

**CROSSRAIL BROADGATE TICKET HALL
AND ASSOCIATED WORKS
Liverpool Street Station
London EC2M
ARCHAEOLOGICAL POST-EXCAVATION ASSESSMENT**

**EVIDENCE FOR ROMAN OCCUPATION AND
MIEVEAL MARSH FORMATION (TO C AD 1200)
MOLA XSM10 PXA01_rev3.0**



Site codes XSM10 and XSL10/XTB12
NGR 533050 181610
OASIS ID: molas1-241917

Sign-off History:

Issue No.	Date:	Prepared by:	H&S signed off by:	Checked/ Approved by:	Reason for Issue:
1 rev0.0	19.02.16	Serena Ranieri Alison Telfer	HSCM	Julian Hill	draft for client review
2 Rev 2.0	27.04.16	Serena Ranieri Alison Telfer Julian Hill	HSCM	Julian Hill	For approval. Submitted with originator response to comment sheet C257-MLA-T1-XCS-CRG03-50029
3 Rev 3.0	23.05.16	Serena Ranieri Alison Telfer Julian Hill	HSCM	Julian Hill	For Code 1 approval. Submitted with originator response to comment sheet C257-MLA-T1-XCS-CRG03-50029 rev2

Graphics: Neville Constantine, Catherine Drew, Carlos Lemos

© MOLA 2016

Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED tel 0207 410 2200
2 Bolton House, Wootton Hall Park, Northampton, NN3 8BE tel 01604 700493
email generalenquiries@mola.org.uk

MOLA is a company limited by guarantee registered in England and Wales with company registration number 07751831 and charity registration number 1143574.
Registered office: Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED

Executive summary

This report constitutes a post-excavation assessment (PXA) document and presents the results of an archaeological investigation by MOLA (Museum of London Archaeology) at the site of the Crossrail Central Broadgate Ticket Hall, Liverpool Street, (Museum of London (MoL) sitecode XSM10) and at the Crossrail 11–12 Blomfield Street site (MoL sitecodes XSL10/XTB12). Both sites are within the City of London. It describes the progress of post-excavation work, the current understanding of the sites and details a schedule of work to complete the analysis of these provisional results and to lead to the publication of the archaeological evidence.

The fieldwork comprised a series of watching briefs, evaluations and excavations undertaken in response to the redevelopment of the sites as part of the Crossrail station at Liverpool Street: at Broadgate, excavation of the site area to a depth of 25 metres below street level was necessary to provide below-ground concourses and booking halls and escalator access to the platforms, whilst work Blomfield Street involved constructing an access shaft of similar depth. At Broadgate archaeological fieldwork occurred 20/02/11–09/10/15 and at Blomfield Street they took place 24/05/2011–23/01/2014.

The largest component of the archaeological sequence was the post-medieval burial ground documented as the 'New Churchyard' (also known as the Bedlam burial ground). This, and the remainder of the later medieval (after c AD 1000) and post-medieval sequence, which will be presented as a separate publication, are covered by separate PXA documents. All three PXA documents additionally incorporate the relevant results of archaeological investigations of 1985–6 by the Department of Urban Archaeology (DUA) at the Broadgate development site (sitecode LSS85: Dyson et al 1987). This document (C257-MLA-T1-RGN-CRG03-50099 or **MOLA XSM10 PXA01 rev3.0**) concentrates exclusively on the Roman and early medieval sequence of marsh formation (before c AD 1200) and includes an assessment of the human bone assemblage from the Roman period.

The site lies on the east bank of the former Walbrook stream. Remains of the stream itself, bands of alluvial clay and gravel, the earliest of which were prehistoric, were seen at the western edge of the sites. At Broadgate, deposits containing late Iron Age pottery and burnt flint could suggest prehistoric activity on the site, or peripheral activity in the first years after the Roman conquest. The stream remained an active component of the local landscape throughout the Roman period.

Several phases of Roman activity were recorded. The earliest, dating to the first half of the 2nd century AD, took the form of water management. The rate of the flow of the stream varied over time: an episode of fast-flowing water deposited gravels over some earlier Roman structures and disturbed and displaced human bones from the Roman cemeteries nearby. Silt and alluvium represented flood events. In c AD 120, an E–W aligned Roman road was built across the Broadgate site. It was subsequently resurfaced and widened and remained in use until the 3rd century AD – at least five phases of successive roadside ditches survived on its southern side. One of the earliest ditches contained disarticulated human bone, also thought to have originated largely from the adjacent Roman cemeteries. The road, traced E–W across the entire site was generally straight apart from a slight kink at a point where other features such as ditches, postholes and gravel layers may represent a roadside feature. There were some burials within the site itself. One grave, aligned parallel to the road, contained a supine skeleton with a skull placed between its legs. Further south, but on a different alignment (NNE–SSW) were up to seven further burials, mostly severely truncated, but containing another two decapitations. A cremation had survived at the western edge of the site

Contents

<u>Executive summary</u>	<u>i</u>
<u>Contents</u>	<u>ii</u>
<u>1 Introduction</u>	<u>1</u>
<u>2 Topographical, historical and archaeological background</u>	<u>7</u>
<u>3 Original research aims</u>	<u>9</u>
<u>4 Site sequence: interim statement on field work</u>	<u>11</u>
<u>5 Quantification and assessment</u>	<u>14</u>
<u>6 Potential of the data</u>	<u>54</u>
<u>7 Significance of the data</u>	<u>61</u>
<u>8 Publication project: aims and objectives</u>	<u>63</u>
<u>9 Acknowledgements</u>	<u>71</u>
<u>10 Bibliography</u>	<u>73</u>
<u>11 OASIS archaeological report form</u>	<u>78</u>
<u>Appendix 1: management, delivery and quality control</u>	<u>82</u>
<u>Appendix 2: botany tabulation</u>	<u>84</u>
<u>Appendix 3: disarticulated human bone tabulation</u>	<u>88</u>
<u>Appendix 4: animal bone tabulation</u>	<u>94</u>
<u>The figures</u>	<u>98</u>

