

**PLANNING DELIVERY ZONE 3 (PDZ3B)
CZ3b (Trenches PDZ 3.04, PDZ 3.07, PDZ 3.12,
PDZ 3.26, PDZ 3.27, PDZ 3.28 and PDZ 3.30)
An Archaeological Evaluation Report**

NGR: TQ 537650 183850

On behalf of the Olympic Delivery Authority

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SUMMARY (NON-TECHNICAL)

This report presents the results of an archaeological evaluation carried out by RPS Planning and Development and AOC Archaeology Group within Construction Zone 3b (CZ3b), on the southern side of Planning Delivery Zone 3 (PDZ3) of the Olympic Park, Stratford, London Borough of Newham (NGR 537650 183850). The report was commissioned by the Olympic Delivery Authority.

Following the recommendations of the PDZ3 Detailed Desk Based Assessment and PDZ 3 Method Statement for Archaeological Evaluation, seven evaluation trenches were excavated across PDZ3B.

The stratigraphic sequence exposed within the evaluation has illustrated that, with the exception of Trenches PDZ3.07 and PDZ3.30, the alluvial clays have been truncated by modern deposits. Specifically, Trenches PDZ3.12 and PDZ3.26 contained 19th/20th century reservoir backfill. Within Trench PDZ 3.28, the foundations of a 20th century concrete building was also found, which correlates with the position of a building on the 1965 Ordnance Survey map and probably overlays the edge of a 19th century reservoir.

Lines of posts and planking, which formed at least two phases of revetment and at least one associated structure, were found within the northeast of the site (Trench PDZ3.07). The wooden post built structures clearly identify evidence of past waterways management within the area. Their location when compared to cartographic sources suggests that they were constructed within the Pudding Mill River.

The earlier revetment, formed from a line of partially worked, large logs, partially worked stakes and crudely worked planks differed greatly from the later revetment of machine cut posts and planks; suggesting that the earlier revetment was abandoned for some time. A parallel line of posts projecting on an east – west alignment from the earlier revetment, also formed from partially worked, sizable timbers, most probably represents a jetty or bridge, which may have been constructed at the same time as the revetment. It is recommended that this material undergo radiocarbon dating.

A total of nineteen 50cm long column samples were collected by from Trenches PDZ3.04, 3.07, 3.12, 3.26, and 3.30. Bulk samples were also recovered from these trenches. A rapid assessment of the litho- and bio-stratigraphic remains was completed. The assessment of the environmental deposits showed that modern material was present within Trenches PDZ3.04, 3.12 and 3.26. Trench PDZ3.30 did contain alluvial sediments; however the potential for further analysis of the material is limited by sampling issues relating to the size of trench. Trench PDZ3.07 contained alluvial deposits which potentially originate from the Pudding Mill River. Further assessment and analysis of the samples from PDZ 3.07 is recommended.

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SECTION 1: INTRODUCTION

- 1.1 This document is a report for an Archaeological Evaluation at Construction Zone 3b (CZ3b) on the southern side of Planning Delivery Zone 3 (PDZ3) of the Olympic Park, Stratford, London Borough of Newham.
- 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 PDZ3 is centred on National Grid Reference (NGR) 537650 183850. The overall area is approximately 37 hectares (Figure 1) and it 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 north-west/south-east pedestrian/cycle link, called *The Greenway*, divides the site in two, with CZ3a to the north and CZ3b to the south.
- 1.4 PDZ 3 is one of 15 zones within the Olympic, Paralympic and Legacy Transformation Planning Applications development area. Major structures to be constructed within this zone include the main Olympics stadium (CZ3a) and warm-up athletics tracks (CZ3b). Ten new bridges, new roads, services, water supply routes and drainage will also be constructed across PDZ3.
- 1.5 A Detailed Desk Based Assessment for PDZ3 (MoLAS-PCA 2007a) assessed the archaeological potential for the zone and provided recommendations for archaeological fieldwork in advance of development. These recommendations included trial trenching across the zone.
- 1.6 The original method statement (MoLAS-PCA 2007b) detailed how the Evaluation was to be undertaken. The later addendum (RPS-AOC 2008) follows the methodology set out in the original method statement, but specifically focuses on the work carried out in CZ3b. All works were undertaken by a team of professional archaeologists.

1.7 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 evaluation 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 A full background description of the local geology and topography has been covered in the Desk Based Assessment produced by MoLAS-PCA (2007a). The main points are summarised below:
- 3.2 The British Geological Survey Sheet 256, of North London, indicates that PDZ3 lies on alluvium, which represents a range of different wetland and dryland environments existing on the floodplain of the River Lea. The alluvium is underlain by the Lea Valley Gravels, deposited during the Palaeolithic period. Below this initial deposit of gravel, lie two further gravel horizons namely the Kempton Park Gravels and the Taplow Gravels. Tertiary Bedrock in this area is London Clay and Woolwich and Reading Beds.
- 3.3 Considerable thicknesses of made ground has been recorded across the site. Stanfords map of 1862 and the first edition OS map show two large reservoirs on the western side of CZ3b. The depth of these features is unknown, but it is probable that their construction has removed alluvial deposits in this area.

SECTION 4: HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

4.1 The following summary of the historical and archaeological background to the site complements the findings of the fieldwork undertaken within PDZ3. For a more detailed description of local and regional themes please see Section 4 of the Desk Based Assessment (MoLAS-PCA 2007a)

Prehistoric

- 4.2 No prehistoric finds have been recorded within CZ3b, although to the east of the area, in PDZ2, two axes were recovered, one Neolithic and one Bronze Age (GLSMR 061746, 060258). Further east, a recent evaluation of the northern part of PDZ1 uncovered an alluvial sequence indicating that the site lay within active river channels or in marshy areas for most of prehistory. Immediately west of PDZ3 a possible palaeochannel was also recorded (GLSMR 080116) which further asserts the chances of palaeo – alluvial deposits being found within PDZ3. Watery areas were often a focus for ritual activity, such as the deposition of votive objects, and it is possible that the two axes are examples of this practice.
- 4.3 Part of a possible Iron Age trackway, the precursor to a later Roman road was recorded in the centre of the PDZ3 (GLSMR 080875).
- 4.4 An evaluation of the southern part of PDZ1 (MoL Site Code OL-003 05) has shown evidence for an area of slightly higher, drier land which had Bronze Age or Iron Age features, such as post-holes, pits, a ditch and a possible ring gully, cutting through it. A small amount of struck and reworked flint and a large amount of burnt flint was also recovered from the site (London Development Agency/MoLAS-PCA, 2005a).
- 4.5 Further prehistoric activity dating from the Neolithic to the Iron Age (MoL Site Codes LEK95, PNL98, WKL01 and YCP05) has been found to the west of PDZ3, on the higher ground overlooking the Lea Valley. This activity may have extended onto larger islands within the valley floor, possibly within PDZ3.

- 4.6 Recent evaluation work within the northern part of PDZ 3 (CZ3a) has recorded a wattle structure, large ditches of probable prehistoric date and further settlement activity, including an unurned cremation burial of Bronze Age/Iron Age date (MoLAS-PCA 2008a, b and c). Further excavation of deposits in these areas has taken place, however the results are, at the time of writing, unpublished.

Roman

- 4.7 The Roman road that connected the main port at *Londinium* (London) with *Camulodunum* (Colchester) is projected to run across PDZ3 (GLSMR 080875/00/00). Knowledge of this route is largely based on excavations further west on the high gravel ridge overlooking the Lea Valley, based around sites surrounding Roman Road and Parnell Road (site codes LFR69, APN71, LEK95). Local evidence comes from excavations at Old Ford Road (OFD73), which recorded compacted gravels, and 413-417 Wick Lane (OFF85), which recorded alluvial layers overlain with a rammed gravel layer. Sites at 16-20 Autumn Street (ANS72), Maverton Street (MAV71) and 423-427 Old Ford Road (ODF72) produced Roman pottery, forming fragmentary evidence for local settlement activity related to the road. Within the wider area there is evidence of nucleated settlements and small farms or farmsteads dotting the landscape with associated field systems surrounding the road.
- 4.8 The road would have crossed the River Lea. This may have taken the form of a ford or via timber bridges or raised platforms, crossing from island to island. The GLSMR identifies a Roman ford to the south of the site, but it is uncertain how or why this was identified (GLSMR 061651/00/00). It should be noted that the evaluation work carried out in CZ3a failed to locate the road.
- 4.9 An evaluation at Crown Wharf Ironworks to the north-west of PDZ3 (DAC03) next to the River Lea produced evidence of a Roman woodwork structure formed from 40 timbers of varying size and shape and the remains of two very large vertical posts resting on substantial plank base plates. It is currently thought that together this forms the footings for a bridge or jetty (Alexander & Stephenson 2004). Although this structure is likely to be too far north to have represented a bridge for the London to Colchester road, it highlights the Roman presence in the area and underlines the importance of both crossing and exploiting the River Lea during the Roman period.

- 4.10 Most other evidence for Roman activity in the vicinity of PDZ3 comes from chance finds made during the 19th and early 20th centuries. A coffin was found on Wick Lane (GLSMR 080763) and an apparent urn cemetery was located in the vicinity of Old Ford Road on the corner of Wick Lane (GLSMR 080792) (Owen *et al* 1973). A coin hoard was found within a pot during the construction of a bomb shelter at 429-48 Wick Lane (GLSMR 080826).
- 4.11 Further evidence of Roman activity in this area was uncovered in 1906 when fragments of a herringbone pavement (*opus spicatum*) were recovered from the river close to Iceland Wharf during dredging operations (GLSMR 080859) (Smith 1910). At the time it was assumed that it formed a ford across the Lea, yet this interpretation has since been abandoned. Brown notes: “it is difficult to conceive how such a surface would have been laid in the bed of a river or why: stone slabs would have been easier to lay if the river was forded at this point in the Roman era.” (Brown forthcoming). It is more likely that the pavement represents the floor of a significant building, such as a *Mansio*.

Saxon

- 4.12 There is limited evidence of Saxon occupation within the area surrounding the site and, prior to work at the Olympic Park, none within PDZ3. However evaluation trenching on the western side of CZ3a recorded wooden revetments, which have been tentatively dated to the Saxon or medieval period (MoLAS-PCA 2008c). It is possible that the London to Colchester road and the crossing point of the Lea may well have continued to be used.
- 4.13 The river will have remained a useful resource during the Saxon period. Within the Domesday Book a reference is made to a water mill (mill of Algot) within the local area. The Bow Back Rivers were probably formed at this time and local tradition has it that King Alfred cut them after Danish marauders sailed up the River Lea to Hertford. Legend has it that by cutting a series of channels, King Alfred had sufficiently lowered the water level, leaving the Viking vessels aground, preventing their escape (Maddocks 1933). Alternatively, and perhaps more likely, however, the channels may have been adapted for use as millstreams (Barber *et al* 2004).

Medieval

- 4.14 Apart from the wooden revetments found in CZ3a (MoLAS-PCA 2008c), there is no archaeological evidence for medieval activity within PDZ3. However, land immediately to the west was occupied and exploited from at least the 13th century. The earliest reference to this area dates to AD 1293 and relates to a fulling mill located on the River Lea, owned by St Helen's Priory in the City of London (SMR 080971). The mill had probably been referred to in the Domesday Book of 1086 as the mill of Algot. It was again noted in deeds dated to 1355 when it was known as Algoldesmille (SMR 080969).
- 4.15 Excavations at nearby 413-417 Wick Lane (OFF85) uncovered medieval features, probably related to the settlement at Old Ford, which had developed along Old Ford Road in the 11th century and been abandoned in the mid-14th century (Leary forthcoming).
- 4.16 A large medieval property is documented to the west of PDZ3 on the junction of Wick Lane and Old Ford Road (GLSMR 080924). Known as Gissing Place, formerly the Old Place or Great Place, this included a mansion known as King John's Palace (although it never belonged to the crown) passed to the Duke of Gloucester in 1418 (Brown forthcoming; Maddocks 1933). A gatehouse from this building existed in a ruinous state into the late 18th century and collapsed in a storm in 1800. An 18th century engraving of the gatehouse (GLSMR 08092/01) shows that it was largely a mid 15th to early 16th century gothic brick gatehouse (Brown forthcoming). A dyehouse is also documented in the area, and was owned in 1501 by Sir John Shaa, Mayor of London (GLSMR 080903). This building continued in use into the 17th century.

Post-Medieval

- 4.17 There is a high potential for evidence of post-medieval activity, particularly since PDZ3 incorporates large sections of the Pudding Mill River and the City Mill River. Where these rivers have been straightened e.g. to the north of Pudding Mill River, there is a high potential for surviving riverbanks and riverbank structures. Elsewhere, the previous riverbanks are unlikely to have survived, as the rivers were significantly widened as part of the River Lea (Flood Relief) Act.
- 4.18 Remains of the City Mill River have been located during trenching in CZ3a, where revetments have been located (Trench 3.24, MoLAS-PCA 2008d) whilst revetments of another former channel were located in Trench 3.39, along with the partial remains of an early 19th century boat (MoLAS-PCA 2008c).
- 4.19 Immediately to the west of PDZ3 at Crown Wharf Ironworks (DAC03) a timber-lined tank re-used sections of 18th century barge, indicating the potential for similar remains within PDZ3.
- 4.20 Two post-medieval Compensation Reservoirs were filled in during the late 19th century. The nature of the infill is unknown.
- 4.21 It should be noted that the current stretch of the Pudding Mill River, which at present projects into PDZ3 from the north, and ends just short of the Northern Outfall Sewer, had passed north-south through the whole of PDZ3 (London Development Agency/MoLAS-PCA 2005b). It assumed its current, shortened length in the period between the Ordnance Survey maps of 1960–74 and the present day, its former course now in filled beneath the southern half of PDZ3.

SECTION 5: AIMS AND OBJECTIVES

5.1 In line with the ongoing archaeological work, AOC adopted the already established aims and objectives, as set out in the Written Scheme of Investigation for PDZ3 (MoLAS-PCA 2007b). 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 have been considered:

- When did the River Lea assume its current course along the southwest edge of the zone? 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 followed 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).

5.4 Any evidence of post-medieval land use (infrastructure, industrial use in the form of mills/wharves/locks) was considered to be of moderate importance because it characterises the area's townscape and has potential to contribute significantly to the local published priorities including the following research objectives: 'Establishing through the archaeological record how sustainable and determined (or not) were public and civic efforts to put in place, and then maintain, different aspects of London's infrastructure' and 'Contributing to the understanding of London's place as an industrial power' (Museum of London 2002, 69, 74). Any such post-medieval remains share group value with any such evidence in the other parts of the Olympic development in terms of collective interpretation and status.

SECTION 6: METHODOLOGY

- 6.1 The Evaluation was carried out in the southern part of PDZ3; PDZ3B (Figure 1). The original method statement (MoLAS/PCA 2007b) specified eight trenches measuring, one 15m x 3m, two 20m x 3m and five 30m x 3m at base. This was later revised to seven trenches measuring 30m x 3m at base and a single trial pit measuring 25m by 8m, which represents approximately 5% of PDZ3B (RPS/AOC 2008).
- 6.2 Practical safety issues regarding high water levels, contamination and unstable ground, coupled with issues with land availability led to numerous changes to the trenching plan. The final trench plan (Figure 2) comprised one 5.75m x 5.75m trench box (Trench PDZ3.04), one 25m x 8m trench (Trench PDZ3.07), one 23m x 4m trench (Trench PDZ 3.12), one 12.00m x 4.60m trench (Trench PDZ3.26), one 20.5m x 2.5m trench (Trench PDZ3.28), two 4.75m x 4.75m trench boxes (Trenches PDZ3.27 and PDZ3.30).
- 6.3 A mechanical excavator, initially using a breaker and toothed bucket, broke out the areas of trenching under archaeological supervision. Once intact archaeological and/or alluvial deposits were identified a toothless ditching bucket was used to excavate the trenches to the first archaeological horizon or natural sands and gravels.
- 6.4 Once the initial machine excavation of the trenches had taken place, all trench faces that required examination or recording were cleaned using appropriate hand tools. All investigation of archaeological levels was undertaken by hand, with cleaning, examination and recording in both plan and section. Within significant levels partial excavation, half-sectioning, the recovery of dating evidence, sampling and the cleaning and recording of structures was undertaken, as agreed with English Heritage (GLAAS).
- 6.5 Investigation was not undertaken at the expense of any structures, features or finds which might reasonably have been considered to merit preservation *in situ*. Some features, such as pits and ditches were half sectioned, whilst modern concrete foundations found *in situ* were left unexcavated.

