Saxon

4.10 No archaeological evidence has been discovered to date within the relevant Planning Development Zones to suggest there is any activity dating to the Saxon period. However, documentary sources suggest that the area was in use during the Saxon period. Place names such as Hackney and Leyton have Saxon origins and it is likely that the Roman Road remained in use during the Saxon period.

4.11 Immediately to the south of PDZ6 a bridge or jetty of Saxon date was recorded in the Stratford Box. It is possible that associated activity may be present within PDZ6, although this would be buried beneath a significant amount of made ground.

Medieval

4.12 A water mill built at Temple Mills by the Knights Templar to the east of PDZ5 between 1185 and 1278 was complemented with a second mill by 1308. The mills were used for the production of various goods, including leather and powder. In the 14th century a bridge was built near to Temple Mills by the Knights.

4.13 A fulling mill dating to AD 1293 was located on the River Lea immediately to the west of PDZ3 and may well date back to 1086 when a ‘mill of Algot’ was refered to in the Domesday Book.

4.14 Medieval features have also been located during excavations at Wick Lane. These probably relate to the 11th century settlement at Old Ford (abandoned in the 14th century) which is thought to extend east, into PDZ3.

4.15 Gissing Place, a large medieval property, existed to the west of PDZ3 in the early 15th century. A gatehouse associated with this building is depicted on an engraving and shows it was largely a mid 15th to early 16th century gothic gatehouse.

4.16 A wattle structure, next to the banks of a former channel of the River Lea, and tentatively dated to the medieval period has been located in the northern part of PDZ3 (Trench 3.38, MoLAS 2007h)

Post-medieval

4.17 Throughout the 16th and 17th centuries land within the footprint of PDZ3 was characterised by marshes and is depicted as such in the maps of Gascoigne (1703) and Rocque (1746). To the north, in PDZ5, a gunpowder mill and a leather mill were added to those already constructed at Temple Mills in the 16th century. The use of the waterways, both as a means of transport and power remained a major theme in the area's later development. However, the majority of the area remained as open marshland with occasional footpaths.

4.18 Not until the map of Stanford in 1862 is there any significant development within PDZ3; the Northern Outfall Sewer designed to carry sewage from central London to Beckton is depicted crossing the site at PDZ3 on a northwest-southeast alignment. Two compensation reservoirs are shown on the 1862 map also, lying between the River Lea and Pudding Mill River. By the time of the 1893 OS map these had been infilled.

4.19 The southern boundary of PDZ5 was clearly defined by the construction of the Eastern Counties Railway in the mid 19th century. Stanford's map also shows the course of the East London Waterworks Canal running parallel to the Hackney Cut, along the west of PDZ5 and the reservoir in PDZ4 to the reservoirs in PDZ3.

4.20 In 1894 Clarke, Nicholson & Coombes confectionary and jam makers built a factory in the southwest corner of PDZ5. The water courses depicted previously are formalised and extend to the south, providing a flow of water to the East London Waterworks reservoir in PDZ4.

4.21 In 1859 the Hope Chemical Works was established and within 10 years had become the leading distillery in Britain for newly imported American crude oil.

4.22 In 1932 Hackney Wick stadium was opened for greyhound and motorcycle racing on Waterden Road.

4.23 Although substantial regeneration of the waterways was undertaken in the mid 20th century, the area remained relatively undeveloped, possibly due to the extensive length of time this work took, but in part due to the few industries that had sprung up in the area producing foul fumes such as the tar and turpentine distillery between the Pudding Mill and City Mill rivers.

4.24 Post-medieval remains have been recorded at a number of locations across PDZ3 including a 18th/19th century boat next to the River Lea (Trench 3.39, MoLAS-PCA 2007j) and wooden revetments of the River Lea and Pudding Mill River.

SECTION 5: AIMS AND OBJECTIVES

5.1 In line with the ongoing archaeological work at the above site, AOC will be adopting the already established aims and objectives, as set out in the generic Written Scheme of Investigation (MoLAS-PCA 2007a). The relevant objectives are set out below:

• To identify Late Pleistocene environmental evidence and late Upper Palaeolithic activity across the site.

• To identify evidence for settlement of prehistoric and historic date, particularly within zones of higher ground not already truncated by quarrying.

• To identify wetland and channel-margin activity of prehistoric date and riverside structures of historic date.

• To identify evidence for the nature and/or date of past land management and exploitation.

• To identify evidence relating to the past landscape, river pattern and changing environment of the site from the Mesolithic onwards.

• To identify evidence for the Roman London to Colchester road and roadside margins.

• To identify evidence for the nature and/or date of past waterways management and exploitation.

• To identify evidence for the presence of the River Lea, Pudding Mill and City Mill Rivers in the past.

5.2 In addition the following questions should be considered:

• When did the River Lea assume its current course along the southwest edge of PDZ3? Is this course the result of 'natural' channel migration or did it originate in past waterway/wetland management activity?

• What evidence is there for early or later medieval exploitation of the area; in particular is there evidence for water inundation (water levels continued to rise throughout these periods) and water management? If so how are these activities characterised? Are there any features or structures, particularly water mills, present within the subject site? Is it possible to determine whether the Pudding Mill River or City Mill River have their origins in the late Saxon era, possibly associated with Alfredian defenses, or partial drainage of the increasingly flooded wetlands.

• Are there any in situ deposits of archaeological significance within the made ground or is it all of 19th/20th century dump and make-up deposits?

5.3 The works will follow the guidance set out in *Archaeological Guidance Paper 3 Standards and Practices in Archaeological Fieldwork In London; Archaeological Guidance Paper 4: Archaeological Reports; Archaeological Guidance Paper 5: Evaluations*. (English Heritage, 1998)

SECTION 6: METHODOLOGY

6.1 The archaeological investigation concentrated on the areas of impact caused by the construction of the Deep Foul Sewer, namely the 13 shafts (P1 - P13), the pumping station shaft and rising main.

6.2 The greatest impact will be caused by the excavation of the pump station shaft and rising main, and as such an evaluation trench was excavated to determine the archaeological potential. It comprised a single 4m x 4m trench within the footprint of the proposed rising main towards the south end of PDZ3.

6.3 It was originally proposed to conduct an archaeological watching brief on excavation of the 13 shafts, however it became clear that the method of construction only enables a watching brief to be carried out during the first three metres of ground reduction. As there was in excess of 3m of made ground at the majority of locations, watching brief at these locations was likely to be unproductive. As such a watching brief was only conducted in locations where the made ground was thought to be 3m or less, or where historic features may be present.

6.4 In order to mitigate against the impacts caused by the shafts on the buried landscape, geoarchaeological boreholes were excavated. These boreholes were undertaken in locations which have not been assessed as part of the ongoing archaeological strategy: P1, P2, P3, P4, P11 and P13 (Figure 2).

Evaluation Methodology

6.5 All machining was carried out by a 360º tracked excavator, under the constant supervision of an Archaeological Project Supervisor. A 1.8m wide toothless ditching bucket was used. Undifferentiated topsoil or overburden of recent origin was removed in successive level spits down to the natural geology.

6.6 The trench depth and restricted area available for excavation meant that the trench needed to be shored to ensure safe access for personnel. Excavated material will be examined in order to retrieve artefacts to assist in the analysis of their spatial distribution.

6.7 On completion of machine excavation, all available faces of the trench that required examination or recording were be cleaned using appropriate hand tools. All investigation of archaeological horizons was done by hand, with cleaning, inspection, and recording both in plan and section.

6.8 Once the trench had been cleaned, bulk samples were taken from significant deposits under consultation with geo-archaeologists (QUEST). Sampling methods followed English Heritage guidelines (EH 2002).

6.9 The trench was accurately located to the National Grid and GPS modules used to obtain levels for the deposits.

6.10 After recording, the trench was backfilled with excavated material and compacted with the excavator's machine bucket.

6.11 All recording was undertaken in accordance with the standards and requirements of the *Archaeological Field Manual* (Museum of London Archaeology Service 3rd edition 1994).

6.12 A continuous unique numbering system was employed, with a block of numbers in a continuous sequence allocated to the trench. The following registers were kept on standardised forms: contexts; sections and photographs.

6.13 Written descriptions, comprising both factual data and interpretative elements, were recorded on standardized sheets.

6.14 A long section for the trench showing layers was drawn at an appropriate scale of 1:20 and was accurately related to Ordnance Datum.