List of illustrations

Front cover: Excavation being carried out in Area 2/3

The figures, other than histograms, are presented at the end of this document

<i>Fig 1</i>	<i>The identified Roman coins from XSM10 (histogram)</i>	<i>28</i>
<i>Fig 2</i>	<i>Percentage completeness of articulated burials (n=8) (histogram)</i>	<i>36</i>
<i>Fig 3</i>	<i>Plan showing the study area in relation to the Roman road, the Roman City Wall, the modern street plan and other sites referred to in the text</i>	<i>99</i>
<i>Fig 4</i>	<i>The Early Holocene surface and the location of sections referred to in the text</i>	<i>100</i>
<i>Fig 5</i>	<i>Schematic transect section across the Walbrook valley at the site location (see Fig 4 for locational data)</i>	<i>101</i>
<i>Fig 6</i>	<i>The extent of surviving natural brickearth with the projected line of the Walbrook tributary to the west</i>	<i>102</i>
<i>Fig 7</i>	<i>The surviving extent of the layer containing LIA pottery</i>	<i>103</i>
<i>Fig 8</i>	<i>The primary phase of Roman use of the site: water management</i>	<i>104</i>
<i>Fig 9</i>	<i>One of two timber gates at the edge of the Walbrook stream; looking south-west</i>	<i>105</i>
<i>Fig 10</i>	<i>Remains of the first phase of Roman road, with sequence of roadside ditches; looking WNW</i>	<i>105</i>
<i>Fig 11</i>	<i>Plan showing the second phase of Roman activity: primary Roman road metalling and adjacent funerary remains</i>	<i>106</i>
<i>Fig 12</i>	<i>Series of roadside ditches ([6782] with human bones) with charnel pit [6823] in foreground; looking north</i>	<i>107</i>
<i>Fig 13</i>	<i>Decapitated burial [6840]; looking east</i>	<i>107</i>
<i>Fig 14</i>	<i>Decapitated Roman burial; looking down to south-east</i>	<i>108</i>
<i>Fig 15</i>	<i>Roman features at break in the southern roadside ditches; looking ENE</i>	<i>108</i>
<i>Fig 16</i>	<i>Resurfacing of Roman road and recuts of side ditches</i>	<i>109</i>

List of tables

Table 1	XSM10 Fieldwork conducted between 20/02/11 and 09/10/15	4
Table 2	XTB12 fieldwork conducted between 24/05/2011 and 23/01/2014	5
Table 3	LSS85 principal fieldwork included in this report, conducted between 1984 and 1985	5
Table 4	XSM10 stratigraphic archive	15
Table 5	XTB12 stratigraphic archive	15
Table 6	XSM10 finds and environmental archive general summary	16
Table 7	XSL10/XTB12 finds and environmental archive general summary	16
Table 8	Quantification of Roman registered finds by object and material type excluding glass, coins, building material and ceramic vessels (continues on next page)	23
Table 9	Roman objects that could not be accessed during assessment and still require cataloguing	25
Table 10	Roman glass assemblage by colour	26
Table 11	Roman glass assemblage by form	26
Table 12	The Roman monetary system, 27 BC – c AD 260.	27
Table 13	Reece Coin Periods by date	28
Table 14	Iron working remains sorted by type and period. Weight in grams.	29
Table 15	Slag/metalworking debris samples	30
Table 16	Seven oak (<i>Quercus</i> spp.) samples from XSM10: interpretations using a 10-46 ring sapwood estimate (after Tyers 2014; table 1.	31
Table 17	Demographic assessment categories	35
Table 18	A summary table of articulated burials.	37
Table 19	C14 dating of four skulls	39
Table 20	Section log: first Roman roadside ditch – Section 310 north	42
Table 21	Section log: first Roman road side ditch – Section 310 south	42
Table 22	Section 312: second Roman roadside ditch section log	42
Table 23	Section 303 east: late to post-Roman marsh section log	43
Table 24	Section 303 west: late to post-Roman marsh section log	44
Table 25	Ostracod assessment samples	45
Table 26	Section 310: first Roman road side ditch section ostracod assessment results	46
Table 27	Section 312: second Roman road side ditch section ostracod assessment results	46
Table 28	Section 303: late to post-Roman marsh ostracod assessment results	46
Table 29	Section 303: late to post-Roman marsh ostracod assessment results (continued)	47
Table 30	Tabulated resource requirement of analysis and publication (does not include print and archive requirements)	65
Table 31	Summary of botanical assessment data (Roman)	84
Table 32	A summary table of disarticulated human bone.	88
Table 33	Animal bone tabulation	94

1 Introduction

This document is catalogued within the Crossrail system as C257-MLA-T1-RGN-CRG03-50099. Within MOLA terminology it is **MOLA XSM10 PXA_01**.

MOLA (Museum of London Archaeology) is a company limited by guarantee registered in England and Wales with company registration number 07751831 and charity registration number 1143574. The Registered Office is Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED). It has its own independent Board of Trustees but works in partnership with the Museum of London via a Memorandum of Understanding.

All work carried out on this project at assessment level has been, and all proposed analysis tasks will be, subject to the health and safety policy statement of MOLA as defined in the MOLA Health And Safety Policy. This document is available on request. It is MOLA policy to comply with the requirements of the Health and Safety at Work Act 1974, the Management of Health and Safety at Work Regulations 1992 and all Regulations and Codes of Practice made under the Act which affect MOLA operations.

All work has also been carried in accordance with the generic Crossrail Written Scheme of Investigation (WSI) (Document No. CR-XRL-T1-GST-CR001-00003) and the Site-Specific WSI (Document No. C138-MMD-T1-RST-C101-00001 Rev. 3.1) and addendum (Document No. C502-XRL-T1-RST-C101-50002 rev. 2). Specific site methodology was also iterated in the MOLA method statement for the watching brief and excavation of the Crossrail Broadgate Ticket Hall site Areas 1–6 (Document No. C257-MLA-T1-GMS-C101-50002; MOLA 2015).