- 6.6 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 Detailed Desk Based Assessment (MoLAS-PCA 2007a).
- 6.7 Alluvial and peat deposits were cleaned and recorded by the archaeological team, before being sampled and recorded in greater depth by a team of geoarchaeological specialists. The field team for the evaluation trench included a geoarchaeologist from Quaternary Scientific, University of Reading (formerly ArchaeoScape), who was available for the duration of the project to assess the potential of the natural deposits for reconstructing the past environment, which was 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 original method statement (MoLAS/PCA 2007b)
- 6.8 All trenching conformed to current best practice and was 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, Management of Archaeological Projects (MAP2).
- English Heritage Greater London Archaeology Advisory Service, 1998, Archaeological Guidance Papers 1-5.
- English Heritage Greater London Archaeology Advisory Service, 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.
- 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).

- 6.9 Archaeological work was monitored by Atkins on behalf of the Olympic Delivery Authority. The English Heritage (GLAAS) Archaeological Advisor, David Divers, was responsible for monitoring progress and standards throughout the project on behalf of the Olympic Delivery Authority Planning Decisions Team (ODA PDT).

SECTION 7: RESULTS

7.1 Trench PDZ3.04 (Figure 3)

Height	Context	Description
4.80m OD	406	Modern Tarmac surface.
4.74m OD	407	Crushed demolition material, gravel and sand levelling deposit.
4.64m OD	401	Dark greenish grey, firm re-deposited clay with moderate basal inclusions of light greyish white gravel. Made ground.
4.44m OD	405	Mid greyish brown, firm, slightly silty clay. Made ground.
1.39m OD	414	Mid – light grey sandy clay. Alluvial deposit
0.91m OD	415	Mid brownish grey sandy, poorly sorted gravels. Natural.

7.1.1 Trench PDZ3.04 was situated within the north of CZ3B (Figure 2). The trench measured 5.75m x 5.75m.

7.1.2 Natural gravels (415) were observed at a height of 0.91m OD. These were overlain by a layer of mid – light grey, friable, sandy clay alluvium 0.48m thick (414). This layer was sealed by a 3.05m thick, mid greyish brown clay deposit (405), which was interpreted as alluvium on site. Preliminary laboratory examination of the column samples taken from (405) showed the material to be a uniform, poorly sorted, gritty, sandy clayey silt with a mainly blocky structure (Appendix B). There was some evidence of soil activity in the form of scattered root channels and root material, calcareous worm granules and discontinuous worm burrows. Broken mollusc shell was common, particularly in the upper part of the sequence, and a few complete shells including a juvenile *Bithynia tentaculata* together with finely divided plant remains. Anthropogenic components included small particles of CBM, a piece of tar-coated road stone, chips of bone and finely divided charcoal (Appendix B). The depth of this deposit, and the fact that it lacks the typical alluvial depositional structures or mature features of solid development, suggests that this it is likely to be made ground (Appendix B).

- 7.1.3 These deposits were overlain by a layer of dark greenish grey re-deposited clay made ground with moderate basal inclusions of light greyish white gravel (401), which measured 0.20m in thickness. This layer was overlain by a crushed demolition material, gravel and sand levelling deposit (407), 0.10m thick. This was situated below a modern tarmac surface (406) 0.06m thick.
- 7.1.4 A linear ditch orientated northwest-southeast [404] was uncovered running across the centre of Trench PDZ3.04. It measured up to 2m in width and extended beyond 7m in length. The feature cut through re-deposited clay, made ground layers (401) and (405). The ditch was straight in plan with consistently parallel sides. The cut of the feature broke sharply from horizontal, the flat sides steeply sloping and breaking moderately to a shallowly undulating base. The cut contained two distinct fill deposits; (402) and (403).
- 7.1.5 The primary fill (403) of ditch [404] comprised dark brownish orange, firm, silty clay with frequent large, poorly sorted, sub-rounded gravel and fragmentary brick inclusions. The deposit varied greatly in depth, measuring 1.10m within the north facing section of Trench PDZ3.04 and as little as 0.20m in the south facing section of the trench. It was present throughout the length of linear feature [404].
- 7.1.6 The secondary fill (402) of ditch [404] was a mid-dark greyish black, firm, silty clay, which contained moderate building material and gravel inclusions. It measured 0.81m in depth and was present throughout the length of [404]. It was sealed by crushed demolition material, gravel and sand levelling deposit (407).
- 7.1.7 A line of six wooden posts had been driven into deposit (405) within the western side of ditch cut [404]. The southernmost post [408] was found 0.04m to the north of the limit of excavation and 0.20m to the east of the edge of ditch [404]. It was squared in plan, measuring 50mm in width and 0.20m in length. The wood was straight grained and had been machine cut into a point. A similar post [409] was situated 1.9m to the northwest. It was squared in plan, measured 70mm in width and 100mm in length.

7.1.8 Posts [410] and [411] were found 2.01m to the northwest of [409]. Post [410] was squared in plan, made from straight grained wood and machine cut to a point. It measured 50mm in width and 110mm in length. Immediately to the northwest was post [411], which was similarly machine cut, straight grained and squared in plan. It measured 60mm in width and 100mm in length.

7.1.9 Posts [412] and [413] were located 1.40m to the northwest of [4011]. Both were machine cut from straight grained wood to a point and squared in plan. Post [4012] measured 50mm in width and 110mm in length. Post [413] was 80mm in width and 350mm in length.

7.1.10 The line of posts driven into the western wall of ditch [404] was evenly spaced along the length of the linear feature. The wood was straight grained and had been precisely cut by a machine powered saw, suggesting that the fence line and associated ditch form a modern field boundary that was destroyed and backfilled during the 20th century, when the area was levelled and surfaced with tarmac.

7.2 Trench PDZ 3.07 (Figures 4 and 5)

Height	Context	Description
3.94m OD	701	Concrete surface.
3.69m OD	702	Charcoal rich gravely silt, highly compacted levelling layer.
3.58m OD	703	Mid-dark orangey brown silty clay, with frequent CBM, rounded pebble and mortar inclusions. Made ground.
3.33m OD	704	Mid greyish brown clay with moderate ironstone inclusions. Alluvium.
2.93m OD	705	Mid-dark bluish, brownish grey clay, with occasional shell inclusions. Alluvium.
1.69m OD	706	Mid-dark bluish, greenish grey clayey sand, with occasional organic inclusions. Alluvium
0.90m OD	732	Mid yellowish brown, friable gravely sand, with occasional sub rounded pebble inclusions. Natural lens.
0.78m OD	733	Mid greyish blue, soft, clayey sand, with very occasional rounded pebble inclusions. Alluvium.
0.52m OD	734	Mid-light greyish yellow, friable, gravely sand. Natural.

7.2.1 Trench PDZ3.07 measured 25m x 8m at base. It was located within the east of CZ3b (Figure 2).

- 7.2.2 Natural gravels (734) were reached at 1.42m OD. Column samples taken from the deposit identify it as a light olive brown, well-sorted, slightly silty sand containing scattered plant remains and iron-rich concretions (Appendix B).
- 7.2.3 The gravels were below an alluvial deposit of mid greyish blue, soft, clayey sand, with very occasional rounded pebble inclusions (733), which measured up to 0.31m in depth. It was sealed by a separate alluvial deposit of mid – dark bluish, greenish grey clayey sand, with occasional organic inclusions (706). Geo-archaeological analysis of this deposit has divided the deposit into two lenses. The lower lens comprised very dark greyish brown sands and silts, 0.1m thick, which was rich in organic material, including common plant debris and patches of sediment very rich in mollusc remains (Appendix B). The overlying lens comprised complex interpenetrating lobes of bedded sands and silts, 0.1m thick, incorporating common plant remains, scattered ostracods and broken mollusc shell (Appendix B).
- 7.2.4 Within the west of the trench, a lens of mid yellowish brown, friable gravely sand, with occasional sub rounded pebble inclusions (732) was found between sandy clay (733) and alluvium (706). It measured between 0.10m and 0.12m in thickness. Mid-dark bluish, brownish grey clay alluvium (705) was found above (706). It contained occasional shell inclusions and measured between 0.11m and 0.22m in depth. Geo-archaeological analysis of column samples taken from the deposit identify the lower 0.27m of (705) as peaty silt comprising thin alternating beds of silt and laminated plant remains (Appendix B). Scattered clasts of sub-angular flint were present and mollusc remains, including complete shells of *Succinea* spp. and *Bithynia tentaculata* (Appendix B). The upper portion of the deposit was recorded as a dark yellowish brown sandy silt containing common plant remains, mainly fragments of reed, and a rich mollusc fauna, including *Theodoxus fluviatilis*, *Valvata piscinalis*, *Valvata crista*, *B. tentaculata* and shells of small bivalves (Appendix B). Particles of charcoal and small (5mm) pieces of wood were also present.

- 7.2.5 Layer (705) was sealed by the uppermost alluvial clay deposit (704), which was mid greyish brown in colour and contained moderate inclusions of ironstone. The deposit extended to 0.94m in depth. Geo-archaeological analysis of samples taken from the deposit defined it as; a dark greyish brown, very well-sorted silt, which was platy in structure, containing finely divided plant debris and in its lower half a rich and well preserved mollusc fauna. These included *V. piscinalis*, *V. crista*, *B. tentaculata*, *Limnaea peregra* and small bivalves preserved with valves conjoined (Appendix B). One small (3mm) piece of possible CBM was noted.
- 7.2.6 All the Trench PDZ3.07 sediments that were investigated by Quaternary Scientific suggest they were deposited in or close to an active river channel (Appendix B). The sequences in the column samples generally consist of well bedded, moderately organic sands and silts with mollusc faunas indicative of large, clean, well-oxygenated bodies of running water (Appendix B). It is likely that the deposits represent sedimentation in one of the main channels shaping the floor of the Lea valley. It seems possible that the channel may be the Pudding Mill River (Appendix B).
- 7.2.7 The alluvial deposits uncovered within Trench PDZ3.07 were sealed by three identifiable layers of manmade overburden. The lowest (703) was up to 1.68m deep and comprised mid-dark orangey brown silty clay, with frequent CBM, rounded pebble and mortar inclusions. It was sealed by a 0.20m thick levelling layer of charcoal rich, highly compacted gravely silt (702), which was found below a 0.24m deep layer of modern concrete (701).
- 7.2.8 Two wooden revetments formed from lines of posts and vertical planks, a number of independent stakes and posts, and a line of horizontal planks were found within clay alluvium (705), some extending into the lower alluvial levels beneath.
- 7.2.9 A line of posts [707] and associated wooden planking [708] ran parallel with the western extent of the excavation in a north-south orientation, continuing into the northern and southern extents of the trench. Post line [707] consisted of 19 posts, each constructed from a sawn, de-barked, squared log of *Pinus sylvestris* (Scot's Pine) (Appendix C). The base of each post tapered into a two sided point. The top of the posts were found within clay alluvium (704). The bases were driven through

alluvial deposits (705), (732), (706) and (733), and secured vertically within the natural gravels (734). Post [707] was extracted during the excavation. It measured 1.61m in length.

7.2.10 A continuous line of overlapping vertical planks [708] were secured to the eastern side of posts [707] with square headed iron nails. The planks were 20mm wide and survived in depth up to 160mm. They were constructed from *Pinus sylvestris* (Scot's Pine) and are closely comparable in shape to modern 'shiplap', as used for fence panels and for the exterior cladding of out-buildings (Appendix C), further indicating that the revetment is modern.

7.2.11 Within the centre of the trench, two lines of posts ran in a north–south orientation between a line of vertical planking. The line to the east [709], comprised 23 posts, each circular in cross section with a diameter between 40mm and 80mm. The wood used to construct the posts was straight grained and missing its bark. However, the sapwood remained and only the base of the post had been work crudely into a point. The posts spanned a length of 5.10m, spaced closely together, only 60 - 150mm apart. The posts were set diagonally (the top of the posts slanting eastwards) within the lowest alluvial deposit (733), having been driven through (706). The top of the posts were found within alluvial deposit (705).

7.2.12 Posts [709] were driven vertically below revetment planking [710], which ran for 5.68m directly to the west of the post line. The planks were set diagonally against the sloping posts of [709], adjacent to larger vertical posts [711] further to the west, although no fixing mechanism was visible. The planking was 40mm thick and varied between 0.90m and 1.20m in length. No tool marks, intentional marks or evidence of surface treatments were visible.

7.2.13 Post line [711] comprised seven posts located to the west of planking [710] and post line [709], which were irregularly spaced for 4.40m. Each post was circular in cross section, formed from unmodified branches, rather than trunk wood, that had been minimally worked to remove any extraneous side branches and partly cut and split, to form a (very) crude 'point' (Appendix C). The posts measured between 80mm and 120mm in diameter and up to 1.15m in length. The posts were set vertically into the natural gravels (734) and had been driven through alluvial layers (733) and (706). The top of the posts were found within alluvial clay (705). They were constructed from *Quercus* sp. (Oak) (Appendix C). Much of the sapwood was soft in contrast to the dense extremely hard, and blackened, heartwood. Though the outermost wood was present the bark was not.

7.2.14 To the west of [711] were 3 evenly spaced posts [720], [723] and [735] in a north-south alignment. All were circular in plan, with a diameter of between 0.18m and 0.24m. For each of the timbers the bark remained, except around the base of the post, which had been worked into a point. The length of the posts was not fully reached.

7.2.15 The size and spacing of the post line comprising [720], [723] and [735] was similar to a longer line of posts to its west, situated to the east of revetment [707]/[708]. The post line comprised posts [712], [713], [714], [715] and [717]. Each was vertically set within the alluvial deposits and consisted of unworked logs, which still had bark attached in places. The depth of the logs and the form of each posts base was not discovered. The posts varied in diameter between 0.14m and 0.16m. Only post [717] was excavated to its base, which was worked to a roughly circular point. The post was 1.56m long. The post line may also incorporate posts [716] and [730], which were located between [715] and [717], but were not in full alignment with the line.

- 7.2.16 Post [716] was sampled for subsequent analysis during the investigation (Appendix C). It was found to be made from Elm (*Ulmus* sp.), fashioned from a trunk that was felled, side branches removed and, without further modification, one end skilfully tapered to a point. It is believed that the post would have been bark covered when erected. Signs of eccentric wood growth were present in the sample, suggesting that the wood formed at an angle on a gentle slope. Woodworking marks suggest a well-sharpened metal axe with a flat cutting edge was used to shape the end of the post and purvey a good woodworking knowledge, further suggested by the use of Elm, which is a native taxon valued for its resistance to decay in wet or waterlogged environments.
- 7.2.17 It is more likely from its position that [730] forms part of the post line. The post measured 1.64m in length and 0.20m in diameter, and still had its bark attached. Similarly, post [716], although it deviated from the north-south orientation of the post line had the characteristics of the other posts within the line, suggesting it's inclusion within the structure. [716] was unworked apart from the pointed base, it measured 1.46m in length and 0.16m in diameter.
- 7.2.18 The post lines [720]–[735] and [712]–[730] were situated in north-south orientated rows emanating westwards from revetment [709], [710] and [711]; suggesting that they represent supports for a structure related to the revetment, such as a jetty, bridge or trackway.
- 7.2.19 Between the two lines of posts, within the centre of the trench, was a revetment feature formed from vertically formed posts and stakes [718], [719], [721] and [722], which were of varying sizes, generally becoming smaller towards the south, set to the east of vertical planking [724]. Between the post supports and the planking ran horizontal unworked branches. All of the stakes and posts still had remnants of bark attached and were unworked, although the full extent of the timbers was only exposed in the shorter stakes that did not have a worked base.