6.15 A digital photographic record was maintained that included working shots to represent more generally the nature of the fieldwork.

6.16 All samples were treated in a proper manner and to standards agreed in advance with the recipient museum.

Watching Brief Methodology

6.17 The archaeologist was present to observe all the groundworks to a depth of 3m at proposed shafts P5, P11 and P12 positioned outside the working area of the mechanical excavator, in the normal working arrangement.

6.18 Archaeological recording, where not precluded by Health and Safety considerations, consisted of:

- Limited hand cleaning of archaeological sections and surfaces sufficient to establish the stratigraphic sequence exposed.
- The attempted collection of dating evidence from *in-situ* deposits and spoil scans.
- A scaled photographic recording of representative exposed sections and surfaces, along with sufficient photographs to establish the setting and scale of the groundworks.
- A record of the datum levels of archaeological deposits.

6.19 Records were produced using either pro-forma context or trench record sheets and by the single context planning method, compatible with those published by the Museum of London (MoL 1994).

Geoarchaeology

6.20 Specific guidance on the treatment of palaeo-environmental remains within the Olympic Park area has been issued by English Heritage. Prehistoric landscapes have survived within the Olympic Park area and this presence has been identified in the Environmental Statement.

6.21 EH have advised that for each evaluation site the alluvial sequence, if it survives, should be sampled, described and recorded. An outline characterisation and interpretation of the deposit sequence, will form part of the detailed evaluation of each site. Each evaluation report will include a section through the alluvial stratigraphy and a surface plot of floodplain gravels based on geotechnical data and the results of the evaluation.

6.22 The field team for the evaluation trench and watching brief included a geoarchaeologist (AFESS), who was available for the duration of the project to assess the potential of the natural deposits for reconstructing the past environment, which is of relevance to understanding the context of any archaeological levels (or the lack of them). The geoarchaeologist conformed to the methodology set out in the generic method statement (MoLAS-PCA 2007a) and generic written scheme of investigation for archaeological evaluation (MoLAS-PCA 2008b).

Geoarchaeological Boreholes

6.23 Six geoarchaeological boreholes were drilled by SI contractors at the locations of shafts P1, P2, P3, P4, P11 and P13. The geological borehole taken from P2 went missing from site prior to collection by AOC and QUEST.

6.24 The boreholes were carried out as a continuous sequence through all the below ground deposits until the natural sands and gravel were reached, the final cores penetrating at least 0.30m into the natural sands and gravels.

6.25 All cores were extracted by cable percussion, except for shaft P1, where limited space meant that a smaller Dando Terrier tracked boring machine was used. All cores were labelled with the site name, location, depth and orientation. The ends were sealed with wax or wrapped in cling film and brown tape. The core samples were then transported to Reading University for storage to prevent sample deterioration.

Standards

6.26 All investigations conformed to current best practice and were undertaken according to the relevant guidelines set out in:

- Department of the Environment, 1990 Planning Policy Guidance 16, Archaeology and Planning (PPG 16).
- English Heritage, 1991 Exploring our Past. Strategies for the Archaeology of England, English Heritage.

- English Heritage, 1991 Management of Archaeological Projects (MAP2).
- English Heritage Greater London Archaeology Advisory Service, June 1998 Archaeological Guidance Papers 1-5.
- English Heritage Greater London Archaeology Advisory Service, May 1999 Archaeological Guidance Papers 6.
- Institute of Field Archaeologists (IFA), rev. 2001 By-Laws, Standards and Policy Statements of the Institute of Field Archaeologists, Standard and guidance: Desk Based Assessment.
- Museum of London, 1998 General Standards for the preparation of archaeological archives deposited with the Museum of London.
- The Unitary Development Plans of the London Boroughs of Newham (2001), Hackney (1995), Waltham Forest (1996), And Tower Hamlets (1998).

SECTION 7: RESULTS

7.1 Trench 1 (Figure 3)

OD Height	Context	Description
4.39m	101	Mid yellowish brown sandy silt modern made ground.
4.27m	102	Light greyish grey concrete rubble. Hardcore layer.
4.07m	103	Dark brown clayey silt made ground with frequent inclusions of refuse, lime, CBM and pottery (Victorian / 20th century).
3.27m	104	Mid – light orangey yellow, firm, slightly silty clay. Re-deposited alluvium.
1.69m	105	Mid greyish brown silty sand made ground with frequent CBM and charcoal inclusions
1.38m	106	Mid – light orangey yellow, firm, slightly silty clay.
0.58m	107	Mid – dark greyish brown peaty clay with moderate organic inclusions.
0.36m	108	Mid – light bluish, greenish grey organic clay with occasional organic inclusions.
0.26m	109	Mid yellowish grey sandy clay.
0.12m	110	Mid yellowish orange sandy gravels. Natural.

7.1.1 Trench 1 was situated within the footings of the proposed pump station (Figure 2). The trench measured 4.00m x 4.00m.

7.1.2 Natural gravels (110) were observed at a height of 0.12m OD. These were overlain by a layer of mid yellowish grey sandy clay 0.14m thick (109). This layer was sealed by a 0.10m thick, mid – light bluish, greenish grey organic clay with occasional organic inclusions (108), which was overlain by a layer of mid – dark greyish brown peaty clay with moderate organic inclusions (107), measuring 0.22m in thickness. The uppermost alluvial clay deposit (106) overlaid (107) and comprised a 0.80m thick layer of mid – light orangey yellow, firm, slightly silty clay.

7.1.3 Above the sequence of alluvial clays, peats and sands, 3.01m of made ground was found. This comprised 0.31m of mid greyish brown silty sand with frequent CBM and charcoal inclusions (105) that directly overlaid clay (106). Above this was a 1.58m thick deposit (104) of redeposited alluvial clay (106), with charcoal and CBM fleck inclusions. Overlying this was a 0.80m thick deposit of dark brown clayey silt (103), overlain by a 02.0m thick layer of crushed hardcore, which was in turn overlain by a mid yellowish brown sandy silt (101).

7.1.4 No finds or archaeological features were revealed during the excavation of Trench 1.

7.2 Watching Brief

7.2.1 Prior to the excavation of sewer shafts P5, P11 and P12 collar excavations were undertaken using a tracked excavator fitted with a bladed ditching bucket. Each trench measured 10.00m by 10.00m and were excavated to a depth of approximately 3.50m. The shaft excavations were monitored as part of the watching brief programme. In each shaft the sequence of deposition was similar; several layers of made ground overlay the uppermost alluvial horizon, where exposed. No archaeological features were revealed and no peat or significantly organic sediments were recovered.

P5 Collar Trench (Figure 3)

Thickness	Context	Description
0.45m	501	Dark blackish grey, loose gravel. Made ground. .
0.65m	502	Mid brownish blue, compact clay. Made ground.
1.60m	503	Mixed dark brownish grey silty gravel with frequent brick inclusions. Made ground.
0.80m	504	Bluish grey, compact clay with orange sand lenses. Made ground.
0.10m+	505	Bluish grey, compact clay. Alluvium.

7.2.2 The earliest deposit encountered in the P5 excavations comprised a bluish grey clay (505), found 3.40m below the surface of the trench. This was overlain by similar re-deposited clay (504) 0.80m thick. Above this was a 1.60m thick deposit of dark brownish grey silty gravel (503), which was overlain by 0.55m of brownish blue clay made ground (502). The surface deposit overlying (502) was a dark blackish grey gravel made ground 0.45m deep (501).

P11 Collar Trench (Figure 3)

Thickness	Context	Description
0.95m	1101	Loosely compacted dark brown silt. Made ground
1.20m	1102	Moderately – loosely compacted brown/grey sandy silt with frequent building material inclusions. Made ground
0.50m	1103	Moderately compacted grey silt. Made ground
0.25m	1104	Dark brown, moderately-firmly compacted clayey silt. Made ground.
0.15m+	1105	Dark brown gravelly sand. Alluvial silty sands.

7.2.3 The earliest deposit encountered was a dark brown gravelly sand (1105). There were a small number of building material inclusions but these appeared to be intrusive and

the layer is probably an alluvial sand deposit. Sealing the alluvial sand were four deposits of made ground (1104-1101), in combination 2.90m thick.