1.1 Textual conventions

- MOLA employs a single context excavation system. Contexts are defined on site and remain the basic unit of archaeological stratification throughout. Context numbers are always presented within square brackets [1] ... etc.
- Environmental sample numbers, usually a subsample of a context, are defined by curly brackets {1} ... etc.
- Accession numbers given to particular categories of find are shown as <1> ... etc.
- During post-excavation work, contexts are amalgamated into larger units or subgroups (sgp 1, ...), which are then progressively built up, initially by grouping them together in groups (gp 1, ... etc), into land-use (LU) entities (described as Open Areas (OA1, ...) or Structures (S1, ...)) and chronological periods, as defined by both stratigraphic and dating evidence.
- Topographical heights in this report are given throughout as m ATD, or metres above tunnel datum. Tunnel datum is –100m OD (Ordnance Survey datum). **The sole exception is the plan drawings which are annotated in m OD. This is to avoid confusion should these plans be compared in isolation from the text with other plan data for adjacent sites.**

1.2 Site background

The Broadgate Ticket Hall site is being developed by Crossrail Ltd in order to create a new, sub-surface ticket hall beneath Liverpool Street, City of London, EC2, to serve the deeper level platforms being inserted in tunnels beneath Liverpool Street station (Fig 3). The approximate site centre lies at Ordnance Survey National Grid Reference (NGR) 533050 181610 and the Museum of London (MoL) sitecode is XSM10. Henceforth in this report the

Broadgate Ticket Hall site is referred to as either 'the site', 'XSM10' or 'site A'. The site was occupied until recently by the western road and pavement of Liverpool Street, up to its junction with Blomfield Street, and to the south and west of the disused former Broad Street ticket hall/sub-station.

Archaeological excavation at 11 and 12 Blomfield Street (MoL sitecodes XSL10 and XTB12, with the majority of the work undertaken under the second sitecode) are also included (Fig 3). This site is bounded to the north by the TfL District/Circle line railway cutting, to the south by buildings fronting onto Blomfield Street, and to the east by the western end of Broad Street Avenue. The approximate centre of the site is at NGR 532990 181570. Crossrail development on this site involved the demolition of the existing properties prior to the installation of a 40m deep shaft to accommodate ventilation, electrical, mechanical and systems/equipment for the new Crossrail station. Henceforth in this report, the Blomfield Street site is referred to as either 'the site', 'XTB12' or 'site B'.

1.3 Planning background

The legislative and planning framework within which the excavation took place has been set out previously elsewhere (Crossrail 2011). In brief, the construction of the railway and its infrastructure has been undertaken by Crossrail Ltd under the authority of the Crossrail Act of 2008. 'The act gives the nominated undertaker 'deemed' planning permission for the authorised works, subject to conditions set out in Schedule 7 which requires additional plans and specifications for the design to be approved by relevant local planning authorities. Over-site development is not covered by the Act and is subject to the normal [Local Authority] planning approval process' (<http://www.cityoflondon.gov.uk/services/transport-and-streets/transport-planning/transport-infrastructure-projects/Pages/Crossrail.aspx> – accessed February 2016). The overall framework within which archaeological work is undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail (Crossrail 2008), under which any contractors were required to implement certain control measures in relation to archaeology before construction work began.

Schedules 9, 10 and 15 of the Crossrail Act (2008) concern matters relating to archaeology and the built heritage and allow the dis-application by Crossrail of various planning and legislative provisions, including those related to listed building status, conservation areas and scheduled ancient monuments (Schedule 9). Schedule 10 allows certain rights of entry to English Heritage given that Schedule 9 effectively dis-applies their existing rights to the Crossrail project. Notwithstanding these dis-applications, it is intended that agreements setting out the detail of the works and requiring relevant consultations and approvals of detail and of mitigation arrangements will be entered into by the nominated undertaker with the relevant local planning authorities and English Heritage in relation to listed buildings and with the Department of Culture, Media and Sport (DCMS) and Historic England in relation to Scheduled Ancient Monuments.

The LSS85 excavations (see below) were funded by Rosehaugh Stanhope Developments PLC.

1.4 Scope of the excavations and report

The overall aim of archaeological work on the Crossrail site was to identify the extent and survival of archaeological deposits, to record and excavate remove those to be impacted upon by the development (preservation by record) or, where appropriate and possible, to preserve these remains *in situ*. The aim of the project is also to put the results into a wider context, whether local, regional, national or international and the proposed publication project will address these issues and introduce updated research aims and objectives raised by the discovery of evidence on site. This report, Crossrail Document No. C257-MLA-T1-

RGN-CRG03-50099, was commissioned from MOLA by Crossrail Project Archaeologist Jay Carver on behalf of Crossrail Ltd and covers the Crossrail sites at Liverpool Street (XSM10) and Blomfield Street (XSL10 and XTB12). It also incorporates the results of archaeological works within trench TP7, and other selected areas, undertaken by the then Department of Urban Archaeology (DUA) of the MoL between 10/08/85 and 25/03/86 at the Broadgate development site, Liverpool Street, between 1985 and 1986 (Rosehaugh Stanhope Developments Plc). This site carries MoL sitecode LSS85 (Fig 3; Dyson et al 1987).