- 7.2.20 Seven overlapping wooden planks [725] of varying sizes were lain in a rudimentary east-west alignment at the southern end of the trench. The planks spanned a length of 5m. The length of individual timbers varied between 0.45m and 2.75m and between 0.20m and 0.13m wide. Each plank was 20–30mm thick and was clearly machine cut, although most were broken. This may represent a simple dump of broken materials within a river environment, or a rudimentary crossing within a marshland environment.
- 7.2.21 An unworked, vertically set stake [729] was situated to the north of planks [725]. The stake was not excavated to its full depth and it measured 60mm in diameter. The wood was knotty and still had bark attached. The stake may represent a continuation of revetment posting [711] to the north, as may similar stakes [727] and [728] situated further to the north.
- 7.2.22 The wooden structures in this trench, coupled with the environmental evidence, may be indicative of activity associated with the Pudding Mill River.

7.3 Trench PDZ3.12 (Figure 6)

Height	Context	Description
6.00m OD	1201	Pale whitish yellow, crushed demolition material. Modern hard standing.
5.58m OD	1202	Dark blackish brown, compacted, charcoal rich coal and asphalt. Levelling layer.
5.48m OD	1203	Fragmentary, crushed yellow stock bricks, red LBC bricks and mid greyish yellow mortar, with frequent modern CBM and metal inclusions. Hardcore layer / surface.
5.18m OD	1204	Mid brownish grey, friable, gravelly silt, with frequent slate inclusions towards the top of the deposit and fragmentary brick inclusions at the base. Oil barrels were recovered from this deposit. Made Ground.
4.44m OD	1205	Bright white, soft chalk. Industrial dumping layer.
4.01m OD	1206	Mid – dark brown, firm gravelly, silty clay, with occasional CBM inclusions.
3.34m OD	1207	Mid – light brownish yellow, in places mottled light greyish blue and mid –dark brown, firm clay. Patches of hydrocarbon staining found at the surface of the deposit and areas of organic decomposition found throughout. Contained frequent inclusions of wood fragments. Reservoir backfill.
1.55m OD	1208	Mid – dark bluish grey, firm clay, with moderate organic inclusions. Reservoir backfill.
1.23m OD	1209	Mid brownish grey, poorly sorted gravels. Natural

- 7.3.1 Trench PDZ3.12 measured 23m x 4m at base. It was located within the south of CZ3b (Figure 2).
- 7.3.2 Natural gravels (1209) were reached at 1.23mOD. They were overlain by a deposit, 0.29m thick, of bluish grey clay, which contained organic inclusions (1208). This layer was sealed by a thicker secondary deposit, which comprised mid–light brownish yellow clay, mottled light greyish blue and mid–dark brown in places, with frequent organic inclusions (1207). The deposit measured up to 1.79m in thickness.
- 7.3.3 Geo-archaeological analysis of column samples taken from Trench PDZ3.12 identify that (1207) comprised alternating beds of clayey silt, and (1208) beds of peaty sand or silt (Appendix B). Within (1207) the clayey silt varied in colour from olive brown to dark bluish grey and was either massive or blocky in structure. Plant remains were present and common at some levels but absent or uncommon at others. Mollusc remains are generally absent from the clayey silt but broken shell was noted at two levels, with a complete example of *Lymnaea peregra* (Appendix B). Small particles of CBM were recognised at the uppermost level in the sequence.
- 7.3.4 The peaty horizons within (1208) were black or very dark greyish brown. These beds were generally silty with varying amounts of sand and scattered sub-angular flint clasts, up to 45mm Ø, but generally smaller (5-10mm) (Appendix B). No evidence of primary depositional structures survived and the beds were either massive or more commonly chaotic in their organisation. Mollusc remains are common with valves of small bivalves present and an operculum of *B. tentaculata*. A single complete shell of the Common Winkle (*Littorina littorea*) was noted in the lower part of the sequence (Appendix B).
- 7.3.5 It is thought that deposits (1207) and (1208) consist of reservoir backfill. The environmental assessment supports this theory (Appendix B). Evidence of the reservoir was also identified in Trench PDZ3.26 (see below), which is located in close proximity to Trench PDZ3.12.

7.3.6 The backfill deposits were overlain by a layer of mid–dark brown, firm, gravelly, silty clay, with occasional CBM inclusions (1206), which measured 0.80m in thickness. This layer was overlain by a dumping deposit of white, soft, chalk (1205) 0.25m thick. Above this was another deposit of made ground that comprised mid brownish grey, friable, gravelly silt, with frequent slate inclusions towards the top of the deposit and fragmentary brick inclusions at the base (1204). The deposit was 0.76m thick. A crushed brick and mortar hardcore surface (1203) 0.42m thick was found above (1204) and below a highly compacted charcoal rich coal and asphalt levelling layer (1202), which measured 0.24m in thickness. The uppermost deposit within the stratigraphy was a layer of hard standing, which comprised crushed modern demolition material (1201) and measured 0.42m deep.

7.4 Trench PDZ3.26 (Figure 6)

Height	Context	Description
5.66m OD	2601	Mid – dark greyish brown, clayey silt containing frequent inclusions of modern building materials and gravels. Made ground.
3.54m OD	2602	Mixed re-deposited blue alluvial clay, mid brown peat and mid greyish yellow gravelly sand. Reservoir backfill.
1.02m OD	2603	Poorly sorted sub angular gravels within a mid brownish yellow sand matrix. Natural.

7.4.1 Trench PDZ3.26 was located within the southern end of CZ3b, directly to the north of Trench PDZ3.28 (Figure 2). The trench measured 12.00m in length and 4.60m in width at base.

7.4.2 Natural gravels (2603) were reached at 1.02m OD. They were sealed by a layer of mixed re-deposited blue alluvial clay, mid brown peat and mid greyish yellow gravelly sand (2602), which was 2.20m deep. The mixed nature of the deposit suggests that this was the backfill of a reservoir found on 19th century maps of the area.

- 7.4.3 Geo-archaeological laboratory examination of samples taken from (2602) identified 65 separate sub-units. They ranged in texture from slightly silty sands to silty clays and in colour from olive to bluish grey to black. Some of the sediment bodies incorporated flint clasts (up to 30mm), or pieces of wood or mollusc remains. Some bedded alternations of sand and clay were present but the general impression was of very crude layering with more or less steeply inclined, sharp and very uneven contacts, much interpenetration of sediment bodies and the presence of many isolated inclusions (Appendix B). The lack of primary depositional structures and the random juxtaposition of varied sediments types identifies this deposit as an artificial backfill.
- 7.4.4 Within the centre of the trench a bowl shaped deposit of mid brownish yellow sand (2604), measuring up to 2.08m deep was found above (2602). The deposit was clearly water lain, further supporting the stratigraphy's connection to the reservoir.
- 7.4.4 The reservoir deposits and natural gravels were found below a 1.4m deep deposit of mid-dark greyish brown, friable, silty clay made ground (2601). The deposit contained frequent inclusions of 20th century building materials, pottery, CBM and demolition rubble.
- 7.4.5 No archaeological features or significant artefactual remains were uncovered within Trench PDZ3.26.

7.5 Trench PDZ3.27 (not illustrated)

Height	Context	Description
5.45m OD	2701	Mixed mid brown sandy silt and mid orangey brown gravels with moderate inclusions of modern building materials. Made Ground.
3.44m OD	2702	Mottled, mid to light bluish, brownish grey clay with moderate dark blackish brown organic inclusions and mid brownish peat inclusions. Alluvium.
1.79m OD	2703	Poorly sorted gravels within a mid yellowish brown sand matrix. Natural.

- 7.5.1 Trench PDZ3.27 was located within the centre of PDZ3. It measured 4.75m x 4.75m.

7.5.2 Natural gravels (2703) were reached at 1.79mOD. Sealing the gravels was a 1.65m thick deposit of mottled, mid to light bluish, brownish grey alluvial clay with moderate dark blackish brown organic inclusions and mid brownish peat inclusions (2702). The alluvium was found beneath a deposit of made ground, comprising mid brown, friable, sandy silt, mixed with mid orangey brown gravels and moderate inclusions of modern building materials (2701). The deposit measured 2.01m thick.

7.5.3 No archaeological features or significant artefactual remains were uncovered within Trench PDZ3.27.

7.6 Trench PDZ3.28 (Figure 6)

Height	Context	Description
5.98m OD	12/001	Crushed demolition material, gravel and sand levelling deposit
4.50m OD	12/005	Mid bluish grey concrete slabs comprising walls and floors of a concrete structure and associated surface.
4.38m OD	12/006	Highly compacted, mixed, black charcoal rich gravels and dark red crushed CBM fragments. Levelling material deposited during construction of 12/005.
4.18m OD	12/007	Light white, loose, lime / chalk dumping deposit.
3.88m–3.44mOD+	12/008	Mid brownish grey, firm clay with frequent gravel and CBM inclusions. Re-deposited alluvial clay within reservoir.

7.6.1 Trench PDZ3.28 was located within the south of PDZ3B, directly to the north of Trench PDZ3.12 (Figure 2). The area of excavation was 20.5m long and 2.5m wide. The excavation was undertaken to the depth of concrete structure (12/005), which was partially uncovered during the excavation of Trench PDZ3.26 to the north. At the northern and southern end of the structure, deposits were removed to below the depth of the structure in order to establish its position within the stratigraphy uncovered in Trenches PDZ3.12 and PDZ3.26.

7.6.2 Structure [12/005] was constructed from bluish grey concrete with white flecking within its interior. The feature was structurally composed of two overlaying layers of horizontal concrete slabs, each between 40mm and 50mm thick, 6.00m and 5.00m long and 1.80m and 2.50m wide, projecting 13m southwards from a concrete basement 6m long, 4.75m wide and 1.12m deep. The northern wall of the room was missing and the eastern and western walls only partially survived. Metal rivets were exposed within parts of the room's construction and a metal mesh was found within the surface slabs. The structure was found within the location of a building noted on the 1965 Ordnance Survey map of the area.

7.6.3 Basement [12/005] was uncovered below made ground deposit (12/001), which comprised crushed demolition material, gravel and sand. It extended to a depth of 1.48m. Concrete structure [1205a] was set upon a levelling layer of highly compacted, mixed, black charcoal rich gravels and dark red crushed CBM fragments (12/006). The deposit was 0.20m deep and sealed dumping layer (12/007), which comprised light white, loose chalk and lyme and extended to a depth of 0.30m. The lowest deposit exposed during the excavation of Trench PPZ3.28 was a reservoir layer (12/008), similar to that found within Trench PDZ3.26 to the north. The deposit comprised mid brownish grey, firm alluvial clay mixed with frequent gravel and CBM inclusions

7.7 Trench PDZ 3.30 (Figure 7)

Height	Context	Description
4.72m OD	3001	Greyish white modern concrete surface.
4.57m OD	3002	Mid – light orangey yellow, heavily compacted, crushed concrete, mortar and sand. Levelling layer.
4.37m OD	3003	Dark blackish brown, soft re-deposited alluvial clay with moderate inclusions of modern building materials and lenses of charcoal rich gravels. Made ground.
3.87m OD	3004	Mid greyish brown, friable, sandy, gravelly clay. Made ground.
2.97m OD	3005	Mid – dark greenish grey, firm clay with occasional organic inclusions. Alluvium.
2.52m OD	3006	Mid – light bluish grey, firm clay with frequent shell inclusions. Alluvium.
1.42m OD	3007	Mid brown peaty clay, with moderate inclusions of decomposing wood material. Alluvium.
1.02m OD	3008	Mid bluish grey clay with occasional lenses of peat and organic material. Alluvium.
0.12m OD	3009	Poorly sorted gravels in a mid brownish yellow sand matrix. Natural.

- 7.7.1 Trench PDZ3.30 was located within the north of the site (Figure 2). It measured 4.75m x 4.75m.
- 7.7.2 Natural gravels (3009) were reached at 0.12m OD. They were found below a 0.90m deep alluvial deposit of mid bluish grey clay (3008), which contained lenses of peat and organic material. Analysis of column samples taken from the deposit (Appendix B) show that the sediment comprised a well sorted but slightly sandy silt with scattered tufa-like calcareous concretions up to 25mm (long dimension) which incorporated plant remains and pieces of snail shell. Mollusc remains included a few individual specimens of *Pupilla muscorum* and *Vertigo pygmaea*. Substantial numbers of calcareous worm granules were also present. Both worm granules and mollusc remains became increasingly common towards the base of the unit. A few small (1-2mm) particles of possible CBM were noted.
- 7.7.3 Alluvial deposit (3007) composed of mid brown peaty clay, with moderate levels of organic inclusion sealed (3008). The layer was up to 0.40m thick. Geo-archaeological assessment of the deposit showed it comprised very dark grey (oxidising to dark brown), very well sorted, very slightly sandy silt (Appendix B). Organic content took the form of finely divided plant material, increasing in abundance downward, with occasional seeds and other larger (2-3mm) plant fragments, which in some cases had a patchy coating of iron-rich micro-spherules. A single fragment of snail shell was noted and a few small (1-2mm) particles of possible CBM.
- 7.7.2 Alluvium (3007) was located below another alluvial deposit (3006) that was 1.10m thick and comprised mid – light bluish grey, firm clay with frequent shell inclusions. The uppermost alluvial deposit (3005) was a mid–dark greenish grey, firm clay with occasional organic inclusions. It was 0.45m thick.
- 7.7.3 Geo-archaeological assessment of the deposits, (3007) and (3008), from Trench PDZ3.30 confirms that this is floodplain alluvium and suggests deposition in an abandoned channel or a floodplain pond (Appendix B).

7.7.4 The alluvial deposits within Trench PDZ3.30 were covered by a 0.90m deep layer of mid greyish brown, friable, sandy, gravely clay made ground (3004). This was found below a 0.50m deep layer of made ground, which comprised dark blackish brown, soft re-deposited alluvial clay with moderate inclusions of modern building materials and lenses of charcoal rich gravels (3003). This deposit was sealed by a compacted levelling layer (3002) of mid–light orangey yellow, heavily compacted, crushed concrete, mortar and sand. It measured up to 0.20m in thickness and was sealed by modern concrete surface (3001), which was 0.15m thick.

7.7.5 No archaeological features or significant artefactual remains were uncovered within Trench PDZ3.30.

7.8 Finds

7.8.1 With the exception of wood samples (Appendix C) from the revetment structures in Trench PDZ3.07 no significant artefactual evidence was recovered from the evaluation undertaken within PDZ3. Late 19th and early 20th century domestic waste, including pottery, metalwork and CBM fragments were observed within the made ground overburden that covered each trench.

7.8.2 A total of nineteen 50cm long column samples were collected by Quaternary Scientific from Trenches PDZ3.04, 3.07, 3.12, 3.26, and 3.30. Bulk samples (c.30) were also recovered from these trenches. A rapid assessment of the litho- and bio-stratigraphic remains (Appendix B) was completed. The assessment of the environmental deposits showed that modern material was present within Trenches PDZ3.04, 3.12 and 3.26. Trench PDZ3.30 did contain alluvial sediments; however the potential for further analysis of the material is limited by sampling issues relating to the size of trench. Trench PDZ3.07 contained alluvial deposits which potentially originate from the Pudding Mill River. Further assessment and analysis of these samples is recommended (Appendix B).