P12 Collar Trench (Figure 3)

Thickness	Context	Description
1.25m	1201	Loosely – moderately compacted gravelly silt with occasional building material inclusions. Made ground
1.05m	1202	Moderately compacted grey clayey silt. Made ground
0.55m	1203	Dark brown clayey silt with frequent building material inclusions. Made ground
0.55m+	1204	Bluish/grey firmly compacted clay. Alluvium

7.2.4 The earliest deposit encountered during the P12 excavations was a blue/grey alluvium at the base of the trench (1204), some 2.85m below ground level. Sealing the alluvium were three deposits of made ground of recent origin (1203 – 1201).

7.3 Boreholes P1, P2, P3, P4, P11and P13

7.3.1 Watching briefs were undertaken during the excavation of boreholes at locations P1, P2, P3, P4, P11 and P13. Due to the nature of the excavations limited records of the deposits could be recorded within the field.

7.3.2 The post-excavation environmental rapid assessment (Appendix B) produced few results through pollen analysis, radiocarbon dating and diatom analysis, but the stratigraphic sequences revealed are detailed within the lithostratigraphic descriptions below.

7.3.3 Following the results and interpretation of the sedimentary sequences, two horizons were selected for range-finder radiocarbon dating: an organic-rich horizon located at 6.23 to 6.24m bgs (-0.90 to -0.91m OD) in borehole P4, which has been dated to 14,000-13,750 cal BP, and an organic-rich horizon at 2.76m to 2.78m bgs (2.00 to 2.02m OD) in borehole P11, which has been dated to 1360-1260 cal BP. The δ13C (‰) values are consistent with that expected for organic sediment. The determinations from borehole P4 indicate a date for the organic component of the sediment during the early part of the Devensian Late Glacial period, whilst the organic component in the sediment in borehole P11 dates to the early Post Roman cultural period.

7.3.4 The date obtained from material in borehole P4 falls within a period of cold climate (Late Glacial Zone 1 – Older Dryas) which is not widely represented by organic or archaeological remains in south east England. The date falls towards the end of the interval between the Early and Late Upper Palaeolithic, when human occupation may have been absent in Britain. No deposits of this age have been recorded in the Lea Valley and although the survival of such deposits is not impossible, it seems more likely that the date reflects the presence of derived material within the Holocene sediment sequence in which case it must be regarded as unreliable.

7.3.5 The early post-Roman date from borehole P11 can be treated with greater confidence. In isolation it reveals very little about the history of the valley floor of the Lea, but it is reasonable to suppose that the Lea has meandered widely across its valley floor in the Postglacial period and therefore that channel remnants of early post-Roman age might be preserved within the height range from which the dated sample was recovered.

Lithostratigraphic descriptions

Borehole P1

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
1.00 to 2.00	***2.68 to 1.68***		Made ground
2.00 to 2.18	***1.68 to 1.50***		Void
2.18 to 2.44	***1.50 to 1.24***		Made ground
2.58 to 2.66	***1.06 to 1.02***	***7***	5Y3/1 very dark grey; very well sorted silt; massive; scattered decomposed detrital plant remains; no acid reaction; gradual transition to:
2.66 to 2.88	***1.02 to 0.80***	***6***	5Y4/1 dark grey; very well sorted silt; massive; very scattered root channels; very scattered decomposed detrital plant remains; no acid reaction; gradual transition to:
2.88 to 3.00	***0.80 to 0.68***	***5***	10YR2/2 very dark brown; silty peat; massive; very scattered charcoal.
3.00 to 3.49	***0.68 to 0.19***		Slurry of wet clayey gravel (drilling spoil)
3.49 to 3.59	***0.19 to 0.09***	***5***	7.5YR2.5/2 very dark brown; slightly silty and sandy peat; well-marked transition to:
3.59 to 3.87	***0.09 to -0.19***	***4***	2.5Y4/1 dark grey; very well sorted silt with scattered fine gravel clasts; massive; common detrital plant remains; finely divided wood debris; pyrite spherules; no acid reaction; sharp contact with:
3.87 to 3.89	***-0.19 to -0.21***	***3***	Layer of finely divided wood debris identical with wood debris in overlying unit; sharp contact with:
3.89 to 3.93	***-0.21 to -0.25***	***2***	2.5Y4/1 dark grey very well sorted silt; massive detrital plant remains; no acid reaction; sharp contact with:
3.93 to 3.97	***-0.25 to -0.29***	***1***	7.5YR2.5/2 very dark brown; gravelly peat becoming increasingly gravelly downward.

Borehole P3

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
7.25 to 7.75	***1.10 to 0.60***	***1***	5Y2.5/1 black/dappled grey oxidising to 2.5Y4/2 dark greyish brown; very well sorted silt with zone of small (10mm) stony calcareous concretions at 7.44-7.49m; massive; ocalised acid reaction.

Borehole P4

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
3.40 to 3.43	***1.93 to 1.90***		Void
3.43 to 3.82	***1.90 to 1.51***	***6***	Mosaic of grey shades; very well sorted silt; massive but displaying breccia-like pattern defined by slight variations of colour, brecciation becoming less obvious downward; single specimen of gastropod mollusc (cf. Trichia hispida); sand size particles of CBM; strong acid reaction. Probably re-deposited alluvium.
3.82 to 3.95	***1.51 to 1.38***		Void
3.95 to 4.95	***0.83 to 0.38***	***5***	Dappled grey; very well sorted silt; massive (*cf* lower part of P4 3.43-3.82); moderate acid reaction passing down to weak.
5.50 to 5.54	***-0.17 to -0.21***		Void
5.54 to 5.78	***-0.21 to -0.45***	***4***	2.5Y3/2 very dark greyish brown; peaty silt, sandy silt, fine sand with gravel clasts (25mm) at base; crude, steeply inclined bedding separating beds of peaty silt, fine sandy silt and fine sand; plant remains common; broken mollusc shell common; strong acid reaction.
5.78 to 5.95	***-0.45 to -0.62***		Void
6.00 to 6.23	***-0.67 to -0.90***		Void
6.23 to 6.32	***-0.90 to -0.99***	***3***	2.5Y3/2 very dark greyish brown; peat with thin slightly inclined sand bed at 6.28m; peat laminated; plant remains very common; no acid reaction; sharp contact with:
6.32 to 6.36	***-0.99 to -1.03***	***2***	2.5Y4/1 dark grey; very well sorted silt; massive; scattered plant remains; strong acid reaction; well-marked transition to:
6.36 to 6.45	***-1.03 to -1.12***	***1***	2.5Y4/1 very dark grey and black; well sorted fine sand with irregular patches of very well sorted silt; strong acid reaction.

Borehole P11

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
1.10 to 1.12	***3.68 to 3.66***		Void
1.12 to 1.17	***3.66 to 3.61***	***5***	2.5Y4/4 olive brown with coarse mottle of 5YR3/4 dark reddish brown and 7.5YR4/6 strong brown; well sorted silt with sub-angular flint clasts (up to 30mm); massive; common root channels and root remains; single specimen of freshwater mollusc *Bithynia tentaculata*; Chalk clasts (up to 10mm); strong acid reaction.
1.17 to 1.21	***3.61 to 3.57***		Void
1.21 to 1.43	***3.57 to 3.35***	***5***	2.5Y4/4 olive brown with coarse mottle of 5YR3/4 dark reddish brown and 7.5YR4/6 strong brown; well sorted silt with sub-angular flint clasts (up to 30mm); massive; common root channels and root remains; single specimen of freshwater mollusc *Bithynia tentaculata*; Chalk clasts (up to 10mm); strong acid reaction.
1.60 to 1.63	***3.18 to 3.15***		Void
1.63 to 2.02	***3.15 to 2.76***	***5***	2/5Y4/4 olive brown with small mottles of 5YR3/4 dark reddish brown; very well sorted silt; massive; scattered sand-size particles of chalk' strong acid reaction.
2.10 to 2.13	***2.68 to 2.65***		Void
2.13 to 2.37	***2.65 to 2.41***	***5***	2.5Y4/4 olive brown with 5YR3/4 dark reddish brown small mottles passing down to 7.5YR4/6 strong brown larger more diffuse mottles; very well sorted silt; massive; scattered root channels with iron-rich coatings; scattered broken mollusc shell; moderate acid reaction becoming weaker downward; gradual transition to:

Borehole P11

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
2.37 to 2.45	***2.41 to 2.33***	***4***	10YR3/1 very dark grey; very well sorted silt; massive; no acid reaction.
2.70 to 2.73	***2.08 to 2.05***		Void
2.73 to 2.84	***2.05 to 1.94***	***3***	black; peat; laminated; well-marked transition to.
2.84 to 2.95	***1.94 to 1.83***	***2***	2.5Y3/1 very dark grey; slightly gravelly (up to 5mm) silty fine sand; massive with slight tendency to lamination; very common plant remains; moderate acid reaction; sharp contact with:
2.95 to 3.15	***1.83 to 1.63***	***1***	2.5Y3/1 very dark grey; poorly sorted clayey gravel (up to 25mm); massive; patchy detrital plant remains; moderate acid reaction.