The document is one of three post-excavation assessment documents (PXA's) to be produced to cover the results of archaeological works undertaken 2011–2015 by MOLA at the site, which produced a record of multi-period activity ranging from early Roman to late post-medieval. It focusses on the Roman and post-Roman sequence to c AD 1000, outlines its significance and potential and proposes a schedule of further analytical work to lead to the publication of these periods as a volume in the Crossrail Archaeology Series. As it covers the chronologically earliest strata and finds, this document carries the MOLA reference identity **MOLA XSM10 PXA01**. The remainder of the archaeological sequence postdating c AD 1000 and the documentary evidence relating to the New Churchyard – including that deriving from the Crossrail volunteer programme – is assessed as **MOLA XSM10 PXA02** (Crossrail Document No. C257-MLA-T1-RGN-CRG03-50101). The analysis of the osteological data derived from the New Churchyard is already underway and following a schedule of tasks defined in a separate, previously issued **MOLA XSM10 PXA02a**/Crossrail Document No. No. C257-MLA-T1-ASM-CRG03-50001 (Crossrail 2015e).

1.5 Circumstances and dates of fieldwork

In the following sections, cited references are reproduced in the style in which they appear in the bibliography.

All work was carried out in accordance with both the generic Crossrail WSI (Crossrail 2009) and the Site-Specific WSI (Crossrail 2010) and their addendums.

Crossrail, 2009 *Archaeology Generic Written Scheme of Investigation* (Doc. No. CR-XRL-T1-GST-CR001-00003) [WSI]

Crossrail, 2010, *Liverpool Street Station, Site-specific Written Scheme of Investigation* (Doc. No. C138-MMD-T1-RST-C101-00001, Rev.3.0) [SS-WSI]

Site A/XSM10

The sequence of archaeological work undertaken at Site A is tabulated at Table 1. Fieldwork conducted between 20/02/11 and 07/11/14 has been previously reported in:

- Crossrail, 2012b *C257 Fieldwork Report Archaeological Evaluation & Watching Brief Broadgate Ticket Hall (XSM10)* (Doc. No. C257-XRL-X-RGN-CRG02-50064, Rev.2.0), unpub MOLA report for Crossrail
- Crossrail, 2013b *C257 Fieldwork Report Crossrail Broadgate Ticket Hall Excavated Evaluation and GWBs, (XSM10)* (Doc No. C257-MLA-X-RGN-CRG02-50113, Rev. 2.0), unpub MOLA report for Crossrail
- Crossrail, 2015b *C257 Fieldwork Report Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Utilities Combined Report 2013 (XSM10)*(C257-MLA-T1-RGN-CRG03-50014, Rev.2.0), unpub MOLA report for Crossrail
- Crossrail, 2015c *C257 Fieldwork Report Crossrail Broadgate Ticket Hall Pile Line General Watching Brief (XSM10)* (Doc. No. C257-MLA-T1-RGN-CRG03-50072, Rev.2.0), unpub MOLA report for Crossrail

Specific site methodology has also been iterated in the appropriate MOLA method statements. The versions listed below superseded all previous versions and were those in place while works were undertaken on site:

- Crossrail, 2011 *C257 Method Statement Archaeological Evaluation and Watching Briefs Broadgate Ticket Hall* (Doc. No. C257-MLA-X-RGN-CRG02-50002, Rev.4.0), unpub MOLA report for Crossrail
- Crossrail, 2012c *C257 Method Statement Archaeological Watching Brief, Evaluation, and Sample Excavation Broadgate Ticket Hall* (Doc. No. C257-MLA-X-RGN-CRG02-50046, Rev.4.0), unpub MOLA report for Crossrail
- Crossrail, 2013a *C257 Method Statement Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Utilities Corridor* (Doc. No. C257-MLA-X-GMS-C101-50001, Rev.3.0), unpub MOLA report for Crossrail
- Crossrail, 2014a *C257 Method Statement Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Pile Line* (Doc. No. C257-MLA-T1-GMS-C101-50001, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2014b *C257 Method Statement Archaeological Excavation and General Watching Brief Archaeological Targeted Watching Brief Broadgate Area 5 West* (Doc. No. C257-MLA-T1-GMS-CRG03-50002, Rev.3.0), unpub MOLA report for Crossrail
- Crossrail, 2015a *C257 Method Statement for the Watching Brief and Excavation of the Crossrail Broadgate Ticket Hall Areas 1–6* (Doc. No. C257-MLA-T1-GMS-C101-50002, Rev.4.0), unpub MOLA report for Crossrail

Table 1 XSM10 Fieldwork conducted between 20/02/11 and 09/10/15

XSM10 Task	Principal Contractor	Date
GWB (General Watching Brief), structural trial pit in the basement of the Railway Tavern	C243 JP Riney	07/03/11
Evaluation, trenches 5, 6 and 9	C243 JP Riney	20/02/11 to 14/03/11
Excavated Evaluation, trenches 1, 2, 7 and 13	C243 JP Riney	07/03/11 to 27/07/11
Evaluation, Pit 4	C503 VCUK [Vinci Construction UK Limited]	13/10/11 to 26/10/11
GWB, southern pile line (preliminary ground reduction, clearance of human remains by exhumation contractor). Included Pits 1, 2, 3, 4a, 5, 6, 7, 8, 9, 9a and 10.	C503 VCUK	26/10/11 to 07/02/12
GWB, Trench 15, within the pavement south of the UBS building (ground works trial pit)	C503 VCUK	11/01/12 to 20/01/12
GWB, UKPN utility diversions (installation of new utility ducts)	C503 VCUK	11/01/12 to 03/02/12
Excavated Evaluation, Trench 14, in the N pavement of Liverpool Street	C503 VCUK	10/02/12 to 01/03/12
TWB (Targeted Watching Brief), Pit 11 (ground works trial pit)	C503 VCUK	08/02/12 to 19/03/12
Excavation (and associated watching briefs), the Utilities Corridor	C503 VCUK	GL1 to GL8: 19/03/13 to 25/04/13 GL8 to QVT: 14/08/13 to 16/09/13
GWB, 200mm water trial trench	C503 VCUK	13/06/13
GWB, 180mm gas main trial trench	C503 VCUK	14/06/13
GWB and TWB, Sewer Shaft MHS1	C503 VCUK	15/07/13 to 18/10/13
GWB and TWB, Sewer Shaft MHS2-100	C503 VCUK	05/08/13 to 30/08/13
GWB and TWB, Open Cut Sewer	C503 VCUK	12/04/13 to 09/05/13
GWB, Heading from MHS2-100 to Blomfield Street sewer	C503 VCUK	10/09/13 to 03/10/13
GWB, demolition of Manhole X	C503 VCUK	09/12/13 to 13/12/13
TWB, Manhole MHS2	C503 VCUK	20/01/14 to 03/02/14
GWB, northern pile line (preliminary ground reduction and clearance of human remains by exhumation contractor). Included trench TB1-TB8, TB2b, TS1-TS2, TB2.3-TB2.14)	C502 LOR [Laing O'Rourke]	19/06/14 to 07/11/14
GWB and Excavation, Area 5	C502 LOR	Area 5 West: 18/07/15 to 30/07/15 Area 5: 02/02/15 to 11/03/15
GWB and Excavation, Area 2/3	C502 LOR	20/02/15 to 08/05/15
GWB and Excavation, Area 1	C502 LOR	13/07/15 to 09/10/15