SECTION 8: CONCLUSIONS AND RECOMMENDATIONS

- 8.1 The stratigraphic sequence exposed within the evaluation has illustrated that, with the exception of Trenches PDZ3.07 and PDZ3.30, the alluvial clays have been truncated by modern deposits. Specifically, Trenches PDZ3.12 and PDZ3.26 contained 19th/20th century reservoir backfill. Within Trench PDZ 3.28, the foundations of a 20th century concrete building was also found, which correlates with the position of a building on the 1965 Ordnance Survey map and probably overlays the edge of a 19th century reservoir.
- 8.2 The most significant historic archaeological remains uncovered during the evaluation were the lines of posts and planking, which formed at least two phases of revetment and at least one associated structure within Trench PDZ3.07. The wooden post built structures clearly identify evidence of past waterways management within the area, whilst their location when compared to cartographic sources suggest that they were constructed within the Pudding Mill River.
- 8.3 Two distinct phases of revetment show a continuation of river management on the Pudding Mill River. The earlier revetment formed from a line of crudely worked, large oak logs, a line of partially worked stakes and crudely worked planks differed greatly from the later revetment of precisely sawn Scotch Pine posts and planks, suggesting that the earlier revetment underwent extensive use, or may have been abandoned for some time. A parallel line of posts projecting on an east–west alignment from the earlier revetment, also formed from partially worked, sizable timbers most probably represents a jetty or bridge constructed after the initial revetment, as the posts show the use of greater woodworking skills and more suitable materials in the form of elm, which is more resistant within wet environments. There was no dating evidence for the wood structures. Radiocarbon dating of the oak revetment and elm ‘jetty’ are recommended. Radiocarbon dating of the wood may show that management of the river, through the construction of revetments and jetties, has taken place over an extended period of time.

- 8.4 A rapid assessment of the environmental remains (Appendix B) sampled from the site indicates that the sediments recovered from Trench PDZ3.07 represent a period of active channel formation on the floodplain of the River Lea. Therefore, further assessment of the biological macro-remains from contexts (706) and (705), and diatoms from contexts (732), (733), (704) is recommended. This work may contribute significantly to our understanding of the history of the floodplain and the Pudding Mill River. During the assessment, no material suitable for radiocarbon dating was recovered, however additional assessment of the macro-remains may produce material suitable for radiocarbon dating, allowing the formation of a dating sequence for the sediments.
- 8.5 No sediments of Late Pleistocene age were identified. No archaeological remains associated with settlement were uncovered during the evaluation. The results of the rapid assessment (Appendix B) indicate that there is very little evidence for anthropogenic input into any of the natural sediments examined. The results of the rapid assessment indicate that it is doubtful whether the environmental archaeological evidence can contribute significantly to an understanding of channel margin or land-use activities, except possibly to show that such activities have had little impact on the preserved sediments. However, further assessment of the biological macro-remains from contexts (706) and (705), and diatoms from contexts (732), (733), (704), Trench 7, has the potential to provide important information contributing to these aims. The results of the rapid assessment indicate that none of the trenches examined are likely to provide any insights into the origin of the present-day course of the River Lea.
- 8.6 Following consultation with EH GLAAS, advisors to the ODA PDT it is not intended to carry out any further archaeological fieldwork across CZ3b. 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/stratigraphical database and GIS model.
- 8.7 It is recommended that the results of the evaluation are included and assessed in the Site Wide Integrated Post-Excavation Assessment (SWIPEA), which will recommend any further analysis of archaeological data across the Olympic Park and in the eventual production of publication and dissemination of the results.

SECTION 9: ARCHIVE DEPOSITION

9.1 The documentary archive comprises of:

Context checklist	3 sheets
Trench record	6 sheets
Context sheet series	402-413, 701-734, 1205A-1208A, 2602 + 2604
Levels register	4 sheets
Photo registers	8 sheets
Watching brief notes	1 sheet
Section register	1 sheet
Section drawings	12 sheets
Plan register	1 sheet
Plan drawings	23 sheets
Environmental register	1 sheet
Soil sample sheets	3 sheets

9.2 The physical archive comprises of two boxes of wood samples, two wrapped timbers, 19 50cm long column samples and c.30 bulk samples.

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.

9.4 The documentary, digital and physical archive will be prepared and deposited at the London Archaeological Archive and Research Centre (LAARC) within three months of this report being submitted.

9.5 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	Image No.	Single Ctxt. Plan?	Plan No.	Section No.	Specialist Drwg. No.
401	Dark greenish grey, re-deposited clay Made ground.	5.75m	5.75m	0.20m		N		10 and 11	
402	Dark brownish orange, silty clay. Fill.	5.75m	2.30m	1.25m		N		10 and 11	
403	Mid greyish black, silty clay. Fill.	5.75m	2.00m	0.80m		N		10 and 11	
404	Cut of Linear Ditch	5.75m	2.30m	1.52m		N		10 and 11	
405	Mid greyish brown, firm, slightly silty clay. Alluvium	5.75m	5.75m	3		N		10 and 11	
406	Modern Tarmac surface	5.75m	5.75m	0.06m	-	N	-	10 and 11	-
407	Crushed demolition material, gravel and sand levelling deposit.	5.75m	5.75m	0.10m	-	N	-	10 and 11	-
408	Timber Post	0.20m	0.05m	?	-	N	1		-
409	Timber Post	0.10m	0.07m	?	-	N	1		-
410	Timber Post	0.11m	0.05m	?	-	N	1		-
411	Timber Post	0.10m	0.06m	?	-	N	1		-
412	Timber Post	0.11m	0.05m	?		N	1		
413	Timber Post	0.35m	0.08m	0.05m		N	1		
414	Mid – light grey sandy clay	5.75m	5.75m	0.20m	-	N	-	10 and 11	-
415	Mid brownish grey sandy, poorly sorted gravels	5.75m	5.75m	1.00m	-	N	-	10 and 11	-
701	Concrete surface	25.00m	8.00m	0.25m		N	4	1, 2 and 5	
702	Charcoal rich gravelly silt, highly compacted levelling layer	25.00m	8.00m	0.11m	-	N	4	1, 2 and 5	-
703	Mid – dark orangey brown silty clay	25.00m	8.00m	0.35m	-	N	4	1, 2 and 5	-

704	Mid greyish brown clay	25.00m	8.00m	0.40m	-	N	4	1, 2 and 5	-
705	Mid – dark bluish, brownish grey clay	25.00m	8.00m	1.24m		N	4	1, 2, 3, 4 and 5	
706	Mid – dark bluish, greenish grey clayey sand	25.00m	8.00m	0.20m	-	N	4	1, 2, 3, 4 and 5	
707	Post line	14.00m	0.09m	1.61m	-	N	4	1, 2 and 5	-
708	Revetment planking	14.00m	0.02m	0.16m	-	N	4	1, 2 and 5	-
709	Line of Stakes	5.00m	0.08m	?	-	N	4	3	-
710	Revetment planking	5.00m	0.04m	1.20m	-	N	4	3	-
711	Post line	4.80m	0.02m	0.62m		N	4	3	
712	Post	0.16m	0.16m	?		N	4		
713	Post	0.14m	0.14m	?		N	4		
714	Post hole	0.16m	0.16m	0.40m+		N	4		
715	Post hole	0.14m	0.14m	?		N	4		
716	Post	0.16m	0.16m	?		N	4	4	
717	Post	0.15m	0.15m	1.56m		N	4		
718	Line of 3 stakes and a post	0.10m	0.10m	?		N	4	4	
719	Stake	0.11m	0.11m	?		N	4		
720	Post	0.23m	0.23m	?		N	4		
721	Post	0.11m	0.11m	0.14m+		N	4		
722	Post	0.16m	0.16m	0.14m+		N	4		
723	Post	0.20m	0.20m	?		N	4		
724	Planking	1.20m	0.04m	?		N	4	4	
725	Planking	5.00m	0.13m	0.03m		N	4		
726	Dark bluish greyish brown, gravelly, clayey silt.	8.00m	?	?		N	4		

727	Stake	0.60m	0.60m	?		N	4		
728	Stake	0.40m	0.40m	?		N	4		
729	Stake	0.60m	0.60m	?		N	4		
730	Stake	0.50m	0.50m	?		N	4	4	
731	Concrete Revetment	25.00m	?	?		N	4	5	
732	Mid yellowish brown, friable gravelly sand	4.00m+	4.00m+	0.12m		N	4	5	
733	Mid greyish blue, soft, clayey sand	25.00m	8.00m	0.43m		N	4	3,4 and 5	
734	Mid – light greyish yellow, friable, gravelly sand	25.00m	8.00m	0.21m		N	4	3 and 4	
735	Post	0.14m	0.14m	?		N	4		
1201	Modern hard standing	23.00m	4.00m	0.30m			3	6 and 7	
1202	Dark blackish brown, compacted, charcoal rich coal and asphalt.	23.00m	4.00m	0.24m			3	6 and 7	
1203	Crushed yellow stock bricks, red LBC bricks and mid greyish yellow mortar	23.00m	4.00m	0.42m			3	6 and 7	
1204	Made Ground. Mid brownish grey, friable, gravelly silt	23.00m	4.00m	0.76m			3	6 and 7	
1205	Bright white, soft chalk	23.00m	4.00m	0.25m			3	6 and 7	
1206	Mid – dark brown, firm gravelly, silty clay	23.00m	4.00m	0.80m			3	6 and 7	
1207	Mid – light brownish yellow, firm clay	23.00m	4.00m	1.80m			3	6 and 7	
1208	Mid – dark bluish grey, firm clay, with moderate organic inclusions.	23.00m	4.00m	0.30m			3	6 and 7	
1209	Mid brownish grey, poorly sorted gravels. Natural.	23.00m	4.00m	NFE			3	6 and 7	
12/005	Concrete basement	19.00m	4.75m	1.12m			2	14 and 15	
12/006	Charcoal rich gravels and crushed red brick	19m	4.75m	0.30m			2	14 and 15	
12/007	White chalk and lyme	6.00m	6.00m	0.30m			2	14 and 15	

12/008	Mid brownish grey, firm, clay	6.00m	6.00m	1.00m+			2	14 and 15	
2601	Mid – dark greyish brown, clayey silt. Made ground.	12.00m	4.60m	1.40m				9	
2602	Mixed re-deposited blue alluvial clay, mid brown peat and mid greyish yellow gravely sand	12.00m	4.60m	2.20m				9	
2603	Poorly sorted sub angular gravels within a mid brownish yellow sand matrix	12.00m	4.60m	0.06m+				9	
2604	Mid brownish yellow sand.	7.00m	4.60m	2.08m				9	
								9	
2701	Mixed mid brown sandy silt and mid orangey brown gravels. Made ground.	4.75m	4.75m	2.00m					
2702	Mottled, mid to light bluish, brownish grey clay	4.75m	4.75m	1.65m					
2703	Poorly sorted gravels within a mid yellowish brown sand matrix	4.75m	4.75m	NFE					
3001	Concrete Surface	4.75m	4.75m	0.15m				30	
3002	Levelling layer	4.75m	4.75m	0.20m				30	
3003	Dark blackish brown, soft re-deposited alluvial clay	4.75m	4.75m	0.50m				30	
3004	Mid greyish brown, friable, sandy, gravely clay. Made ground.	4.75m	4.75m	0.90m				30	
3005	Mid – dark greenish grey, firm clay	4.75m	4.75m	0.45m				30	
3006	Mid – light bluish grey, firm clay	4.75m	4.75m	1.10m				30	
3007	Mid brown peaty clay	4.75m	4.75m	0.40m				30	
3008	Mid bluish grey clay	4.75m	4.75m	1.10m				30	
3009	Poorly sorted gravels in a mid brownish yellow sand matrix.	4.75m	4.75m	NFE				30	

APPENDIX B - PLANNING DELIVERY ZONE 3 (PDZ3), OLYMPIC PARK: RAPID ENVIRONMENTAL ARCHAEOLOGICAL ASSESSMENT

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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 Planning Delivery Zone (PDZ) 3 of the Olympic Park (Figure 1). During recent archaeological investigations at the site undertaken by RPS Planning and Development, QUEST and AOC Archaeology recorded the sedimentary sequences in Trenches PDZ 3.04, PDZ 3.07, PDZ 3.12, PDZ 3.26, PDZ 3.27, PDZ 3.28 and PDZ 3.30, and obtained column and bulk samples suitable for a laboratory-based environmental archaeological rapid assessment, and possible future assessment and analysis (Figure 2). The key aims of the environmental archaeological (including geoarchaeology, zooarchaeology and archaeobotany) rapid assessment are outlined in the following documents: PDZ3 Archaeological Detailed Desk Based Assessment (MoLAS-PCA, 2007a), PDZ3 Method Statement for an Archaeological Evaluation (MoLAS-PCA, 2007b), and PDZ3 Addendum to a Method Statement for an Archaeological Investigation (RPS-AOC, 2008). The environmental archaeological aims 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 past landscape, river pattern and changing environment for the site from the Mesolithic onwards
6. To identify evidence for the nature and/or date of past waterways management and exploitation
7. To identify evidence for the presence of the River Lea, Pudding Mill and City mill Rivers in the past.

In addition, the following research questions were recommended for consideration:

1. When did the River Lea assume its current course along the southwest edge of the zone? Is this course the result of 'natural' channel migration or did it originate in past waterway/wetland management activity?
2. 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 defences, or partial drainage of the increasingly flooded wetlands.
3. 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?

In order to evaluate the potential of the samples for achieving the research aims and questions proposed for PDZ3, the environmental archaeological rapid assessment consisted of:

1. Integration of detailed sediment descriptions from the column samples, field-based descriptions and archaeological sections, 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 (from the column samples) 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 (from the column samples) to evaluate the potential for reconstructing the hydrological history, in particular changes in the riverine environment and salinity
4. A rapid assessment of the concentration of macroscopic plant remains (waterlogged and charred seeds, waterlogged wood and charcoal), insect remains, Ostracoda and Mollusca (from the bulk samples) to evaluate the potential for reconstructing the environmental and land-use history. In particular, the former vegetation cover, the nature of woodland utilisation, cultivation and diet, and changes in the aquatic and terrestrial environment.

THE SITE

The area occupied by PDZ3 (Figures 1 and 2) is on the floor of the lower Lea valley towards the southern end of the area formerly occupied by Hackney Marshes. The site is underlain by the floodplain Alluvium of the river (British Geological Survey 1:50,000 Sheet 256 North London 1994). The floodplain here is ca. 1.6km in width and is flanked on both sides by discontinuous remnants of a low terrace, now regarded as equivalent to the Kempton Park Terrace of the River Thames. The bedrock beneath the valley floor is the sands, clays and pebble beds of the Lower Tertiary (Palaeocene) Lambeth Group (formerly Woolwich and Reading Beds). The valley floor of the Lea has been extensively modified, particularly since the mid-19th century, by quarrying, the construction and demolition of industrial premises and the development of water supply, power and communications networks. Made and disturbed ground is widely present reflecting extensive programmes of ground raising. The modern ground level is between 4.0m and 5.0m OD in the south of the area, rising to between 9.0m and 10.0m near the northern boundary.

The modern channel of the River Lea forms the western boundary of PDZ3 and the City Mill River passes just to the east of the eastern extremity of the area. The open channel of a third waterway, the Pudding Mill River terminates immediately to the north of PDZ3, but seems likely to have originally crossed the area from NW to SE near its eastern end, probably parallel with and closely adjacent to Pudding Mill Lane. Both the City Mill River and the Pudding Mill River probably served as mill leats, and may be wholly artificial in origin or tributaries of the River Lea adapted for this purpose.

Previous investigations in the vicinity of PDZ3 (Branch *et al.*, 2005), based on BGS borehole records indicated the presence of sand and gravel underlying the floodplain Alluvium, with an uneven surface between 0.0m and 2.0m OD. This sand and gravel, the Lea Valley Gravel of Gibbard (1994), can be regarded as equivalent to the Late Devensian Shepperton Gravel of the River Thames. This underlies the floodplain alluvium of the Thames and has a characteristically uneven surface representing the bars and channels that formed during the final stages of its deposition. A borehole transect across the floor of the Lea valley and coincident with the northern boundary of PDZ3 suggested the presence of a narrow channel (Channel A) near the western edge of the valley floor, coinciding quite closely with the modern course of the River Lea and a broader channel (Channel B) lying beyond the eastern end of PDZ3 and coinciding approximately with the modern course of the City Mill River. Most of the PDZ3 site appears therefore to be underlain, beneath the alluvium, by the gravel bar situated between these two channels.