Borehole P13

Depth (bgs)	*Depth (m OD)*	*Unit number*	*Composition*
9.00 to 9.02	***-2.00 to -2.02***		Void
9.02 to 9.05	***-2.02 to -2.05***	***4***	Veneer of clasts of CBM, mortar and coal. Made ground
9.05 to 9.14	***-2.05 to -2.14***	***3***	Black; very well sorted silt; massive; very common plant remains; common *Chara* oospores; localised weak acid reaction; well-marked transition to:
9.14 to 9.23	***-2.14 to -2.23***	***2***	Black; very well sorted silt; obscurely laminated; very common plant remains, increasing downward; common *Chara* oospores; moderate acid reaction; well-marked transition to:
9.23 to 9.45	***-2.23 to -2.45***	***1***	Black and very dark grey; peaty and sandy silt with clasts of sub-angular flint (up to 10mm); laminated passing down to massive; very common plant remains; scattered pieces of wood (up to 5mm); common broken mollusc shell; strong acid reaction.

7.4 Finds

7.4.1 No finds were recovered during the archaeological excavation and monitoring works for the deep foul sewer at the Olympic park.

7.4.2 A total of ten 50cm long and three 100cm long core samples were collected from bore holes at proposed sewer shafts P1, P3, P4, P11 and P13. A single bulk sample was also recovered from a peaty alluvial deposit (107) of identified significance within evaluation trench 1. A rapid assessment of the litho- and bio-stratigraphic remains was completed (Appendix B).

SECTION 8: CONLUSIONS AND RECOMMENDATIONS

8.1 The stratigraphic sequence exposed within the evaluation has illustrated that a variety of changing environments across the site, but failed to uncover evidence of prehistoric or historic activity within the area.

8.2 A rapid assessment of the environmental remains (Appendix B) sampled from the site indicates that although there is Late Pleistocene environmental evidence, there is no evidence of Upper Palaeolithic activity or prehistoric or historic settlement. Similarly, wetland and channel-margin activity of prehistoric date and riverside structures of historic date were not identified and insufficient data was obtained to identify past land and waterways management of the area.

8.3 However, lithostratigraphic descriptions did indicate changing styles of river activity, from a stable or erosional regime to deposition of richly organic sands and silts and then to inorganic silts. There is also evidence for changes in the position of the river channels from the rapid assessment, although too few sample points were excavated to identify the past locations of River Lea, Pudding Mill and City Mill Rivers.

8.4 Following consultation with EH GLAAS, advisors to the ODA PDT it is not intended to carry out any further archaeological fieldwork within the footprint of the deep foul sewer. It is intended that the results and any further recommended work highlighted in the assessment of environmental remains is included in the site-wide geoarchaeological assessment, and the site-wide geoarchaeological/stratigraphic database and GIS model.

8.7 It is recommended that the results of the evaluation are assessed and incorporated into the on-going post-excavation analysis, Phase 3b and Phase 5 of the ODA Archaeology Programme, where appropriate.

SECTION 9: ARCHIVE DEPOSITION

9.1 The documentary archive comprises of:

Trench record	4 sheets
Photo registers	2 sheets
Watching brief notes	6 sheets
Section register	1 sheet
Section drawings	5 sheets
Plan drawings	3 sheet

9.2 The physical archive comprises ten 50cm long core samples, three 100cm long core sample and 1 bulk sample.

9.3 The integrity of the site archive will be maintained. The finds and records will be available for public consultation. Appropriate guidance set out in the Museum and Galleries Commission's, *Standards in the Museum Care of Archaeological Collections' (1992) Towards an Accessible Archaeological Archive. The Transfer of Archaeological Archives to Museums: Guidelines for Use in England, Northern Ireland Scotland and Wales*. For deposition with the Museum of London the Guidelines for the Preparation of Archaeological Archives will be followed.

9.3 The documentary, digital and physical archive will be prepared and deposited at the London Archaeological Archive and Research Centre (LAARC) within three months.

9.4 The results will be made publicly available via the ADS OASIS form (Appendix D).

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APPENDIX A – CONTEXT REGISTER

Context No.	Context Description	Length	Width	Depth	Plan No.	Section No.
101	Made ground.	4.00m	4.00m	0.12m		5
102	Hardcore	4.00m	4.00m	0.20m		5
103	Made ground	4.00m	4.00m	0.80m		5
104	Re-deposited alluvial clay	4.00m	4.00m	1.58m		5
105	Made ground	4.00m	4.00m	0.31m		5
106	Orangey yellow alluvial clay	4.00m	4.00m	0.80m		5
107	Greyish brown organic peaty clay	4.00m	4.00m	0.22m		5
108	Greenish grey organic clay	4.00m	4.00m	0.10m		5
109	Yellowish grey sandy clay alluvium	4.00m	4.00m	0.14m		5
110	Natural sandy gravel	4.00m	4.00m	0.10m+		5
501	Made ground	10.00m	10.00m	0.45m	1	1-4
502	Made ground	10.00m	10.00m	0.55m	1	1-4
503	Made ground	10.00m	10.00m	1.60m	1	1-4
504	Clay made ground	10.00m	10.00m	0.80m	1	1-4
505	Bluish alluvial clay	10.00m	10.00m	0.10m+	1	1-4

APPENDIX B - UPATED DEEP FOUL SEWER MAIN, OLYMPIC PARK (SITE CODE: OFS09): RAPID ENVIRONMENTAL ARCHAEOLOGICAL ASSESSMENT INCLUDING RANGEFINDER RADIOCARBON DATING

C.P. Green and C.R. Batchelor

Quaternary Scientific (QUEST), School of Human and Environmental Sciences, University of Reading, Whiteknights, PO Box 227, Reading, RG6 6AB, UK

INTRODUCTION

This report summarises the findings arising out of the rapid environmental archaeological assessment undertaken by Quaternary Scientific (QUEST) in connection with the proposed development of the Deep Foul Sewer Main, Olympic Park (Figures 1 and 2 main report; site code: OFS09). During recent investigations at the site, geotechnical boreholes were recovered from 5 locations (Boreholes P1, P3, P4, P11 and P13) for a laboratory-based environmental archaeological rapid assessment, and possible future assessment and analysis (Figure 2 main report). The key aims of the environmental archaeological (including geoarchaeology, zooarchaeology and archaeobotany) rapid assessment are outlined in the Deep Foul Sewer Main Written Scheme of Investigation for an Archaeological Evaluation and Watching Brief (AOC-RPS Planning, 2008). The environmental archaeological aims for the Deep Foul Sewer Main are:

1. To identify Late Pleistocene environmental evidence and late Upper Palaeolithic activity across the site.
2. To identify evidence for settlement of prehistoric and historic date, particularly within zones of higher ground not already truncated by quarrying.
3. To identify wetland and channel-margin activity of prehistoric date and riverside structures of historic date.
4. To identify evidence for the nature and/or date of past land management and exploitation.
5. To identify evidence relating to the past landscape, river pattern and changing environment of the site from the Mesolithic onwards.
6. To identify evidence for the Roman London to Colchester road and roadside margins.

7. To identify evidence for the nature and/or date of past waterways management and exploitation.
8. To identify evidence for the presence of the River Lea, Pudding Mill and City Mill Rivers in the past.

In order to evaluate the potential of the samples for achieving the research aims and questions proposed for the Deep Foul Sewer Main geoarchaeological boreholes, the environmental archaeological rapid assessment consisted of:

1. Detailed sediment descriptions of the geoarchaeological boreholes, to produce a preliminary interpretation of the depositional history of the site (deposit model)
2. A rapid assessment of the concentration of pollen grains and spores (boreholes P1, P4, P11 and P13) to evaluate the potential for reconstructing the vegetation history and detecting evidence for human activities
3. A rapid assessment of the concentration of diatom frustules (boreholes P1, P4, P11 and P13) to evaluate the potential for reconstructing the hydrological history, in particular changes in the riverine environment and salinity
4. Rangefinder radiocarbon dating to provide a provisional geochronological framework for the natural stratigraphic sequences

THE SITE

The Deep Foul Sewer Main serving the Olympic facilities extends across the Olympic site from north to south following a somewhat sinuous route from PDZ6 in the north, passing beneath the Waterworks River into PDZ5, southward beneath PDZ4, between the Waterworks River and the River Lea, into PDZ3, where it terminates at the Deep Foul Drainage Pumping Station. A short branch passes eastward from PDZ3 beneath the City Mill River into PDZ2. The sewer is at levels between -2.8m OD at the northern end of the site to -8.2m OD at the southern end. Access to the sewer is by 13 service shafts at intervals along the route.