Site B/XTB12

The sequence of archaeological work undertaken at Site B is tabulated at Table 2. Fieldwork conducted between 24/05/2011 and 23/01/2014 has been previously reported in:

- Crossrail, 2012d *Central Section Project, Fieldwork Report, Archaeological Evaluation at 11–12 Blomfield Street (XSL10)* (Doc. No. C257-MLA-X-RGN-CRG02-50126, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2015d *C257 Archaeology Central Fieldwork Report Blomfield Box Site Archaeological Watching Brief and Excavation Blomfield Box (XTB12)* (Doc. No. C257-MLA-T1-RGN-CRG03-50017, Rev.1.0), unpub MOLA report for Crossrail

As with Site A, all work was carried out in accordance with both the generic Crossrail WSI (Document No. CR-XRL-T1-GST-CR001-00003) and the Site-Specific WSI (Doc. No. C138-MMD-T1-RST-C101-00001, Rev.3.0) and their addendums. The MOLA method statements in place while works were undertaken on site are:

- Crossrail, 2012a, *Watching Brief & Detailed Excavation – Blomfield Worksite – (XTB12) Blomfield Box* (Doc. No. C502-XRL-T1-RST-C101-50001, Rev.1.0) [WSI Addendum] (this supersedes the earlier addendum C138-MMD-T1-RST-C101-00005), unpub MOLA report for Crossrail
- Crossrail, 2013c *C257 Archaeology Central, Method Statement, Archaeological Targeted Watching Brief, Blomfield Box, 11–12 Blomfield Street* (Doc. No. C257-MLA-X-GMS-C101-50002, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2013d *C257 Archaeology Central, Method Statement, Archaeological Excavation, 11–12 Blomfield Street* (Doc. No. C257-MLA-T1-GMS-CRG03-50001, Rev.1.0), unpub MOLA report for Crossrail

Table 2 XTB12 fieldwork conducted between 24/05/2011 and 23/01/2014

XSL10 / XTB12 Task	Principal Contractor	Programme
Trial trench evaluation (3 trenches)	J F Hunt Demolition & JB Riney	24/05/2011–26/07/2011
General Watching Brief on Obstruction Removal	C502 LOR (Laing O'Rourke)	Collectively: 20/08/2012– 05/04/2013
General watching brief on site wide ground reduction to 106.74m ATD	C502 LOR	
Targeted Watching Brief within the Main Box on ground reduction to 106.70m ATD	C502 LOR	
Excavation in Grout shaft (13m x 7m x c 2.6m deep)	C502 LOR	06/11/2014–23/01/2014

LSS85

The excavation of trench TP7 consisted of full controlled excavation of the burial ground horizon and later sequence; however, earlier archaeological deposits were recorded under watching brief conditions. Thus, the c pre-1569 archaeological sequence within TP7 was only recorded as a north facing trench section, following DUA monitored machine excavation (Dyson et al 1987).

LSS85 fieldwork results have been previously documented by unpublished DUA reports (Dyson et al 1987) and a popular book (Hunting et al 1991). The site archive is lodged at the MoL Archaeological Archive (or LAARC).

Table 3 LSS85 principal fieldwork included in this report, conducted between 1984 and 1985

LSS85 Task	Principal Contractor	Date
TP7, open area excavation (4m x 18m) was targeted for the controlled excavation	Bovis Construction Ltd	10/08/85 to 25/03/86

1.6 Organisation of the report

As per section 1.3 above: 'Notwithstanding these dis-applications, it is intended that agreements setting out the detail of the works and requiring relevant consultations and approvals of detail and of mitigation arrangements will be entered into by the nominated undertaker with the relevant local planning authorities

Consequently, despite the statutory framework of the planning background, this report adopts the standard structure of a MOLA PXA/UPD submission for a site within the City of London which is the relevant planning authority for the site. The principle underlying the concept of post-excavation assessment and updated project design were established by English Heritage in the *Management of Archaeological Projects 2* (MAP2; English Heritage 1991). More recent Historic England guidance, superseding MAP2 but embodying the same principles, is contained in Historic England's (previously English Heritage) Management of Research Projects in the Historic Environment (MoRPHE) Project Planning Note (PPN) 3.

The updated project design and proposed publication outline have been formulated in response to the Crossrail Central Archaeology Post-Excavation Strategy (CRL Doc CR-XRL-T1-STP-CR001-50001) and proposed publication output (Crossrail workstream ref CRL11 'Roman and Medieval Broadgate and Blomfield Street').

The report begins with a brief archaeological and historical background to the site and surrounding area, based on knowledge prior to the excavation of the site (Section 2) and then presents the original research aims (Section 3) that were formulated on the basis of that information. The interim results of the excavation are described in Section 4; this information is presented using context information and is again organised chronologically by period and incorporates archaeological evidence from neighbouring sites.