In the same investigation, the pre-industrial surface of the floodplain of the River Lea was recognised in borehole records between 2.5m and 3.5m OD. More recently it has been recorded between 2.5m and 3.0m OD in trenches adjacent to the City Mill River about 400m to the north of PDZ3 (MOLAS/PCA 2008)

METHODS

Field investigations

During the excavations, column and bulk samples were recovered from Trenches PDZ 3.04, PDZ 3.07, PDZ 3.12, PDZ 3.26, PDZ 3.27 and PDZ 3.30. The samples were collected from specific archaeological contexts that would enable a rapid assessment of the potential of the deposits to address the site-specific research aims and questions.

Lithostratigraphic descriptions (Geoarchaeology)

The field investigation records were enhanced by laboratory-based lithostratigraphic descriptions of all column samples 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.

Pollen rapid assessment (Archaeobotany)

A total of thirty pollen samples were extracted from the contexts recorded in the column sequences obtained from Trenches PDZ 3.04 (1 sample), PDZ 3.07 (9 samples) and PDZ 3.30 (2 samples). Multiple samples were taken from context (1207), Trench PDZ 3.12 (11 samples), and context (2602), Trench PDZ 3.26 (7 samples), due to distinct variations in the lithostratigraphy. 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 (>125 μ); (4) acetolysis; (5) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm³); (6) 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). Plant nomenclature follows the Flora Europaea as summarised in Stace (1997). The assessment procedure consisted of scanning

the prepared slides, and recording the concentration of pollen grains and spores on four transects (10% of the slide) (Table 1).

Diatom rapid assessment (Archaeobotany)

A total of thirty diatom samples were extracted from contexts recorded in the column sequences obtained from Trenches PDZ 3.04 (1 sample), PDZ 3.07 (9 samples) and PDZ PDZ 3.30 (2 samples). Multiple samples were taken from context (1207), Trench PDZ 3.12 (11 samples), and context (2602), Trench PDZ 3.26 (7 samples), due to distinct variations in the lithostratigraphy. 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 assessment procedure consisted of scanning the prepared slides, and recording the concentration of pollen grains and spores on four transects (10% of the slide) (Table 1).

Bulk sample assessment (charred and waterlogged seeds, waterlogged wood, charcoal, insects, Ostracoda and Mollusca) (Archaeobotany and Zooarchaeology)

Eight of the eighteen bulk samples collected from Trenches PDZ 3.07 (7 of 14 samples) and PDZ 3.12 (1 sample) were processed and rapidly assessed for charred and waterlogged seeds, waterlogged wood, charcoal, insects, Ostracoda and Mollusca. The three bulk samples obtained from Trench PDZ 3.27 were not processed for the rapid assessment stage. In order to maximise the recovery of each class of sub-fossil remains, the entire sample was processed by wet-sieving using 300 micron, 500 micron and 1mm mesh sizes. The residues from each sieve size were then scanned using a low power zoom-stereo microscope. The quantities of each class were recorded for each sample (Table 2).

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

Trench PDZ 3.04

Two overlapping 0.5m column samples (*upper* and *lower*) were taken from this trench at levels between 4.18m and 3.26m OD from sediment forming context (405), regarded in the field as mid greyish brown alluvial clay. Preliminary laboratory examination of the column samples showed the material to be a uniform, poorly sorted, gritty, sandy clayey silt with a mainly blocky structure. There was some evidence of soil activity in the form of scattered root channels and root material, calcareous worm granules and discontinuous worm burrows. There was no evidence however for the development of soil horizons or for the survival of primary depositional structures. Broken mollusc shell was common particularly in the upper part of the sequence and a few complete shells including a juvenile *Bithynia tentaculata* together with finely divided plant remains. Anthropogenic components included small particles of CBM, a piece of tar-coated road stone, chips of bone and finely divided charcoal.

At a level between 3.26m and 4.18m OD, the deposit recorded in Trench PDZ 3.04 is largely above the highest level (3.5m OD) at which the pre-industrial floodplain surface has been recognised in this part of the Lea valley. This fact and the lack of either typical alluvial depositional structures or mature features of soil development suggest that the deposit is probably Made Ground.

Trench PDZ 3.07

Two sets of 0.5m column samples were taken from this trench. The first set was composed of three overlapping columns (*upper*, *middle* and *lower*) taken from the south-facing section (Section 4) at levels between 1.75m and 0.71m OD, from sediment forming (from the top downward) contexts (705), (706), (733) and (734). These were accompanied by a set of thirteen bulk samples obtained between 1.61m and 0.96m OD. The second set was composed of a set of three overlapping columns (*upper*, *middle* and *lower*) taken from the east-facing section (Section 5) between 1.71m and 0.61m OD from sediment forming (from the top downward) contexts (704), (705), (732), (706) and (733).

Section 4 – south-facing

The bottom of the lower column was close to the upper surface of the sand and gravel that formed the floor of the trench. The four lowest units (Units 1-4), representing contexts (734) and (733) were light olive brown, well-sorted, slightly silty sands containing scattered plant remains. Between 0.77m and 0.96m OD (Unit 2), the sands were pebbly and contained iron-rich concretions; and in the upper 50mm (Unit 4), they became darker bluish grey in colour. Overlying these sandy horizons was a bed, of very dark greyish brown sands and silts (Unit 5), representing the lower part of context (706), 0.1m in thickness and rich in organic material, including common plant debris and patches of sediment very rich in mollusc remains. The overall structure of this bed was complex with interpenetrating lobes of sand and silt. Overlying this organic-rich unit was a succession of bedded sandy silts (Units 6-8), representing the upper part of context (706), 0.1m in thickness and incorporating common plant remains, scattered ostracods and broken mollusc shell. These silts passed up at 1.37m OD into peaty silt (Unit 9) representing the lower part of context (705), 0.27m in thickness and comprising thin alternating beds of silt and laminated plant remains. Scattered clasts of sub-angular flint were present and mollusc remains, including complete shells of *Succinea* spp. and *Bithynia tentaculata*. The uppermost unit in the succession (Unit 10) representing the upper part of context (705), between 1.64m and 1.75m OD was a dark yellowish brown sandy silt containing common plant remains, mainly fragments of reed, and a rich mollusc fauna, including *Theodoxus fluviatilis*, *Valvata piscinalis*, *Valvata crista*, *B. tentaculata* and shells of small bivalves. Particles of charcoal and small (5mm) pieces of wood were also present.

Section 5 – east facing

The bottom of the lower column was close to the upper surface of the sand and gravel forming the floor of the trench. The lowest unit (Unit 1) was a thin (30mm) bed of olive brown well-sorted slightly silty sand - context (734). This passed up into a dark grey, slightly pebbly, sandy and clayey silt (Unit 2) representing context (733), 0.2m in thickness, containing the scattered remains of woody roots and other scattered plant debris. A sharp and very uneven contact separated this bed from the overlying unit of dark brown, gritty sand (Unit 3) representing context (706), 50mm thick, containing common plant remains and a rich mollusc fauna, including *T. fluviatilis*, *V. piscinalis*, *V. crista*, *B. tentaculata*, *Limnaea palustris* and the shells of small bivalves.

Overlying this unit and separated from it by a sharp contact was a bed of peat (Unit 4), 0.18m in thickness representing context (705). Above the peat, the uppermost unit in the sequence (Unit 5) representing context (704) was a very dark greyish brown, very well-sorted silt, 0.9m in thickness, platy in structure, containing finely divided plant debris and in its lower half a rich and well preserved mollusc fauna. These included *V. piscinalis*, *V. crista*, *B. tentaculata*, *Limnaea peregra* and small bivalves preserved with valves conjoined. One small (3mm) piece of possible CBM was noted.

All the sediments recorded in Trench PDZ 3.07 seem likely to have been deposited in or close to an active river channel. The two sets of column samples record sequences that are different in detail but in general consist of well bedded, moderately organic sands and silts alternating with less well-structured sandy and silty sediments rich in organic remains. The mollusc faunas include species that are characteristic of large, clean, well-oxygenated bodies of running water, e.g. *T. fluviatilis*, *V. piscinalis*.

In Section 5, well-bedded sandy and slightly gravelly sediments (Units 5/1 and 5/2) were present at the base of the sequence, thickening towards the northern end of the trench to form the northern margin of a channel-like depression. The set of columns taken from Section 5 came from within the channel-like depression and recorded both the sandy sediments in which the depression was cut and sediments contained within the depression, including the mollusc-rich gritty sand forming Unit 5/3 and the peat forming Unit 5/4. The peat unit was only very locally preserved and its upper surface appeared to be erosional with the silt of Unit 5/5 resting on it unconformably and extending northward across the margin of the depression to rest on the sandy sediments of Units 5/1 and 5/2.

These sediments (Units 5/1, 5/2 and 5/5) can be traced eastward into Section 4 and are represented in the sediment sequence recorded in the set of column samples taken from the eastern end of Section 4 where Units 4/1-4/4 appear to be equivalent to Units 5/1 and 5/2 and Units 4/5 -4/10 appear to be equivalent to Unit 5/5, although Units 4/5 - 4/10 are much sandier and more obviously bedded than Unit 5/5. The peat (Unit 5/4) in Section 5 and the mollusc-rich gritty sand immediately below it (Unit 5/3) are not present in Section 4.

The local variability of the sediments recorded in Trench PDZ 3.07 in both the lateral and the vertical sense is typical of deposition in an active sand-bedded river and it seems likely that the deposits represent sedimentation in one of the main channels shaping the floor of the Lea valley in the period prior to large-scale land-raising and reclamation. This might have been a completely natural channel but could be such a channel adapted to serve as a mill leat. It seems possible that the channel in question was the Pudding Mill River, which in its latest course must have flowed southward a short distance to the east of Trench PDZ 3.07. The revetments and other evidence of wooden structures in Trench PDZ 3.07 would be consistent with this possibility.

Trench 12

Two sets of 0.5m column samples were taken from the east-facing side in this trench. The more southerly set (from Face 1, Section 6) consisted of four overlapping columns (4/4, 3/4, 2/4, 1/4) between 2.96m and 1.16m OD, from sediment forming context (1207) overlying context (1208). The more northerly set (from Face 2, Section 8/9) consisted of two overlapping columns (*upper* and *lower*) between 2.67m and 1.73m OD, all from context (1207). The northerly set was accompanied by a single bulk sample collected from a lense of organic material between 2.48m and 2.34m OD.

Section 6 – east facing

This sediment sequence consisted of alternating beds of blocky clayey silt (17 beds) and peaty sand or sandy silt (15 beds). The beds vary in thickness with clayey silt units generally thicker (up to c.12cm) and the peaty units thinner - in some cases less than 10mm. The clayey silt varies in colour from dark grey to olive brown and generally contains little or no visible organic material. However, in two beds, plant material is common but in most cases, organic material is limited to scattered root remains, small peaty inclusions and small amounts of broken mollusc shell. In the upper column (4/4) a large (60x70mm), sharply defined inclusion of dark grey clay is present in a bed of olive brown clay.

The peaty beds are black or very dark brown and contain varying amounts of mineral material, including sand, both mixed in with the plant material and as thin, discontinuous partings. At some levels, the sand is brick red in colour. Flint and quartz clasts are also present; with flint up to 50mm Ø. Small inclusions of grey or olive brown clay are present in

several of the peaty beds and small pieces of wood. Evidence of primary depositional structures is lacking and in several cases, the fabric is thoroughly chaotic. Mollusc remains are not generally present but one bed in the lower part of column 2/4 contains a substantial amount of shell debris.

Contacts between beds and around inclusions are all sharp or very sharp and contacts between beds are almost all inclined and uneven, with deep interpenetration of beds in some cases. A single small (<10mm) clast of chalk was noted near the top of the sequence (2.58m OD).

Section 8/9 – east facing

This sediment sequence consisted of alternating beds (15 in total) of clayey silt, mainly in the upper part of the sequence, and peaty sand or silt, mainly in the lower part of the sequence. The clayey silt varies in colour from olive brown to dark bluish grey and is either massive or blocky in structure. Plant remains are present and common at some levels but absent or uncommon at others. Mollusc remains are generally absent from the clayey silt but broken shell was noted at two levels, with a complete example of *Lymnaea peregra*.

The peaty horizons are black or very dark greyish brown. These beds are generally silty with varying amounts of sand and scattered sub-angular flint clasts, up to 45mm Ø, but generally smaller (5-10mm). No evidence of primary depositional structures survives and the beds are either massive or more commonly chaotic in their organisation. Mollusc remains are common with valves of small bivalves present and an operculum of *B. tentaculata*.

Contacts between beds are sharp or very sharp and there is substantial interpenetration of beds at all levels. Small particles of CBM were recognised at the uppermost level in the sequence (2.67m-2.56m OD) and a single complete shell of the Common Winkle (*Littorina littorea*) was noted in the lower part of the sequence (1.88m OD).

In many respects, the sequences in Trench PDZ 3.12 resemble those recorded in Trench PDZ 3.26 (see below) where there is a strong presumption that the material represents the backfill of a former reservoir. The complete lack of primary depositional structures, the very sharp and highly uneven contacts between beds and the presence of probable anthropogenic debris are all significant in this respect. The close proximity of Trench PDZ

3.12 to Trench PDZ 3.26 is also clearly relevant and there is obviously a need to establish the full extent of any former reservoir in this part of PDZ3.

Trench 26

Three overlapping column samples (*upper, middle and lower*) were taken at levels between 2.54m and 1.19m OD from the west-facing section of this trench from context (2602). In the field, this material was provisionally recognised as being the backfill of an early reservoir.

The three columns represent a total thickness of 1.35m of sediment. In the laboratory examination of the samples, more than 65 separate sub-units were recognised within this sequence. They ranged in texture from slightly silty sands to silty clays and in colour from olive to bluish grey to black. Some of the sediment bodies incorporate flint clasts (up to 30mm), or pieces of wood or mollusc remains. Some bedded alternations of sand and clay were present but the general impression was of very crude layering with more or less steeply inclined, sharp and very uneven contacts, much interpenetration of sediment bodies and the presence of many isolated inclusions.

The apparently random juxtaposition of varied sediment types throughout the sediment sequence recorded in Trench PDZ 3.26 and the lack of primary depositional structures typical of alluvial environments confirm the view that the material-forming context (2602) is all artificial backfill.

Trench 30

Two overlapping column samples (*upper and lower*) were taken at levels between 1.62m and 0.72m OD from the east-facing section of this trench from context (3007) overlying context (3008). These contexts were identified in the field as the lower two of four alluvial units, with context (3008) immediately overlying the sand and gravel of context (3009) that formed the floor of the trench.

The upper column was treated as a single stratigraphic unit, broadly equivalent to context (3007). It comprised a very dark grey (oxidising to dark brown), very well sorted, very slightly sandy silt. Organic content took the form of finely divided plant material, increasing in abundance downward, with occasional seeds and other larger (2-3mm) plant fragments,

which in some cases had a patchy coating of iron-rich micro-spherules. A single fragment of snail shell was noted and a few small (1-2mm) particles of possible CBM.

The lower column was also treated as a single stratigraphic unit, broadly equivalent to context (3008). It was more gleyed in appearance than the overlying unit but oxidised to a similar dark brown colour. The sediment comprised a well sorted but slightly sandy silt with scattered tufa-like calcareous concretions up to 25mm (long dimension) which incorporated plant remains and pieces of snail shell. More generally, the plant remains were similar to those noted in the overlying unit - finely divided with scattered larger plant fragments. Mollusc remains however were more common and as well as broken shell, included a few individual specimens of *Pupilla muscorum* and *Vertigo pygmaea*. Also present in this unit were substantial numbers of calcareous worm granules. Both worm granules and mollusc remains became increasingly common towards the base of the unit. A few small (1-2mm) particles of possible CBM were noted.