The present report relates to boreholes put down at the proposed sites of five of the service shafts, boreholes P3 and P4 in the SE corner of PDZ5, immediately to the west of the present-day channel of the Waterworks River; boreholes P1 and P11 in PDZ3, between the present-day channels of the River Lea and the City Mill River; and borehole P13 in the southern corner of PDZ2, close to the present-day channel of the City Mill River.

Previous investigations in PDZ5 and PDZ6 (Green *et al.*, 2009a) identified the buried channels of the River Lea and the Leyton River, cut into Late Devensian sands and gravels - the Lea Valley Gravel of Gibbard (1994). The aggradational surface of the sand and gravel was widely identified close to 2.0m OD, with local 'islands' (former gravel bars) rising to between 3.0m and 4.0m OD. In most places, the buried channels of the Lea and the Leyton River were cut into the sand and gravel down to a level close to 0.0m OD, but near the inferred confluence of the two rivers, towards the southern end of PDZ5, greater depths, down to -9.0m OD were recognised, probably reflecting scouring associated with increased turbulence at the confluence. Across the greater part of both Development Zones Holocene alluvium was present at levels between 0.0m and 4.0m OD with organic-rich deposits forming the lower part of the sequence within the buried river channels at levels between 0.0mand 2.0m OD. Radiocarbon dating of these organic sequences in PDZ5 and PDZ6 has indicated that deposition of organic sediment began in the third or fourth millennium BC (PDZ5 Trench 1: 3340-3020 cal BC; PDZ6 Trench 8: 2580-2340 cal BC) and terminated in the Late Iron Age/Early Roman period (PDZ5 Trench 1: 40 cal BC to 80 cal AD; PDZ6 Trench 8: 65-220 cal AD). Fine-grained over-bank floodplain silts form the upper part of these sediment sequences between 2.0m and 4.0m OD and spread laterally beyond the margins of the buried channels across the undissected surface of the Late Devensian Lea Valley Gravel. Thus the natural surface of the floodplain of the Lea, prior to quarrying and land-raising operations was close to 4.0m OD.

Previous investigations in PDZ3B (Green *et al*., 2009b) identified organic-rich Holocene channel-fill deposits abutting historic revetments at levels between 0.70m and 2.10m OD. These deposits (in PDZ3B Trench 7) were seen to rest on gravel and sand at about 0.70m OD and were tentatively referred to the Pudding Mill River which appears formerly to have crossed PDZ3 from NW to SE near its eastern end, probably parallel with and closely adjacent to Pudding Mill Lane. Earlier investigations in the area now designated PDZ3 (Branch *et al*., 2005) based on BGS borehole records indicated the presence of sand and gravel - the Lea Valley Gravel of Gibbard (1994) underlying the floodplain alluvium, with an uneven surface between 0.0m and 2.0m OD. The same investigation identified the pre-industrial surface of the floodplain at levels between 2.5m and 3.5m OD. This surface was also recognised in trenches adjacent to the City Mill River at levels between 2.5m and 3.0m

OD in PDZ3A and about 400m to the north of the northern boundary of PDZ3B (MOLAS/PCA Archaeological Evaluation Report, June 2008).

METHODS

Lithostratigraphic descriptions (Geoarchaeology)

The geoarchaeological borehole core samples from each location (boreholes P1, P3, P4, P11 and P13; Tables 1 to 5) were retained and described in the laboratory using standard procedures for recording unconsolidated sediment and peat, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter) and inclusions (e.g. artefacts). The procedure involved: (1) cleaning the samples with a spatula or scalpel blade and distilled water to remove surface contaminants; (2) recording the physical properties, most notably colour; (3) recording the composition e.g. gravel, fine sand, silt and clay; (4) recording the degree of peat humification, and (5) recording the unit boundaries e.g. sharp or diffuse.

Range-finder radiocarbon dating (Geochronology)

The following two samples were taken from the Deep Foul Sewer geoarchaeological boreholes: (1) an organic-rich horizon located at 6.23 to 6.24m from surface in borehole P4, and (2) an organic-rich horizon at 2.76m to 2.78m from surface in borehole P11. These samples (Table 6) have been submitted as range-finder bulk peat radiometric radiocarbon dates to SUERC radiocarbon laboratory, East Kilbride. The results have been calibrated using OxCal v4.0.1 (Bronk Ramsey, 1995, 2001 and 2007) and IntCal04 atmospheric curve (Reimer *et al*., 2004).

Pollen rapid assessment (Archaeobotany)

A total of twenty-two pollen samples were extracted from each of the major sedimentary units recorded (excluding units interpreted as made ground) in boreholes P4 (4 samples), P1 (8 samples), P11 (7 samples) and P13 (3 samples). Pollen was not extracted from borehole P3. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) deflocculation of the sample in 1% Sodium pyrophosphate; (3) sieving of the sample to remove coarse mineral and organic fractions (>125µ); (4) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm^3); (5) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the Reading University pollen type collection and the following sources of keys and photographs: Moore *et al* (1991);

Reille (1992). The rapid assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of pollen grains and spores on four transects (10% of the slide) (Table 7).

Diatom rapid assessment (Archaeobotany)

A total of twenty-two diatom samples were extracted from each of the major sedimentary units recorded (excluding units interpreted as made ground) in boreholes P1 (8 samples), P4 (4 samples), P11 (7 samples) and P13 (3 samples). Diatoms were not extracted from borehole P3. The diatom extraction involved the following procedures (Battarbee *et al.,* 2001):

1. Treatment of the sub-sample (0.2g) with Hydrogen peroxide (30%) to remove organic material and Hydrochloric acid (50%) to remove remaining carbonates
2. Centrifuging the sub-sample at 1200 for 5 minutes and washing with distilled water (4 washes)
3. Removal of clay from the sub-samples in the last wash by adding a few drops of Ammonia (1%)
4. Two slides prepared, each of a different concentration of the cleaned solution, were fixed in mounting medium of suitable refractive index for diatoms (Naphrax).

The rapid assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of diatom frustules (Table 7).

RESULTS AND INTERPRETATION OF THE SEDIMENTARY SEQUENCES REPRESENTED IN EACH TRENCH (GEOARCHAEOLOGY)

The following descriptions are based on laboratory examination of cores recovered using a shell and auger drilling rig. Sub-samples of all units were examined using a low-power binocular microscope to determine sedimentological characteristics, to recognise and identify detrital and in situ remains of flora and fauna, to recognise evidence of pedological processes and to recognise material of anthropogenic origin.

Borehole P3

This borehole (Table 1) was put down from a ground surface at 8.35m OD and was sampled as a short core from a depth of 7.25-7.75m bgs (1.10-0.60m OD). The sample consisted of black (oxidising to very dark brown) very well sorted, patchily calcareous silt containing

neither visible organic remains nor material of anthropogenic origin. It appeared to be a floodplain silt closely comparable to sediments forming the upper part of the Holocene sediment sequence widely present in PDZ5 and PDZ6. In general such inorganic floodplain silts were recognised at levels between 2.0m and 4.0m OD. However, in PDZ6 Trench 9 the whole Holocene sequence between 0.60m and 2.47m OD comprised fine-grained, predominantly silty sediment with little evidence of in-channel deposition. It is possible therefore that the sample from borehole P3 represents evidence of similar conditions, reflecting the gradual infilling of a floodplain depression, probably an abandoned channel remnant.

Table 1: Lithostratigraphic description of borehole P3, Deep Foul Sewer Main, Olympic Park

Depth (bgs)	Depth (m OD)	Unit number	Composition
7.25 to 7.75	**1.10 to 0.60**	**1**	5Y2.5/1 black/dappled grey oxidising to 2.5Y4/2 dark greyish brown; very well sorted silt with zone of small (10mm) stony calcareous concretions at 7.44-7.49m; massive; localised acid reaction.