The quantification and assessment section details the stratigraphic and specialist (finds and environmental) archive (section 5). Discussion of the potential of the site (section 6) combines stratigraphic and specialist information. The degree to which the original research aims can be realised is also discussed, along with the varying significance of the data recovered (section 7). Revised or new research aims and a publication synopsis for proposed dissemination of the results based upon these research aims are stated in section 8, together with method statements for, and tabulation of, the tasks and resource requirement that that publication would entail.

2 Topographical, historical and archaeological background

The geological, topographical, archaeological and historic background of the Liverpool Street Broadgate Ticket Hall site is covered in detail in the Liverpool Street DDBA (Crossrail 2008). This report only presents background information relevant to the chronological period (up to c AD 1000) that it covers. Supplementary data derived from fieldwork reports (Crossrail 2012b, 2012d; 2015b; 2015d) is incorporated in the summary discussions in the sections that follow.

2.1 Topography

Sites A and B lie on the sands and gravels of the Third (Taplow) Thames Terrace. Alluvium overlying the terrace deposits at the western edge of the site, and evidence for flooding seen elsewhere across the site, are thought to be directly associated with component stream of the Walbrook drainage system. Localised deposits of brickearth capping over the terrace gravels were recorded in areas of the site.

The depression for the prehistoric Walbrook channel was clear, with a depth of 106.33m ATD at the western edge of the site, with gravel rising up to 108.05m ATD towards the eastern edge. A slight incline was also noted from north down to south, with levels of 107.9m ATD down to 107.4m ATD.

2.2 Archaeology

The Roman settlement at Londinium was established by c AD 48 (Hill and Rowsome 2014, 258). It was originally focussed north of modern London Bridge, around what is now Leadenhall Market, but had expanded considerably westwards by the time of the Boudican revolt (Hill and Rowsome, 275–6). The formal boundaries of the settlement before c AD 180–225, when the city wall was built, are not clearly defined, but as the area enclosed by the wall comfortably exceeds the area known to be built up during the first 150 years of Roman London's use it may follow an earlier established boundary line. The Crossrail route passes runs parallel to, but c 100m to the north of, the line of the late 2nd/early 3rd century AD defensive enceinte (Fig 3).

Roman settlement expanded northwards up the Walbrook valley sides during the later 1st and 2nd centuries and late 1st–3rd century AD activity has been defined, for example, at Draper's Gardens (DPG03; Butler and Ridgeway 2009). Immediately south of Site A (XSM10), stream channels running E–W (towards the main Walbrook channel to the west) were identified during excavations at New Broad Street House (NEB87; Fig 3). Roman inhumation burials were present.

Roman inhumation and cremation burials were also encountered at the sites west of Crossrail Broadgate (the W–E line of sites from FIB88 to BDC03 shown on Fig 3) and form the main content of Harward et al 2015. This cemetery is atypical for the Roman period in that burial grounds usually flanked the principal approach roads to a settlement. For example, modern Aldersgate Street, c 180m to the east of the site, follows the line of a principal Roman road heading north from London and evidence for the cemetery flanking this road has been recorded at Spitalfields (SRP98; McKenzie and Thomas in prep). However, one important characteristic shared by all these burials is that they lay outside the town boundary as required by Roman custom.

A component of the northward expansion of the Roman settlement is an E–W aligned road, constructed c AD 120, previously observed at a number of sites immediately to the west of Crossrail Broadgate (Harward et al 2015, 30–33; 78–80). This road can be presumed to have struck westwards from the main Roman road heading north from London that underlies modern Aldersgate Street at a point a little to the north of Roman settlement boundary. It is possible that the creation of this road is linked in some way to the construction of masonry fort in the north-western corner of the settlement during the first quarter of the 2nd century AD.

The construction of the Roman city wall was one of many factors that influenced the development of the extra-mural Walbrook valley in the late Roman to medieval period. Although the stream was conducted through the wall in a conduit, the wall itself appears to have significantly impeded the natural drainage of the Walbrook stream basin and ultimately led to the development of distinctly marshy land in the valley outside the city wall. By the medieval period the area was known as Moorfields Marsh and remained sparsely utilised until drained from the 16th century onwards. It was thought likely, therefore, that potential Roman remains at Broadgate would be sealed by deposits associated with Moorfields Marsh, also observed at a number of other previous archaeological interventions in the vicinity (Harward et al 2015, 65–67).

3 Original research aims

The original research aims were listed in the WSI (Crossrail 2009; 2010), where they were identified as having the potential to contribute to London-wide research themes (Museum of London 2002):

- *Evidence relating to the Walbrook, its tributaries and Roman deposits may provide data relevant to the following themes:*
 - Understanding London's hydrology, river systems and tributaries and the relationship between rivers and floodplains;
 - Understanding how water supply and drainage provision were installed and managed;
 - Refining our understanding of the chronology and function of the landward and riverside defences and extramural evidence of defensive or military structures in the Roman period.
 - Understanding the relationships between urban settlements and royal villas or religious estates;
 - Examining the proposal that there was an ideological polarity between town and anti-town systems: Roman towns did not so much fail as were discarded;
 - The end of the Roman occupation: developing explanatory models to explain socio-political change and considering the influence of surviving Roman structures on Saxon development

The site-specific Original Research aims/questions (ORAs) were previously presented in Crossrail, 2015a, where those relevant to the Roman sequence are sub-numbered RM1 etc. Here, they are prefixed with ORA to distinguish them from revised research aims (RRAs) presented later in this document. The fulfilment or otherwise of the ORAs is discussed at Section 6.1 below.