No primary depositional structures were observed in either unit in Trench PDZ 3.30, but the upward fining of the sediment, the well-sorted silty texture and the nature of the organic content confirm that this is floodplain alluvium and suggest deposition in an abandoned channel or a floodplain pond. The presence of worm granules and of terrestrial mollusc species suggests that in-wash of material from nearby terrestrial surfaces made a significant contribution to the sediment accumulation.

RESULTS AND INTERPRETATION OF THE RAPID POLLEN ASSESSMENT

A total of twelve pollen samples were extracted from each context recorded in the column. Samples obtained from Trenches PDZ 3.04 (1 sample), PDZ 3.07 (9 samples) and PDZ 3.30 (2 samples). Multiple samples were taken from context (1207), Trench PDZ 3.12 (11 samples), and context (2602), Trench PDZ 3.26 (7 samples), reflecting the distinctive lithostratigraphic variations (Table 1). All contexts from Trenches PDZ 3.04, PDZ 3.07 and PDZ 3.30 contained an absent to very low pollen concentration, and low to moderate numbers of microscopic charred particles. Pollen concentration and the number of microscopic charred particles in Trenches PDZ 3.12 and PDZ 3.26 varied between absent and very high, reflecting the variable nature of the stratigraphy in contexts (1207) and (2602).

RESULTS AND INTERPRETATION OF THE DIATOM ASSESSMENT

A total of twelve diatom samples were extracted from each context recorded in the column samples obtained from Trenches PDZ 3.04 (1 sample), PDZ 3.07 (9 samples) and PDZ 3.30 (2 samples). Multiple samples were taken from context (1207), Trench PDZ 3.12 (11 samples), and context (2602), Trench PDZ 3.26 (7 samples), reflecting the distinctive lithostratigraphic variations (Table 1). There were no identifiable diatoms present on the slides from the contexts recorded in Trenches PDZ 3.04, PDZ 3.12, PDZ 3.26 and PDZ 3.30. Diatoms were also absent in Trench PDZ 3.07 from contexts (706), (734); however, contexts (705), (732) contained a high concentration of frustules, whilst contexts (704) and (733) contained a variable but low concentration.

Table 1: Results of the pollen and diatom rapid assessment, PDZ3, Olympic Park

Trench Number	Section	Depth (m OD)	Context	Pollen: Rapid Assessment		Diatoms: Rapid Assessment
				Concentration	Microscopic charred particles	Concentration
PDZ3.04	11	3.58 to 3.59	(405)	0	1	0
PDZ3.07	4	1.51 to 1.52	(705)	0	1	5
PDZ3.07	4	1.11 to 1.12	(706)	1	0	0
PDZ3.07	4	0.79 to 0.80	(733)	0	0	0
PDZ3.07	4	0.71 to 0.72	(734)	0	0	0
PDZ3.07	5	1.25 to 1.26	(704)	0	2	2
PDZ3.07	5	1.01 to 1.02	(705)	0	0	3-4
PDZ3.07	5	0.85 to 0.86	(732)	1	0	5
PDZ3.07	5	0.68 to 0.69	(706)	0	1	0
PDZ3.07	5	0.61 to 0.62	(733)	0	0	2
PDZ3.12	6	2.76 to 2.77	(1207)	0	2	0
PDZ3.12	6	2.28 to 2.29	(1207)	1	2	0
PDZ3.12	6	1.94 to 1.95	(1207)	0	0	0
PDZ3.12	6	1.80 to 1.81	(1207)	2	1	0
PDZ3.12	6	1.56 to 1.57	(1207)	3	3	0
PDZ3.12	6	1.44 to 1.45	(1207)	5	1	1
PDZ3.12	6	1.24 to 1.25	(1207)	0	2	0
PDZ3.12	8/9	2.41 to 2.42	(1207)	0	4	0
PDZ3.12	8/9	2.09 to 2.10	(1207)	1	1	0
PDZ3.12	8/9	1.89 to 1.90	(1207)	0	1	0

PDZ3.12	8/9	1.85 to 1.86	(1207)	2-3	3	0
PDZ3.26	9	2.47 to 2.48	(2602)	4	0	0
PDZ3.26	9	2.31 to 2.32	(2602)	4	4	0
PDZ3.26	9	2.03 to 2.04	(2602)	1	1	0
PDZ3.26	9	1.75 to 1.76	(2602)	1	1	0
PDZ3.26	9	1.63 to 1.64	(2602)	1	2	0
PDZ3.26	9	1.55 to 1.56	(2602)	1	1	0
PDZ3.26	9	1.43 to 1.44	(2602)	2	2	0
PDZ3.30	1	1.44 to 1.45	(3007)	0	1	1
PDZ3.30	1	0.96 to 0.97	(3008)	1	1	0

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).

RESULTS AND INTERPRETATION OF THE BULK SAMPLE ASSESSMENT (CHARRED AND WATERLOGGED SEEDS AND WOOD, INSECTS AND MOLLUSCA)

Eight bulk samples collected from Trenches PDZ 3.07 (7 of 14 samples) and PDZ 3.12 (1 sample) were processed and rapidly assessed for charred and waterlogged seeds, waterlogged wood, charcoal, insects, Ostracoda and Mollusca (Table 2).

Trench PDZ 3.07

The results indicate that virtually no sub-fossil biological remains were preserved within context (733) with the exception of a very low concentration of small Mollusca. This is unsurprising due to the composition of the sediment (described as light olive brown, well-sorted, slightly silty sands), which is generally unfavourable for the preservation of sub-fossil biological remains. A single sample (<11>) from context (706) recorded low quantities of charcoal, waterlogged wood and seeds, and a moderate to high quantity of Mollusca. No insects, charred seeds or chaff were recorded. Five samples (<9>, <8>, <7>, <5>, and <2>) were assessed from context (705). Charcoal, Mollusca and insects were recorded in generally low to moderate quantities in all samples. Waterlogged wood was recorded in generally low quantities in all samples except sample <7>. Charred and waterlogged seeds were recorded in low quantities in samples <9>, <8> and <5>. Chaff was not recorded in any of the samples. Ostracoda were not present in the samples rapidly assessed.

Trench PDZ 3.12

A single sample was collected from an organic lense in section 8/9 of Trench PDZ 3.12. The results of the rapid assessment indicate low to moderate quantities of charcoal and waterlogged seeds, moderate quantities of Mollusca and insects, and high quantities of waterlogged wood.

Table 2: Bulk sample rapid assessment from Trenches 3.07 and 3.12, PDZ3, Olympic Park

Trench Number	Section	Sample number	Depth (m OD)	Context number	Volume (litres)	Fraction (e.g. flot, residue, >300µm)	Charred			Waterlogged		Mollusca	Insects
							Wood	Seeds	Chaff	Wood	Seeds		
PDZ 3.07	4	<2>	1.56 to	(705)	4.5	>300µm	1	-	-	-	-	2	3
			1.51			500µm-1mm	1	-	-	1	-	3	1
						>1mm	3	-	-	2	-	5	-
PDZ 3.07	4	<5>	1.41 to	(705)	5	>300µm	-	-	-	-	-	-	1
			1.36			500µm-1mm	1	-	-	-	-	2	2
						>1mm	-	2	-	3	2	5	-
PDZ 3.07	4	<7>	1.31 to	(705)	6.5	>300µm	-	-	-	-	-	-	2
			1.26			500µm-1mm	-	-	-	-	-	1	2
						>1mm	3	-	-	-	-	4	2
PDZ 3.07	4	<8>	1.26 to	(705)	7.5	>300µm	1	-	-	1	-	-	2
			1.21			500µm-1mm	1	-	-	-	-	2	-

						>1mm	3	2	-	1	2	4	2
PDZ 3.07	4	<9>	1.21 to	(705)	7	>300µm	1	-	-	-	-	1	1
			1.16			500µm-1mm	1	-	-	1	-	2	2
						>1mm	3	2	-	2	2	4	-
PDZ 3.07	4	<11>	1.11 to	(706)	6.5	>300µm	1	-	-	-	-	-	-
			1.06			500µm-1mm	1	-	-	-	2	2	-
						>1mm	2	-	-	2	2	4	-
PDZ 3.07	4	<13>	1.01 to	(733)	1.5	>300µm	-	-	-	-	-	1	-
			0.96			500µm-1mm	-	-	-	-	-	-	-
						>1mm	-	-	-	-	-	-	-
PDZ 3.12	8/9	ORGANI	2.48 to	(1207)	4.8	>300µm	1	-	-	-	-	1	2
		C LENS	2.34			500µm-1mm	1	-	-	-	-	2	3
						>1mm	2	-	-	5	1	2	-

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

CONCLUSIONS AND RECOMMENDATIONS

The rapid environmental archaeological assessment was conducted to evaluate the potential of the column and bulk samples collected during the archaeological excavations of Trenches PDZ 3.04, PDZ 3.07, PDZ 3.12, PDZ 3.26, PDZ 3.27 and PDZ 3.30 to address the aims and specific research questions proposed for PDZ3 (see MoLAS-PCA, 2007a, 2007b; RPS-AOC, 2008). However, the field and laboratory-based investigations have established that three of the five trenches to which this rapid assessment relates were cut into material that is largely or wholly Made Ground (Trenches PDZ 3.04, PDZ 3.12, and PDZ 3.26), and that little information could be recovered from Trench PDZ 3.30, because it was relatively small and shuttered. Thus, the only trench having potential for further environmental archaeological (geoarchaeological, zooarchaeological and archaeobotanical) research is Trench PDZ 3.07. Nevertheless, each of the aims and specific research questions are addressed below based upon the results of the rapid assessment.

Aims

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

The results of the rapid assessment indicate that no sediments of Late Pleistocene age have been identified.

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 anthropogenic input into any of the natural sediments examined.

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

The results of the rapid assessment indicate that it is doubtful whether the environmental archaeological evidence can contribute significantly to an understanding of channel margin

or land-use activities, except possibly to show that such activities have had little impact on the preserved sediments. However, further assessment of the biological macro-remains from contexts (706) and (705), and diatoms from contexts (732), (733), (704), Trench PDZ 3.07, has the potential to provide important information contributing to these aims.

5. To identify evidence relating to past landscape, river pattern and changing environment for the site from the Mesolithic onwards
6. To identify evidence for the nature and/or date of past waterways management and exploitation
7. To identify evidence for the presence of the River Lea, Pudding Mill and City Mill Rivers in the past

The results of the rapid assessment indicate that the sediments recovered from Trench PDZ 3.07 represent a period of active channel formation on the floodplain of the River Lea. Further assessment of the biological macro-remains from contexts (706) and (705), and diatoms from contexts (732), (733), (704), Trench PDZ 3.07, may contribute significantly to our understanding of the history of the floodplain. Furthermore, further assessment of the macro-remains may contribute material suitable for radiocarbon dating.

Specific research questions

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

The results of the rapid assessment indicate that none of the trenches examined are likely to provide any insights into the origin of the present-day course of the River Lea.

2. 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 defences, or partial drainage of the increasingly flooded wetlands.

The results of the rapid assessment indicate that dating of the sediments and structures in Trench PDZ 3.07 may contribute significantly to an understanding of the history of the Pudding Mill River. Further assessment of the biological macro-remains from contexts (706) and (705) may contribute material suitable for radiocarbon dating.

3. 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?

All the backfill identified in Trenches PDZ 3.12 and PDZ 3.26 is likely to have been emplaced in the 19th/20th century.

It is therefore recommended that no further assessment is carried out on any of the samples from Trenches PDZ 3.04, PDZ 3.12, PDZ 3.26, and PDZ 3.30, as they are either cut into material that is largely or wholly Made Ground, or do not preserve biological remains. However, further assessment of the biological macro-remains (charcoal, charred seeds, waterlogged wood and seeds, insects and Mollusca) is recommended on the samples from contexts (706) and (705) in Trench PDZ 3.07. This assessment will also contribute material suitable for AMS radiocarbon dating. In addition, it is recommended that further diatom assessment is carried out on the samples from contexts (732), (733), (704) in Trench PDZ 3.07. No further pollen assessment is recommended, however, due to the low concentration of grains and spores.

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APPENDIX C - WATERLOGGED WOOD ASSESSMENT

Phil Austin

Introduction.

Waterlogged wood recovered from excavations of the Olympics site in east London, Site Code: OL10008, by AOC Ltd. were submitted for assessment. The purpose of this assessment was to

- a). determine the identity of the wood of each of the samples and
- b). to record any evidence concerning wood knowledge and woodworking techniques used in the modification of the wood samples. The 5 pieces of wood investigated here were recovered from the following 4 contexts:

Context 708, sample 1

Context 716, sample 2

Context 711A, sample 4

Context 707, sample 5

Methodology.

Preparation for and identification of the wood followed standard procedures for the analysis of waterlogged wood as described in Hather (2000). Where necessary, to view surface detail, any soil adhering to the sample was removed by soaking the sample in water and gently easing the soil from the surface of the sample with a soft bristled toothbrush.

The gross dimensions of each piece of wood was recorded (in mm) as appropriate: for round-wood this included circumference, diameter and length; for non round-wood width, length and depth were recorded.

Growth rings were counted and growth ring widths measured for round-wood samples. This was done to evaluate the approximate age of the wood when felled and probable environmental conditions under which the wood formed. Growth ring characteristics were observed in non-round-wood samples as an aid to evaluating the method of conversion

employed. In all samples any evidence of woodworking, *i.e.* axe/adze or saw marks, was recorded.

Results

The findings of this investigation are summarised in Table 1. (below). More detailed descriptions and discussion of each individual sample follow:

Table 1. Summary of wood identifications and sample descriptions

Context & Samp No.	Identification	Dimensions	Growth ring features	Conversion	Woodworking
708 <1>	x2 Pinus sylvestris (Scot's Pine)	a). W = 128mm. D = 18-14mm. L = 215mm. b). W = 140mm. D = 23-11mm. L = 350mm.	Not recorded	tangential split from trunk	Bark present on outer edge of Sub-samp. 'b'. Small handmade nail present in sub-samp 'b'. Probable nail hole in sub-samp 'a'.
716 <2>	Ulmus sp. (Elm)	C = 582mm. R = 210mm. L = 740mm.	c.16 fast grown broad rings (3-5mm ave width). Eccentric (off centre) growth in cross section	None. Unconverted Round wood. Some bark present.	8 major facets forming tapered pointed end of post. Visible axe marks. Side branches removed.
711A <4>	Quercus sp. (Oak)	C = 200-290mm R = 85-90mm L = 385mm	Sapwood = 11 rings. Heartwood = 10 rings	None. Unconverted round-wood. Bark absent.	Negligable: rough cut/split to produce crude 'pointed' end and remove side branches.

707 <5>	Pinus sylvestris (Scot's Pine)	W = 81x83mm. L = 375mm L (Taper) = 258mm	Not recorded	Poss. Radial Conversion? Hand sawn to produce square post	Visible saw marks. Axe/adze marks visible on single chisel-like tapered facet.
KEY: C = Circumference; W = Width; L = Length; R = Radius; D = Depth.					

Context 708, Sample <1>

The two pieces of wood in this sample were each identified as thin planks of *Pinus sylvestris* (Scot's Pine) and are closely comparable in shape to modern 'shiplap', as used for fence panels and for the exterior cladding of out-buildings. In cross-section both were a thin wedge shape and ring orientation suggests that they were split by the tangential method. This method is a means of acquiring a wide plank from relatively narrow trunk. Except for a possible small square-ish notch cut into one edge of sub-samp 'a' no tool marks were observed.

These planks were associated with a revetment and almost certainly were employed to retain earth within the revetment. The presence of a nail and probable nail hole suggests that the planks were originally fixed by being nailed to uprights.