Borehole P4

This borehole (Table 2) was put down from a ground surface at 5.33m OD and was sampled as a discontinuous core between 3.40m and 6.45m bgs (1.93 to -1.12m OD). The upper part of the sample, down to at least 0.38m OD consisted of very well sorted silts, probably artificially redeposited in their upper part and representing over-bank floodplain deposition. The lower part of the sample, below -0.17m OD consisted of richly organic and generally calcareous silts and sands displaying inclined bedding and including a concentrations of broken mollusc shell and between -0.9m and -0.99m OD, a thin (0.09m) bed of peat. This sequence of typical in-channel deposits overlain by inorganic silty sediment resembles closely other sequences recorded in PDZ5 and PDZ6 and is probably of the same age (Late Neolithic – Late Iron Age). The organic part of the sequence between -0.17 and -1.12m OD is at a lower level than has been recorded in most places elsewhere in PDZ5 and PDZ6.

However, the sequence may lie within the deeper depression associated with the former confluence of the River Lea with the Leyton River.

Both these boreholes are close to the area occupied by Trenches PDZ5.2 and PDZ5.3. In both these trenches sand and gravel was present forming a level surface just above 2.0m OD. This has been interpreted as an undissected remnant of the Late Devensian Lea Valley Gravel (Green *et al*., 2009a). The sediments overlying the gravel were inorganic stony silts and clays, regarded as over-bank deposits of the natural river system active on the pre-industrial floor of the Lea valley. The contrast with the sediments recorded in Boreholes P3 and P4 serves to indicate the variability of the natural sediment bodies occupying the floor of the Lea valley and the complexity of their organisation.

Table 2: Lithostratigraphic description of borehole P4, Deep Foul Sewer Main, Olympic Park

Depth (bgs)	Depth (m OD)	Unit number	Composition
3.40 to 3.43	**1.93 to 1.90**		Void
3.43 to 3.82	**1.90 to 1.51**	**6**	Mosaic of grey shades; very well sorted silt; massive but displaying breccia-like pattern defined by slight variations of colour, brecciation becoming less obvious downward; single specimen of gastropod mollusc (cf. Trichia hispida); sand size particles of CBM; strong acid reaction. Probably re-deposited alluvium.
3.82 to 3.95	**1.51 to 1.38**		Void
3.95 to 4.95	**0.83 to 0.38**	**5**	Dappled grey; very well sorted silt; massive (*cf* lower part of P4 3.43-3.82); moderate acid reaction passing down to weak.
5.50 to 5.54	**-0.17 to -0.21**		Void
5.54 to 5.78	**-0.21 to -0.45**	**4**	2.5Y3/2 very dark greyish brown; peaty silt, sandy silt, fine sand with gravel clasts (25mm) at base; crude, steeply inclined bedding separating beds of peaty silt, fine sandy silt and fine sand; plant remains common; broken mollusc shell common; strong acid reaction.
5.78 to 5.95	**-0.45 to -0.62**		Void
6.00 to 6.23	**-0.67 to -0.90**		Void
6.23 to 6.32	**-0.90 to -0.99**	**3**	2.5Y3/2 very dark greyish brown; peat with thin slightly inclined sand bed at 6.28m; peat laminated; plant remains very common; no acid reaction; sharp contact with:
6.32 to 6.36	**-0.99 to -1.03**	**2**	2.5Y4/1 dark grey; very well sorted silt; massive; scattered plant remains; strong acid reaction; well-marked transition to:
6.36 to 6.45	**-1.03 to -1.12**	**1**	2.5Y4/1 very dark grey and black; well sorted fine sand with irregular patches of very well sorted silt; strong acid reaction.

Borehole P1

This borehole (Table 3) was put down from a ground surface at 3.68m OD and was sampled as a continuous core between 1.0m and 2.97m bgs (2.68 to -0.29m OD). The upper part of the sample was in Made Ground down to 1.24m OD. Below this level, massive, slightly organic very well sorted silts were present down to 0.80m OD, overlying richly organic and peaty silts and sands, including a thin (30mm) layer of wood debris. These fine grained deposits rested on gravelly peat at -0.25m OD. The height range of this organic sediment sequence (1.24- -0.29m OD) overlaps the height range of organic sediments recorded in PDZ3B Trench 7 (2.1-0.7m OD) and it seems reasonable to suggest as a working hypothesis that all these sediments are of similar age, though not necessarily laid down by the same river. Borehole P1 is close to the present-day course of the River Lea; PDZ3B Trench 7 is closer to the City Mill and Pudding Mill Rivers.

Table 3: Lithostratigraphic description of borehole P1, Deep Foul Sewer Main, Olympic Park

Depth (bgs)	Depth (m OD)	Unit number	Composition
1.00 to 2.00	**2.68 to 1.68**		**Made ground**
2.00 to 2.18	**1.68 to 1.50**		**Void**
2.18 to 2.44	**1.50 to 1.24**		**Made ground**
2.58 to 2.66	**1.06 to 1.02**	**7**	5Y3/1 very dark grey; very well sorted silt; massive; scattered decomposed detrital plant remains; no acid reaction; gradual transition to:
2.66 to 2.88	**1.02 to 0.80**	**6**	5Y4/1 dark grey; very well sorted silt; massive; very scattered root channels; very scattered decomposed detrital plant remains; no acid reaction; gradual transition to:
2.88 to 3.00	**0.80 to 0.68**	**5**	10YR2/2 very dark brown; silty peat; massive; very scattered charcoal.
3.00 to 3.49	**0.68 to 0.19**		Slurry of wet clayey gravel (drilling spoil)
3.49 to 3.59	**0.19 to 0.09**	**5**	7.5YR2.5/2 very dark brown; slightly silty and sandy peat; well-marked transition to:
3.59 to 3.87	**0.09 to -0.19**	**4**	2.5Y4/1 dark grey; very well sorted silt with scattered fine gravel clasts; massive; common detrital plant remains; finely divided wood debris; pyrite spherules; no acid reaction; sharp contact with:
3.87 to 3.89	**-0.19 to -0.21**	**3**	Layer of finely divided wood debris identical with wood debris in overlying unit; sharp contact with:
3.89 to 3.93	**-0.21 to -0.25**	**2**	2.5Y4/1 dark grey very well sorted silt; massive detrital plant remains; no acid reaction; sharp contact with:
3.93 to 3.97	**-0.25 to -0.29**	**1**	7.5YR2.5/2 very dark brown; gravelly peat becoming increasingly gravelly downward.

Borehole P11

This borehole (Table 4) was put down from a ground surface at 4.78m OD and was sampled as a discontinuous core between 1.10m and 3.15m bgs (3.68 to 1.63m OD). The upper part of the sample down to 2.33m OD was massive silt with well-developed pedological features and, in its upper part, evidence of agricultural exploitation in the form of particles of chalk dressing. The lower part of the sequence, below 2.08m OD was more organic, with a thin (0.11m) bed of peat overlying organic silty fine sand. These fine-grained deposits rested at 1.83m OD on clayey gravel with patchy detrital plant remains. The height range of the organic part of this sequence (2.08-1.83m OD) overlaps the height range of organic sediments in PDZ3B Trench 7 (2.1-0.7m OD) and it seems reasonable to suggest as a working hypothesis that all these sediments are of similar age, though not necessarily laid down by the same river. Borehole DFS.P11 lies almost exactly midway between the present-day courses of the River Lea and the City Mill River.