- ORA-RM 1 Investigate the natural topography and geomorphic development of the site prior to human intervention*
- ORA-RM 2 Investigate the form of the River Walbrook in its various phases, any crossing points, including any waterlaid deposits with potential for organic preservation and palaeo-environmental remains.*
- ORA-RM 4 Characterise and understand the nature, form, and dating of the different phases of Roman extra-mural activity and land use, including potential settlement occupation and date of any building remains and the function and date of drainage features and how they relate to the Walbrook and Moorfields Marsh*
- ORA-RM 5 Determine the structure, form, phasing and dates of use of the probable Roman road alignment [which] continues across the site and, if so, how it relates to other Roman activity within the area*
- ORA-RM 6 Are there any further primary Roman burials within the site area? How do apparently primary context deposits of human skulls and cremation deposits recovered from the west of the site relate to re-deposited human remains recovered from parts of the site? What can the human remains tell us of the lives of individual Londoners in the Roman period?*
- ORA-RM 9 What is the distribution of disarticulated Roman, or pre-Roman, human remains, and what can be inferred from it, eg from where may it have*

originated, and under what conditions? What does it suggest about nearby Roman cemeteries west and east of the Walbrook?

ORA-RM 10 What is the significance of the Roman shackles?

ORA-RM 11 What can be understood of the relationship between this known floodplain and evidence for burial practices in the Roman period?

ORA-RM 12 What is the significance of the decapitation burials? How do these relate to the cremation urn found only few metres away to the west?

4 Site sequence: interim statement on field work

4.1 Introduction

This section presents a summary of the results of the fieldwork. Text and plans included within this section have been drafted prior to full analysis of the site data and are derived from preliminary spot dates, stratigraphic and documentary information. They give only an impression of activity during the defined periods and do not include all of the excavated features.

This section should be read in conjunction with Fig 3–Fig 16, which are at the back of this document.

4.2 Natural and topography

Remains of the Walbrook stream were seen at the western edge of site A, with a significant north-south depression in the natural terrace gravels containing alluvial clay, interspersed with occasional bands of gravel. At least two phases of the watercourse were seen; the earlier, thought to be pre-Roman, appeared to slope from east down to west; at some point the water flow deposited light grey blue clay, which essentially formed a bank to the east. Remains of the channel, though more in its Roman than pre-Roman form) were also recorded at Site B to the south (Fig 11). The ‘true’ channel lay west of the sites, although assessment of soil samples taken during the fieldwork proposes a landscape involving a network of channels separated by gravel and sand bars (5.15).

Across site A, sporadic deposits of brickearth survived ([6869]; Fig 6), overlying the terrace sands and gravels. The latter was recorded at 106.33m ATD at the base of what is believed to have represented the pre-Roman Walbrook tributary at the western edge of the site, with gravel rising up to 108.05m ATD at the eastern edge. A slight incline was also recorded from north down to south, with levels of 107.9m ATD down to 107.4m ATD.

4.3 Prehistoric

The position of sites A and B on the east bank of the Walbrook stream may have attracted activity in the prehistoric period. The recovery of four abraded sherds of late Iron Age pottery from a single layer (context [2086]; Fig 7), which overlay deposit [2087] containing only burnt flints, could point to Late pre-Roman Iron Age activity on the site, though this material may have been deposited after the Roman conquest. Similarly, it remains possible that stake alignment [1338]–[1340], and [1092], part of a wattle fence on the east bank of the stream are pre-Roman in date (5.11), but they are most likely to be post c AD 45 as shown on Fig 8.

4.4 Roman

There is no evidence for structural activity on the site before the 2nd century AD. Finds datable to the 1st century AD are sparse, with just three contexts producing pottery pre-dating c AD 100 (see 5.5). This reflects the fact that the site is on the periphery of Roman London. Activity in this marginal zone was initially limited to refuse dumping and a combination of domestic rubbish, such as pottery (5.5), finds (5.6, 5.7, 5.8); including leather (5.9) and animal bone (5.14), and waterlain material from flooding events, contributed to a raising of the prevailing ground level on the east side of the Walbrook. This mixture of

material, dumps from the settlement area to the south, which become more prevalent as the town expanded northwards in the early 2nd century, and waterlain debris washed in from upstream, provides the 'background noise' to the site and can be seen in the results from XSM10, LSS85, XSL10 and XTB12.

A timber platform ([1423] and [1428]; Fig 8), made from two (a probable pair) re-used Roman gates (Fig 9; section 5.11), was laid down on the top of stream bank ([1403]. Tree-ring samples taken from the boarding of each gate provided a (combined) date range of c AD 110–134 for the felling of the tree from which the timber came (Table 16; Tyers 2014); however, the timber platform represented the probable fourth use of this timber.

Two parallel ditches (Fig 8) ran at an oblique angle to the stream bank. Levels on the base of southern ditch, of which a greater length survived and along whose southern edge ran a fence, indicate a fairly flat base at 106.96–107.00m ATD and are insufficient to determine with any confidence the direction of flow. In addition to helping to drain the surrounding ground, the ditches clearly formed boundaries within the landscape; they may demarcate a route leading to wooden staging [1403].

After c AD 120 an east–west metalled road was constructed across the site (Fig 3; Fig 10; Fig 11), presumably bridging the rapidly silting-up stream just west of the site. This road has been previously identified on the excavations south of Eldon Street (RIV87, FIB88, ENS03, ELD88 and BDC03; Fig 3; Harward et al 2015, 30–33) and was partially uncovered during fieldwork on the site in 2011, 2012 and 2013. In total a length of c 45m was recorded across the site. It was generally straight, but the southern roadside ditches exhibited a very slight change in alignment at a point where a series of N–S ditches, a group of postholes and gravel layers may represent a roadside feature (Fig 15). It ran west-northwest from Bishopsgate and a continuation of the alignment as defined on site and at the sites considered by Harward et al would bring it to intersect a road leaving the north gate of the masonry fort, also very likely constructed c AD 120 (and so broadly contemporary with the road, though this may be purely coincidental), c 240m north of the fort gate.