Though certainly native to Scotland most, if not all, Scot's Pine in southern Britain has been planted, though not uncommonly becoming naturalised (Preston *et. al.* 2004). It is therefore most likely that the Pine identified here was imported from elsewhere or, alternatively, acquired from a more local source of planted Pine woodland.

Context 716, Sample <2>

Sample <2>, the pointed end of a once substantial round post, was identified as Elm (*Ulmus* sp.). The greater part of the wooden post was not present (presumably what remained of it was removed for convenience during or following excavation).

The post has been fashioned from a trunk that was felled, side branches removed and, without further modification, one end was skilfully tapered to a point. The innermost heartwood, outermost sap wood and a small area of bark were present and all well preserved. The area of bark was confined to that part of the sample coinciding with the

beginning (above ground) part of the post itself. No bark was retained where the wood had been worked into a point. It is believed that the post would have been bark covered when erected.

In cross section the post was more oval than round and wood growth was slightly eccentric. Eccentric wood growth, in which a greater volume of wood forms on one side than it does on the opposite side, is characteristic of reaction wood and occurs in response to mechanical stress. Typically found in branches it can also form in trunk wood. It's presence here suggests that the wood formed at an angle, possibly as a side branch, or as the main stem of a tree growing on a gentle slope. The latter possibility is the one favoured here.

The sixteen growth rings, counted with the aid of a x10 hand lens only, were more or less regularly spaced and relatively broad indicating fairly rapid and consistent growth in a stable environment each season.

The only evidence for woodworking was that associated with the formation of the round tapered end. This consisted of approximately 8 major facets. In most instances each major facet was made up of several subtle sub-facets created by repeated axe strikes. The axe used was almost certainly well sharpened metal with a flat (rather than convex) cutting edge. In places the parts of the taper had been formed not by hewing alone but partly by spitting the wood along the direction of the grain. This exploitation of the natural properties of the wood and the skilled axe work together demonstrate a high level of skilled woodmanship and keen knowledge of wood properties.

Elm is a native taxon valued for its burning properties, the toughness of its wood and its resistance to decay in wet or waterlogged environments in which other woods quickly perish. The choice of Elm in this context may have been made explicitly to exploit this characteristic. Again this demonstrates a good understanding of wood properties.

Context 711a, Sample <4>

Sample 4 was identified as *Quercus* sp. (Oak). This sample is unmodified large branch, rather than trunk wood, that has been minimally worked to remove any extraneous side branches and partly cut and split, forming a (very) crude 'point'. Much of the sapwood was soft in contrast to the dense extremely hard, and blackened, heartwood. Though the outermost wood was present the bark was not. Whilst it is possible that the bark was present when the wood was originally used it remains unknown for sure. Similarly, though possible, it remains unknown if this sample represents the opportunistic use of a piece of deadwood or if

it was living ('green') wood when used. Approximately 21 growth rings were recorded indicating that it was at least 21 years old when growth was stopped.

The two species of native deciduous Oak, (*Q. robur* and *Q. patraea*) cannot be differentiated anatomically and it is not known which of the two is represented.

Context 707, Sample <5>

This sample, the tapered end of an otherwise squared post, was identified as *Pinus sylvestris* (Scot's Pine).

It is unclear which method of conversion, radial or tangential, was employed. None the less, it is clear that conversion of the wood was by sawing rather than splitting. It is thought that the trunk from which the wood derives was most probably pit-sawn by means of a large saw (typically operated by two men). Somewhat irregular more or less parallel saw marks were clearly visible on all surfaces with the exception of the tapered facet. This facet had been skilfully hewn, most probably by an axe with a flat cutting edge, to form a chisel like tapered end.

As with the Pine identified in context 708, sample <1>, this Pine post was almost certainly formed from imported wood or harvested more locally from planted stock.

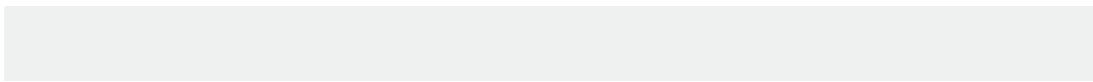
References

Hather, J. (2000) *The Identification of the Northern European Woods. A guide for archaeologists and conservators*. London: Archetype.

Preston, C.D., Pearman, D. A. & Dines, T.D. (2004). *New Atlas of the British & Irish Flora*. Oxford: OUP

APPENDIX D – OASIS FORM

OASIS ID: AOCARCHA1-52303



Project details

Project name The Olympic Park, Stratford, Planning Delivery Zone 3B

Previous/future work No / No

Any associated project OL-100-08 – Site code
reference codes

Type of project Field evaluation

Current Land use Vacant Land 1 - Vacant land previously developed

Methods & techniques 'Environmental Sampling', 'Sample Trenches'

Development type Stadium complex

Prompt Planning condition

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

process

Project location

Country	England
Site location	GREATER LONDON NEWHAM STRATFORD Planning Delivery Zone 3, The Olympic Park, Stratford
Postcode	E15
Study area	37.00 Hectares
Site coordinates	TQ 537650 183850 50.9437964560 0.189011698727 50 56 37 N 000 11 20 E Point
Height OD / Depth	Min: 0.12m Max: 1.79m

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

Type of sponsor/funding Developer
body

Name of sponsor/funding Olympic Development Agency (ODA)
body



Project archives

Physical Archive Museum of London
recipient

Physical Contents 'Wood'

Digital Archive recipient Museum of London

Digital Contents 'Wood'

Digital Media available 'Images raster / digital photography','Survey','Text'

Paper Archive recipient Museum of London

Paper Contents 'Wood'

Paper Media available 'Context sheet','Photograph','Plan','Report','Section','Survey '

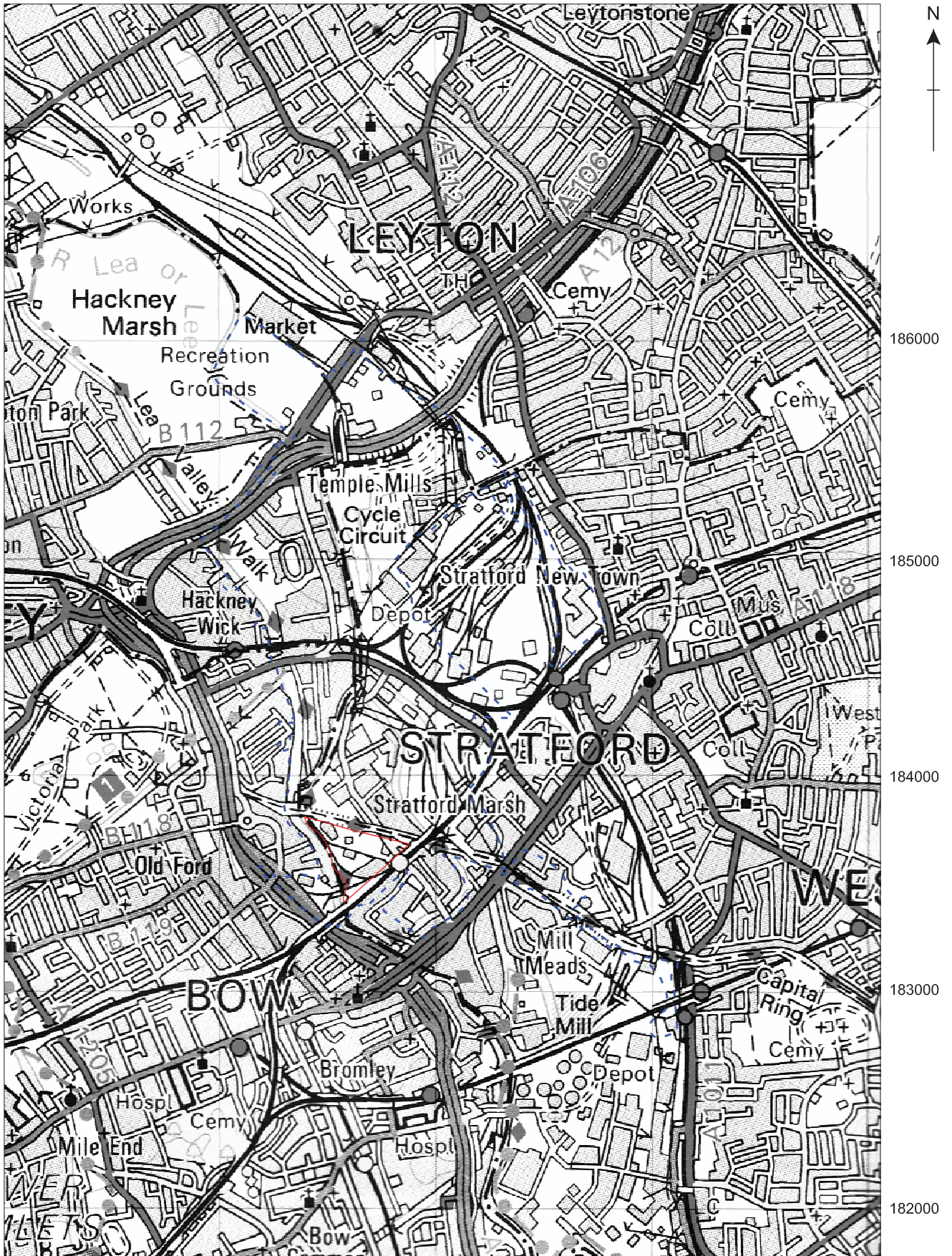
Entered by Paul Harris (paul.harris@aocarchaeology.com)

Entered on 4 December 2008

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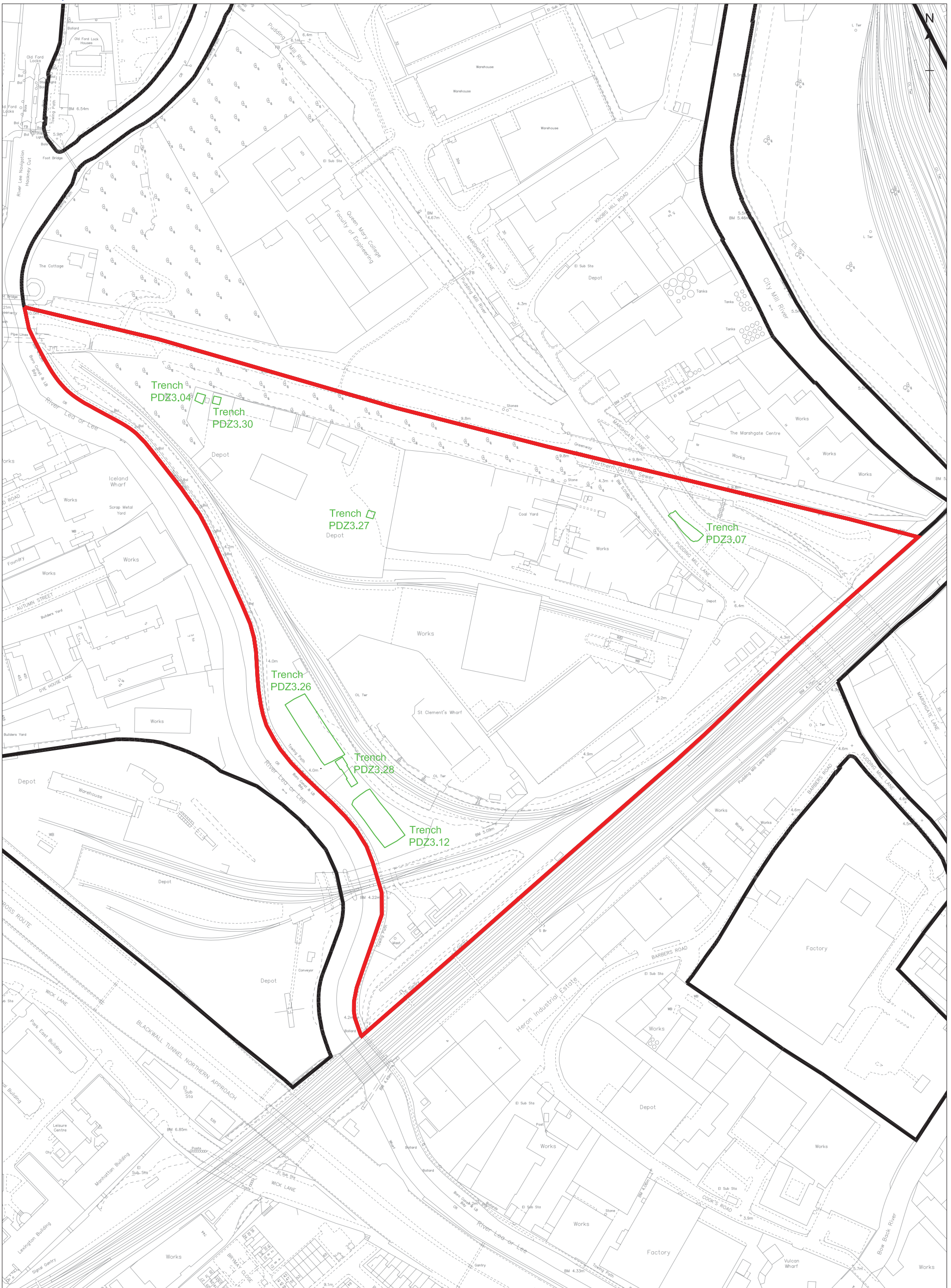
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Site Outline PDZ3a Outline