Table 4: Lithostratigraphic description of borehole P11, Deep Foul Sewer Main, Olympic Park

Depth (bgs)	Depth (m OD)	Unit number	Composition
1.10 to 1.12	**3.68 to 3.66**		Void
1.12 to 1.17	**3.66 to 3.61**	**5**	2.5Y4/4 olive brown with coarse mottle of 5YR3/4 dark reddish brown and 7.5YR4/6 strong brown; well sorted silt with sub-angular flint clasts (up to 30mm); massive; common root channels and root remains; single specimen of freshwater mollusc *Bithynia tentaculata*; Chalk clasts (up to 10mm); strong acid reaction.
1.17 to 1.21	**3.61 to 3.57**		Void
1.21 to 1.43	**3.57 to 3.35**	**5**	2.5Y4/4 olive brown with coarse mottle of 5YR3/4 dark reddish brown and 7.5YR4/6 strong brown; well sorted silt with sub-angular flint clasts (up to 30mm); massive; common root channels and root remains; single specimen of freshwater mollusc *Bithynia tentaculata*; Chalk clasts (up to 10mm); strong acid reaction.
1.60 to 1.63	**3.18 to 3.15**		Void
1.63 to 2.02	**3.15 to 2.76**	**5**	2/5Y4/4 olive brown with small mottles of 5YR3/4 dark reddish brown; very well sorted silt; massive; scattered sand-size particles of chalk' strong acid reaction.
2.10 to 2.13	**2.68 to 2.65**		Void
2.13 to 2.37	**2.65 to 2.41**	**5**	2.5Y4/4 olive brown with 5YR3/4 dark reddish brown small mottles passing down to 7.5YR4/6 strong brown larger more diffuse mottles; very well sorted silt; massive; scattered root channels with iron-rich coatings; scattered broken mollusc shell; moderate acid reaction becoming weaker downward; gradual transition to:
2.37 to 2.45	**2.41 to 2.33**	**4**	10YR3/1 very dark grey; very well sorted silt; massive; no acid reaction.
2.70 to 2.73	**2.08 to 2.05**		Void
2.73 to 2.84	**2.05 to 1.94**	**3**	black; peat; laminated; well-marked transition to.
2.84 to 2.95	**1.94 to 1.83**	**2**	2.5Y3/1 very dark grey; slightly gravelly (up to 5mm) silty fine sand; massive with slight tendency to lamination; very common plant remains; moderate acid reaction; sharp contact with:
2.95 to 3.15	**1.83 to 1.63**	**1**	2.5Y3/1 very dark grey; poorly sorted clayey gravel (up to 25mm); massive; patchy detrital plant remains; moderate acid reaction.

Borehole P13

This borehole (Table 5) was put down from a ground surface at 7.00m OD and was sampled as a short core between 9.00 and 9.50m bgs (-2.00 to -2.5m OD). The sample consists of richly organic silt and sand in sub-horizontal laminations with very common detrital plant remains, becoming peaty, and also slightly gravelly, in the lower half of the sample. *Chara* oospores were common in the upper half of the sample and mollusc remains common throughout. The sample has the characteristics of in-channel Holocene alluvium but the height range that it occupies is well below the level of the organic horizons recorded in Boreholes P1 and P11, or in PDZ3B Trench 7. The top of the sample is 1.71m below the base of the organic units in Borehole P1 and 3.63m below the base of the organic units in Borehole P11. At this low level, the organic sediments forming the sample from Borehole P13 might represent a downstream continuation of the organic-rich channel-fill deposits recorded in PDZ5 and PDZ6 and might therefore be considerably older than the sediments of historic age seen in PDZ3B Trench 7.

Table 5: Lithostratigraphic description of borehole P13, Deep Foul Sewer Main, Olympic Park

Depth (bgs)	Depth (m OD)	Unit number	Composition
9.00 to 9.02	**-2.00 to -2.02**		**Void**
9.02 to 9.05	**-2.02 to -2.05**	**4**	**Veneer of clasts of CBM, mortar and coal. Made ground**
9.05 to 9.14	**-2.05 to -2.14**	**3**	Black; very well sorted silt; massive; very common plant remains; common *Chara* oospores; localised weak acid reaction; well-marked transition to:
9.14 to 9.23	**-2.14 to -2.23**	**2**	Black; very well sorted silt; obscurely laminated; very common plant remains, increasing downward; common *Chara* oospores; moderate acid reaction; well-marked transition to:
9.23 to 9.45	**-2.23 to -2.45**	**1**	Black and very dark grey; peaty and sandy silt with clasts of sub-angular flint (up to 10mm); laminated passing down to massive; very common plant remains; scattered pieces of wood (up to 5mm); common broken mollusc shell; strong acid reaction.

RESULTS AND INTERPRETATION OF THE RANGE-FINDER RADIOCARBON DATES

Following the results and interpretation of the sedimentary sequences, two horizons were selected for range-finder radiocarbon dating from the Deep Foul Sewer geoarchaeological boreholes (Table 6): (1) an organic-rich horizon located at 6.23 to 6.24m bgs (-0.90 to -0.91m OD) in borehole P4, which has been dated to **14,000-13,750 cal BP**, and (2) an organic-rich horizon at 2.76m to 2.78m bgs (2.00 to 2.02m OD) in borehole P11, which has been dated to **1360-1260 cal BP**. The δ13C (‰) values are consistent with that expected for organic sediment. The determinations from borehole P4 indicate a date for the organic component of the sediment during the early part of the Devensian Late Glacial period, whilst the organic component in the sediment in borehole P11 dates to the early Post Roman cultural period.

The date obtained from material in borehole P4 falls within a period of cold climate (Late Glacial Zone 1 – Older Dryas) which is not widely represented by organic or archaeological remains in south east England. The date falls towards the end of the interval between the Early and Late Upper Palaeolithic, when human occupation may have been absent in Britain. A plant assemblage from Colney Heath in Hertfordshire (Godwin 1964) dated to 13,560 BP indicated periglacial climatic conditions. No deposits of this age have been recorded in the Lea valley and although the survival of such deposits is not impossible, it seems more likely that the date reflects the presence of derived material within the Holocene sediment sequence in which case it must be regarded as unreliable.

The early post-Roman date from borehole P11 can be treated with greater confidence. In isolation it reveals very little about the history of the valley floor of the Lea, but it is reasonable to suppose that the Lea has meandered widely across its valley floor in the Postglacial period and therefore that channel remnants of early post-Roman age might be preserved within the height range from which the dated sample was recovered.

Table 6: Selected rangefinder radiocarbon dates, Deep Foul Sewer Main, Olympic Park

Laboratory Code / Method	Borehole number	Unit number	Depth (bgs)	Depth (m OD)	Un-calibrated Radiocarbon Years Before Present (yrs BP)	Calibrated age BC / AD (BP) (2-sigma, 95.4% probability)	$\delta^{13}C$ (‰)
SUERC-28031	P4	3	6.23 to 6.24	-0.90 to -0.91	12,020 ± 40	12,050 to 11,810 cal BC (14,000 to 13,750 cal BP)	-28.7
SUERC-28032	P11	3	2.76 to 2.78	2.00 to 2.02	1385 ± 35	590 to 690 cal BC (1360 to 1260 cal BP)	-29.7

RESULTS AND INTERPRETATION OF THE RAPID POLLEN ASSESSMENT

A total of twenty-two pollen samples were extracted from each of the major sedimentary units recorded (excluding units interpreted as made ground) in boreholes P1 (8 samples), P4 (4 samples), P11 (7 samples) and P13 (3 samples) (Table 7).

Boreholes P1, P4, P11 and P13

An initial rapid assessment of the samples revealed that pollen grains were absent or recorded in very low concentrations throughout all borehole samples (see Table 7). This can be attributed to the physical and/or chemical properties of the sediments at the time of deposition. These properties may include coarse particle size (e.g. sand and gravel), which may cause physical destruction, and high pH due to calcium carbonate-rich groundwater, which may cause chemical deterioration of the pollen grains.

RESULTS AND INTERPRETATION OF THE RAPID DIATOM ASSESSMENT

A total of twenty-two diatom samples were extracted from each of the major sedimentary units recorded (excluding units interpreted as made ground) in boreholes P1 (8 samples), P4 (4 samples), P11 (7 samples) and P13 (3 samples) (Table 7).

Borehole P4

The uppermost sample from borehole P4 contained a high concentration of diatom frustules in a low to moderate state of preservation. All other samples contained a very low to absent quantity of remains.

Borehole P1

No diatom remains were recorded during the rapid assessment of samples from borehole P1.

Borehole P11

The results of the diatom rapid assessment indicate that samples 2.80 to 2.81 bgs and 2.88 to 2.89 bgs, from borehole P11 contained a moderate to very high concentration of diatom frustules, in a moderate state of preservation. No diatom remains were recorded during the rapid assessment of the remaining samples.

Borehole P13

The results of the diatom rapid assessment indicate that all three samples from borehole P13 contain a very high concentration of diatom frustules, in a moderate state of preservation.

Table 7: Results of the pollen and diatom rapid assessment of boreholes P1, P4, P11, P13, Deep Foul Sewer, Olympic Park

			Pollen Rapid Assessment			**Diatom Rapid Assessment**	
Depth (bgs)	**Depth (m OD)**	**Unit number**	**Concentration**	**Preservation**	**Microscopic charcoal**	**Concentration**	**Preservation**
Borehole P4							
5.64 to 5.65	-0.31 to -0.32	4	0	-	Low	4-5	2
6.24 to 6.25	-0.91 to -0.92	3	1	3	Low	1	1-2
6.32 to 6.33	-0.99 to -1.00	2	0	-	Absent	0	-
6.40 to 6.41	-1.07 to -1.08	1	1	3	Absent	0	-
Borehole P1							
2.58 to 2.60	1.10 to 1.08	7	0	-	Moderate	0	-
2.70 to 2.72	0.98 to 0.96	6	0	-	Low	0	-
2.89 to 2.91	0.79 to 0.77	5	1	3	Low	0	-
3.53 to 3.55	0.15 to 0.13	5	1	3	Low	0	-
3.73 to 3.75	-0.05 to -0.07	4	0	-	Low	0	-
3.87 to 3.88	-0.19 to -0.20	3	1	3	Absent	0	-
3.91 to 3.92	-0.23 to -0.24	2	0	-	Low	0	-
3.94 to 3.95	-0.26 to -0.27	1	0	-	Low	0	-

Table 7: Results of the pollen and diatom rapid assessment of boreholes P1, P4, P11, P13, Deep Foul Sewer, Olympic Park

			Pollen Rapid Assessment			**Diatom Rapid Assessment**	
Depth (bgs)	**Depth (m OD)**	**Unit number**	**Concentration**	**Preservation**	**Microscopic charcoal**	**Concentration**	**Preservation**
Borehole P11							
1.12 to 1.13	3.66 to 3.65	5	0	-	Moderate	0	-
1.44 to 1.45	3.34 to 3.33	5	0	-	Low	0	-
2.24 to 2.25	2.54 to 2.53	5	0	-	Low	0	-
2.48 to 2.49	2.30 to 2.29	4	1	3	Low	0	-
2.80 to 2.81	1.98 to 1.97	3	0	-	Absent	2	2
2.88 to 2.89	1.90 to 1.89	2	1-2	2-3	Low	4-5	3
3.04 to 3.05	1.74 to 1.73	1	0	-	Low	0	-
Borehole P13							
9.08 to 9.09	-2.08 to -2.09	3	0	-	Absent	4	2
9.16 to 9.17	-2.16 to -2.17	2	1	3	Absent	4	2
9.32 to 9.33	-2.32 to -2.33	1	0	-	Low	4-5	3

Key: 0 = 0 estimated grains or frustules per slide; 1 = 1 to 75; 2 = 76 to 150; 3 = 151 to 225; 4 = 226-300; 5 = 300+. Estimated number based on assessment of 10% of total number of slide transects (4 of 40 transects)

CONCLUSIONS

The rapid environmental archaeological assessment was conducted to evaluate the potential of the borehole samples collected from the site to address the aims proposed for the Deep Foul Sewer Main, Olympic Park (AOC-RPS Planning, 2009). Each of the aims is addressed below based upon the results of the rapid assessment:

1. *To identify Late Pleistocene environmental evidence and late Upper Palaeolithic activity across the site.*

Late Pleistocene environmental evidence was identified, as described in the report, but there is no evidence of Upper Palaeolithic activity.

2. *To identify evidence for settlement of prehistoric and historic date, particularly within zones of higher ground not already truncated by quarrying.*

The results of the rapid assessment indicate that there is very little evidence for prehistoric or historic settlement.

3. *To identify wetland and channel-margin activity of prehistoric date and riverside structures of historic date.*

The results of the rapid assessment indicate that there is insufficient data from the borehole core samples to answer this question.

4. *To identify evidence for the nature and/or date of past land management and exploitation.*

The results of the rapid assessment indicate that there is insufficient data from the borehole core samples to answer this question.

5. *To identify evidence relating to the past landscape, river pattern and changing environment of the site from the Mesolithic onwards.*

The results of the lithostratigraphic descriptions indicate changing styles of river activity, from a stable or erosional regime to deposition of richly organic sands and silts and then to inorganic silts. There is also evidence for changes in the position of river channels.

6. *To identify evidence for the Roman London to Colchester road and roadside margins.*

The results of the rapid assessment indicate that there is insufficient data from the borehole core samples to answer this question.

7. *To identify evidence for the nature and/or date of past waterways management and exploitation.*

The results of the rapid assessment indicate that there is insufficient data from the borehole core samples to answer this question.

8. *To identify evidence for the presence of the River Lea, Pudding Mill and City Mill Rivers in the past.*

The sediment sequences no doubt record infill of the channels of these rivers and probably also of the Waterworks River but sample points are too few to allow confident attribution of sediment sequences to particular rivers or reconstruction of past river courses.

RECOMMENDATIONS

The poor preservation and concentration of pollen remains indicates that no further pollen assessment or analysis should be carried out on the samples from any of the boreholes. However, further assessment and analysis (if necessary) of the diatoms is recommended on those units from boreholes P4, P11 and P13 where the concentration and preservation of remains is high enough to allow species identifications, and may contribute further answers to the aims and objectives of the Deep Foul Sewer Main. It is recommended that this work should be carried out as part of the on-going post-excavation analysis, Phase 3b and Phase 5 of the ODA Archaeology Programme, where appropriate.

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APPENDIX C - OASIS FORM

OASIS ID: AOCARCHA1-65488

Project details

Project name	Deep Foul Sewer Main, Olympic Park
Short description of the project	AN archaeological watching brief, borehole excavation and evaluation carried out by RPS Planning and Development and AOC Archaeology Group along the extent of the proposed Deep Foul Sewer at the Olympic Park, East London. A single evaluation trench was excavated at the location of the proposed pump station, and a watching brief and geoarchaeological borehole sampling was undertaken at the proposed locations of six shafts along the length of sewer, which extends across much of the park. The stratigraphic sequence exposed within the evaluation trench illustrated that beneath thick deposits of Victorian and modern made ground there were limited alluvial clay and peaty deposits, similar to those found throughout the Olympic development site. A total of ten 50cm long and three 100cm long core samples were collected from bore holes at proposed sewer shafts P1, P3, P4, P11 and P13. A single bulk sample was also recovered from a peaty alluvial deposit of identified significance within the evaluation trench. A rapid assessment of the litho- and bio-stratigraphic remains was completed. The assessment of the environmental deposits depicted a variety of changing environments across the site, but failed to uncover evidence of prehistoric or historic activity within the area.

Project dates	End: 01-10-2009
Previous/future work	No / Not known
Any associated project reference codes	OFS09 - Sitecode
Type of project	Field evaluation
Site status	Local Authority Designated Archaeological Area
Current Land use	Vacant Land 1 - Vacant land previously developed
Methods & techniques	'Augering','Sample Trenches','Visual Inspection'
Development type	Service infrastructure (e.g. sewage works, reservoir, pumping station, etc.)
Prompt	Planning condition

Position in the planning process	Not known / Not recorded

Project location

Country	England
Site location	GREATER LONDON NEWHAM STRATFORD Deep Foul Sewer main, Olympic Park, East London
Postcode	E15 2
Study area	37.00 Hectares
Site coordinates	TQ 5376 1838 50.9437528594 0.188938462723 50 56 37 N 000 11 20 E Point
Height OD / Depth	Min: -1.00m Max: 1.00m

Project creators

Name of Organisation	AOC Archaeology Group

Project brief originator	RPS Planning
Project design originator	RPS
Project director/manager	Andy Leonard
Project supervisor	Paul Harris
Project supervisor	Chris Pole
Project supervisor	Ian Hogg
Project supervisor	Leigh Savage
Type of sponsor/funding body	Developer
Name of sponsor/funding	Olympic Delivery Authority (ODA)

body

Project archives

Physical Archive recipient	Museum of London-LAARC
Physical Contents	'Environmental'
Digital Archive recipient	Museum of London-LAARC
Digital Contents	'Environmental'
Digital Media available	'Images raster / digital photography','Text'
Paper Archive recipient	Museum of London-LAARC
Paper Contents	'Environmental'
Paper Media	'Context sheet','Plan','Report','Section'

available

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Deep Foul Sewer main, Olympic park, East London; An Archaeological Evaluation and Watching Brief Report
Author(s)/Editor(s)	Harris, P
Date	2009
Issuer or publisher	AOC Archaeology (for RPS)
Place of issue or publication	London
Description	A4 sized, blue spine with clear dust covers.
Entered by	Chris Clarke (chris.clarke@aocarchaeology.com)

Entered on 22 April 2010