1:25000

Figure 1: Site Location Plan



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□ Site Outline

□ Evaluation Trench



Figure 2: Trench Location Plan

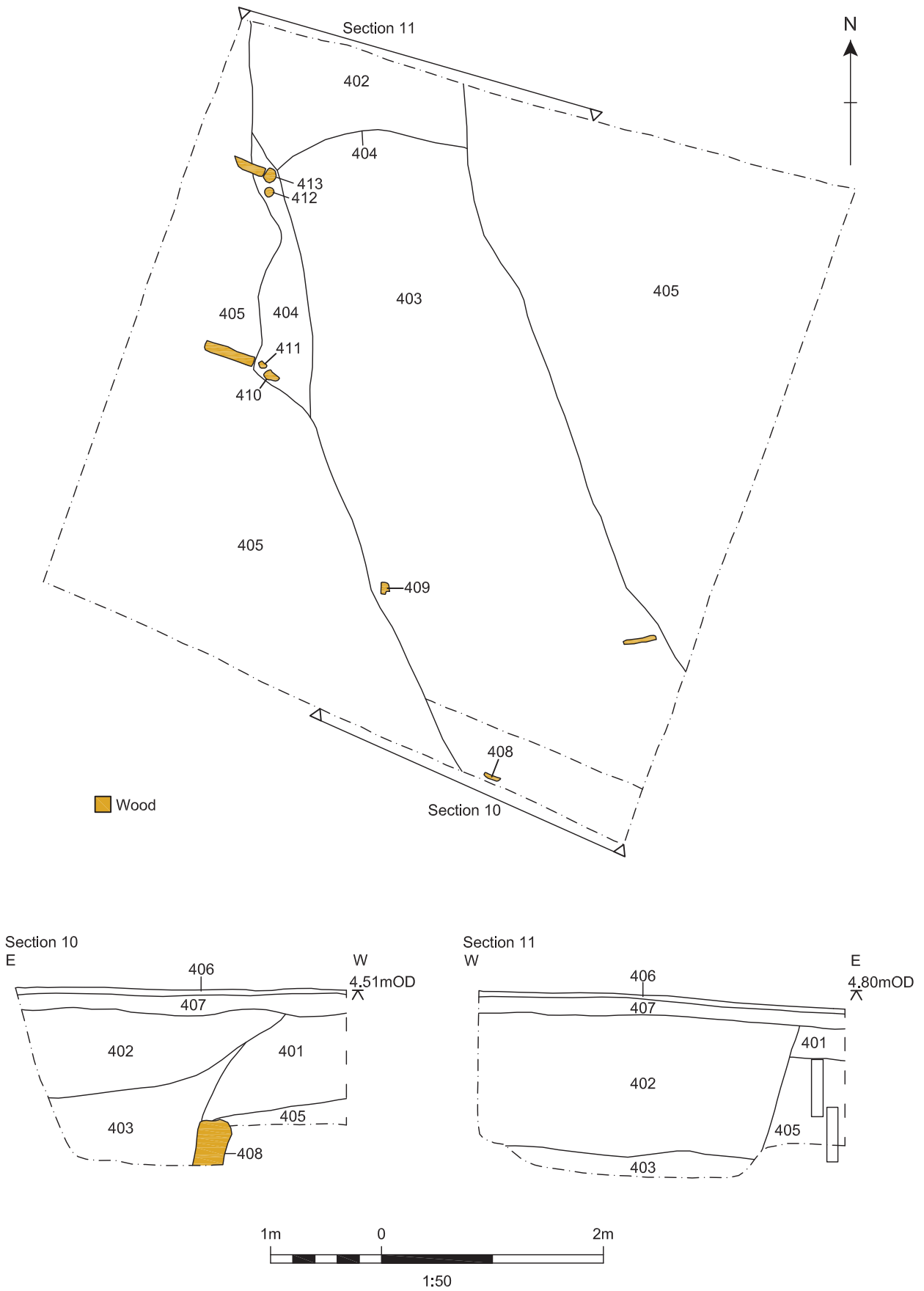


Figure 3: Trench PDZ3.04: Plan and Stratigraphic Sample Sections

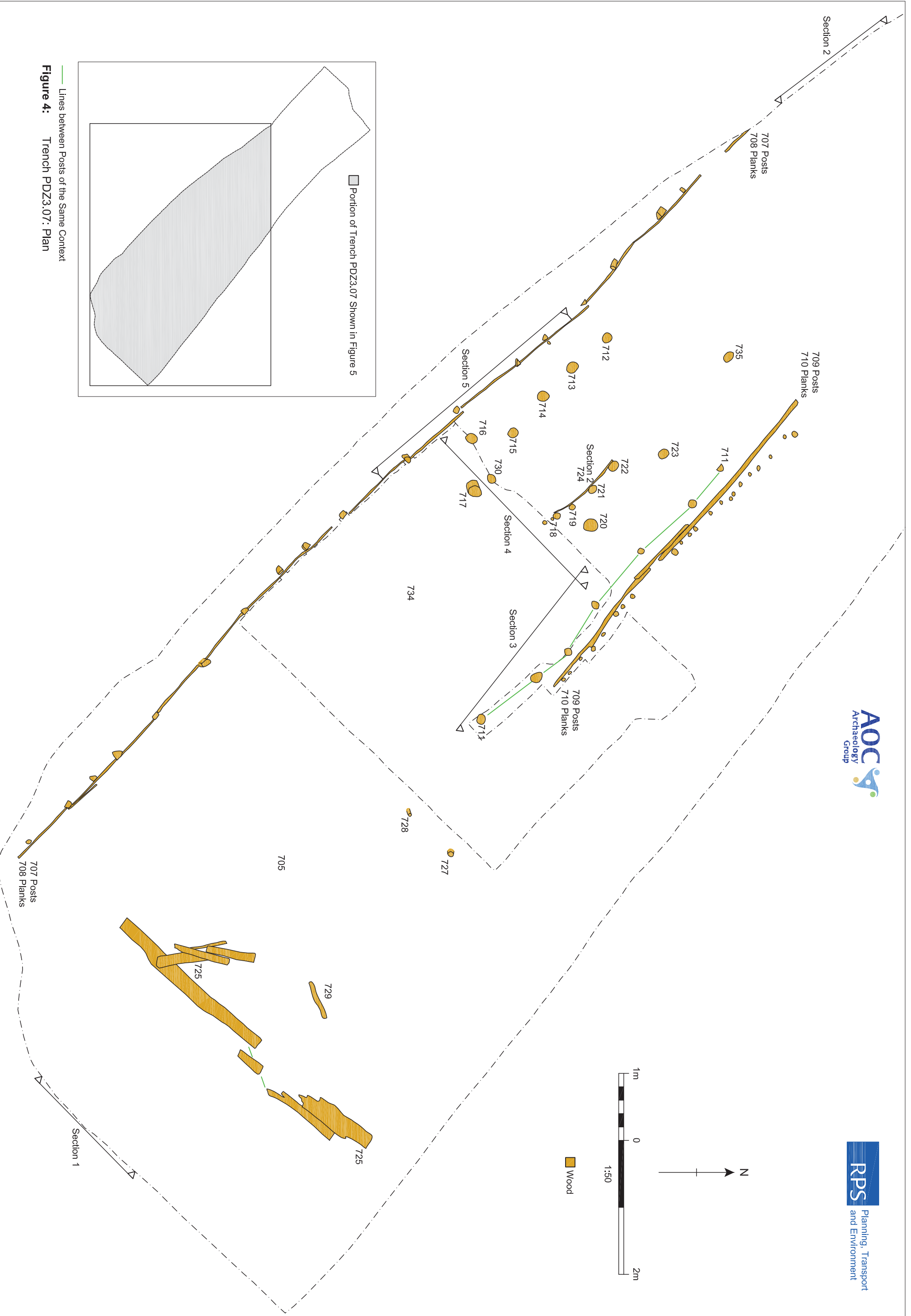


Figure 4: Trench PDZ3.07: Plan

— Lines between Posts of the Same Context

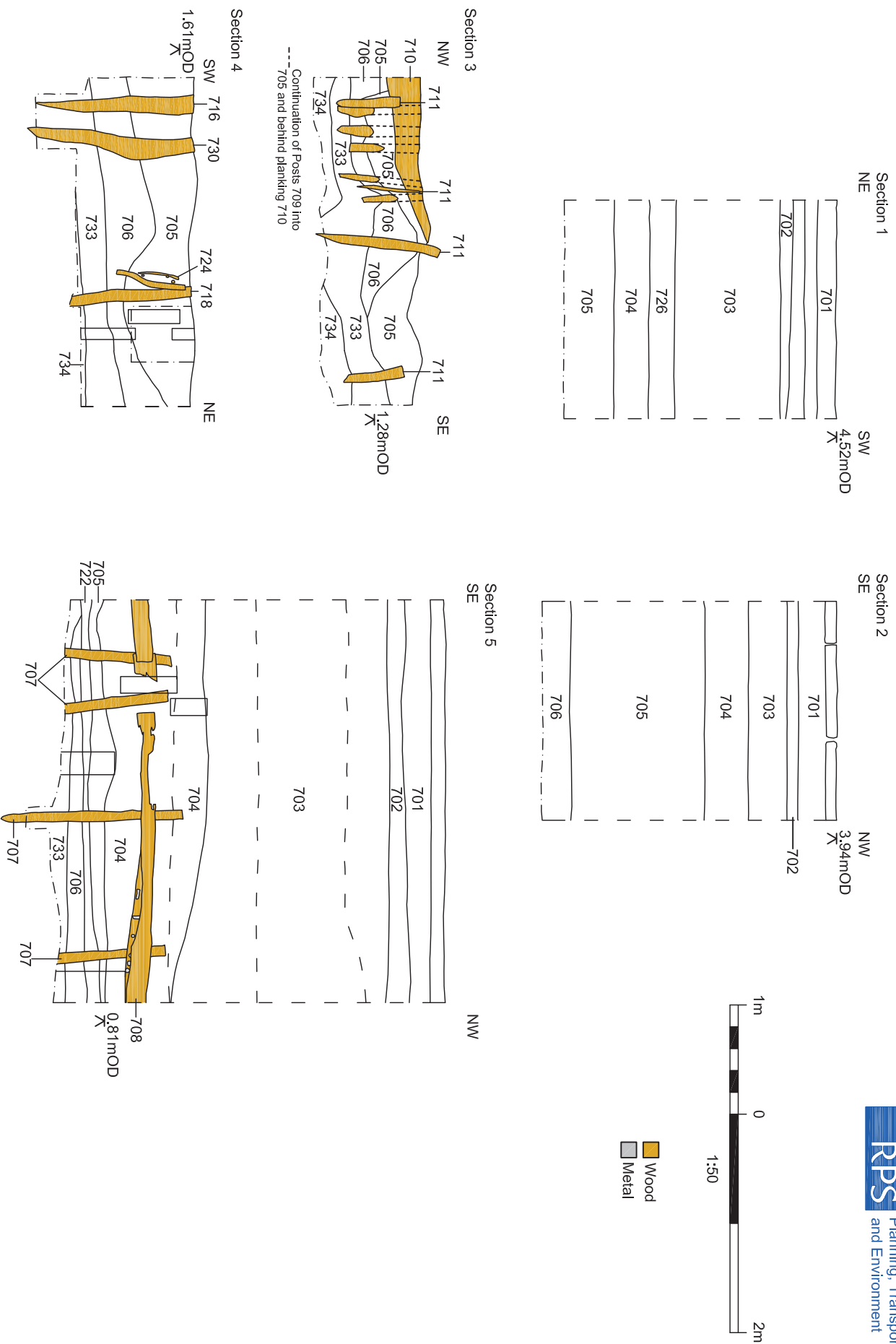


Figure 5: Trench PDZ3.07: Sections

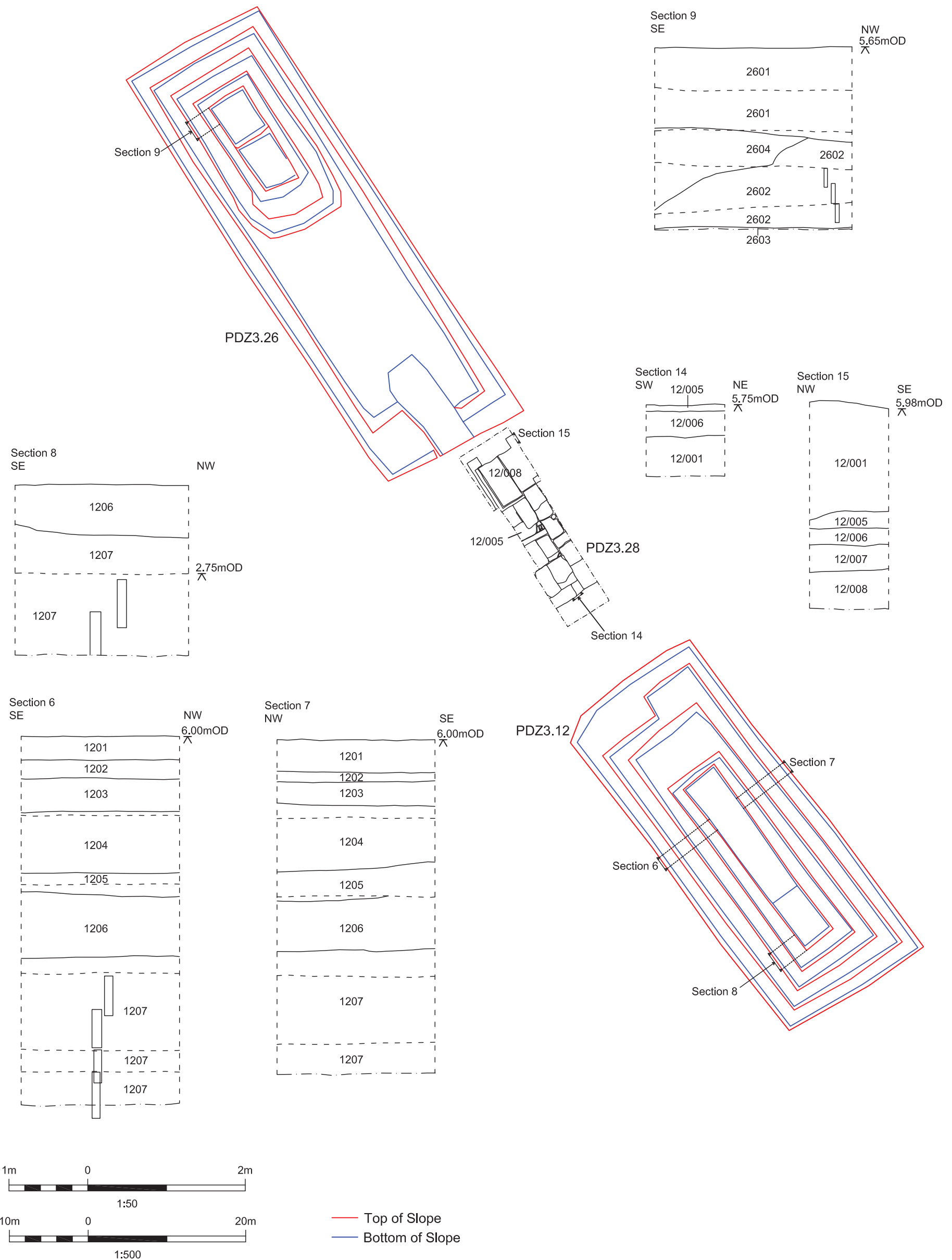


Figure 6: Trench PDZ3.12, PDZ3.28 & PDZ3.26: Plans (1:500) and Stratigraphic Sample Sections (1:50)

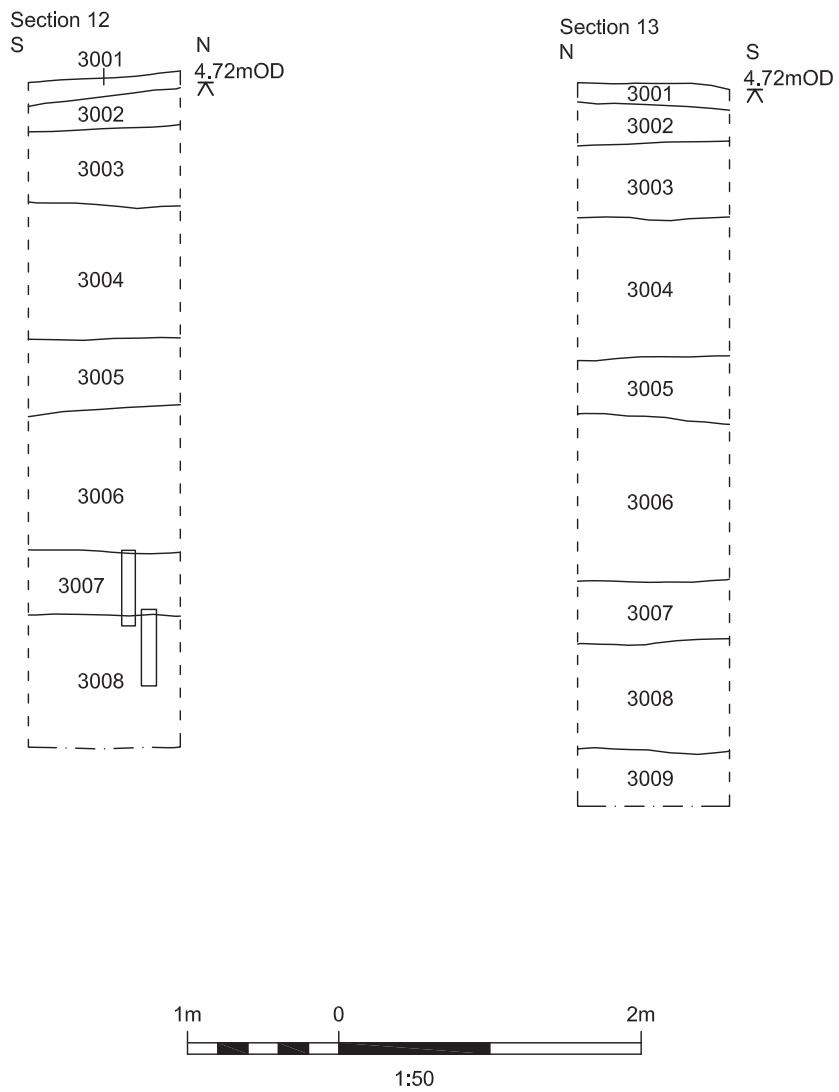


Figure 7: Trench PDZ3.30: Stratigraphic Sample Sections