The primary gravel road surface ([6765]; Fig 11) was cambered and, to the west, as it approached the stream was founded on layers of gravel and large pebbles, thick clay and brushwood raft. It was initially 8–9m wide but was subsequently widened to 10–11m. At least 6 phases of roadside ditches had survived on the southern side of the road; one of the earlier phases of ditch contained disarticulated human bones ([6782]; Fig 11; Fig 12). To the south of this ditch was a charnel pit ([6823]; Fig 11; Fig 12). Truncated remains of one of the ditches ([2072; Fig 11) on the northern side of the road also contained a fragment of human skull. One of the later roadside ditches ([6740]; Fig 16) had evidence for a planted hedge along its southern edge.

As noted at section 2.2 (above), the enceinte of the city defensive wall is likely to follow the line of an earlier boundary. During the 2nd century, cemeteries containing both inhumations and cremations were established outside this boundary. To the north of Roman London, one cemetery flanked the road leading north from Aldersgate (Swift 2003; McKenzie and Thomas in prep), while another ((RIV87, FIB88, ENS03, ELD88 and BDC03; Fig 3; Harward et al 2015) lay immediately on the other side of the Walbrook from site A. Cemetery areas lay, therefore, lay to the west, north-west, north and north-east of site A. Most of the burials within them post-date c AD 120, though a small number could be as early as c AD 100.

At site A, a yellow gravel ([1391]; recorded as [1437] in the MHS2-100 Heading) was deposited over the platform/gates [1428] by an episode of faster-flowing water representing a change in the regime of the Walbrook stream. There were a number of near complete ceramic vessels and a significant quantity disarticulated human bone within this gravel channel fill. The pottery dating for these contexts is AD 140–200, which concords with tree ring dating for the timber gates. The gravel was sealed by clay deposits indicative of slower-moving currents and probable episodes of flooding. At the time the gravels were deposited, the nearby cemeteries had been in use for a number of decades and it is very likely that the

majority of this human bone originated from them (see Harward et al 2015, 126–133, for the erosion of burials and the redeposition of human bone and cremation vessels occurring within the cemetery itself).

There was, however, also Roman burial activity on site A itself. At the western edge of the site, a cremation pot ([1439]) was recovered from the ceiling of the MHS2-100 sewer heading (approximate location plotted on Fig 8). It appeared to immediately post-date the gravel deposit cited above and to have been deliberately set into its upper surface. An absence of any intrusive fill within the pot suggests that it had a lid which had stayed in place (and which therefore remains *in situ* in a deposit above the ceiling of the heading). The location of the cremation pot within the channel course indicates a period of relative drought; the vessel's completeness reinforces this.

Further east and running parallel with the road and ditches was a burial consisting of a decapitated, supine skeleton ([6840]; Fig 13, Fig 11) with a skull placed between its legs. The decapitation does not appear to have been inflicted post-mortem (see 5.13) and can be assumed to have been the cause of death. Further south, and on a different alignment (NNE–SSW) and mostly severely truncated, were up to seven further burials (the more complete are shown on Fig 11), which included another two decapitation burials (Fig 13; Fig 14).

A reduction in activity towards the end of the Roman period led, in basic terms, to a reduction in water management. This ultimately created an environment which enabled the formation of marshland across this part of the Walbrook valley.

4.5 Saxon, Medieval and Post-medieval

There was no dated evidence for activity on the site in the Saxon period, though continued marsh formation may be presumed. Results from an assessment of the medieval and post-medieval stratigraphy are presented separately as MOLA XSM10 assessment report PXA02.

5 Quantification and assessment

Because of the accelerated programme of assessment/analysis/publication for Crossrail Broadgate, where appropriate some tasks have been deferred from the assessment to the analysis stage. These are identified in the following specialist sections.

5.1 Post-excavation review

The following elements of the post-excavation process for XSM10 have been completed:

- site records have been ordered and checked
- site context matrix has been compiled, checked and established digitally within ArchEd and BONN software.
- all site data inputted onto the MOLA Oracle database
- subgroups allocated
- subgroup matrix completed and checked
- provisional group structure has been completed
- provisional land use structure has been completed
- plans digitised in AutoCad and transferred to ArcMap GIS
- all photographs digitally ordered, labelled and stored
- osteological assessment of post-medieval cemetery population has been completed (see PXA02a Doc. No. C257-MLA-T1-ASM-CRG03-50001, MOLA 2015e).
- all ceramic material processed and assessed
- all environmental material processed and assessed
- all accessioned finds processed and assessed
- all conservation requirements assessed

Further database work required for XSM10 the next stage of analysis:

- final check of group and landuse structure against all dating evidence in consultation with specialists
- finalised phasing/period structure
- complete all Oracle inputs to period level
- auxiliary data for skeleton attributes (alignments, coffin furniture presence/absence)

The following elements of the post-excavation process for XSL10/ XTB12 have been completed:

- site records have been ordered and checked
- site context matrix has been compiled, checked and established digitally within ArchEd and BONN software.
- all site data inputted onto the Oracle database
- subgroups allocated
- subgroup matrix completed and checked
- group structure has been completed
- provisional land use structure has been completed
- plans digitised in AutoCad and transferred to ArcMap GIS
- all photographs digitally ordered, labelled and stored
- all ceramic material processed and assessed
- all environmental material processed and assessed
- all accessioned finds processed and assessed
- all conservation requirements assessed

Further XSL10/ XTB12 work required for the next stage of analysis:

- final check of group and landuse structure against all dating evidence in consultation with specialists
- finalised phasing/period structure
- complete all Oracle inputs to period level

The following elements of the post-excavation process for LSS85 (TP7) have been completed:

- site records have been ordered and checked
- site context matrix has been compiled, checked and established digitally within ArchEd and BONN software.
- all site data inputted onto the Oracle database
- all photographs digitally ordered, labelled and stored
- assessment of coffin furniture processed and assessed
- all environmental material processed and assessed
- all accessioned finds processed and assessed

Further LSS85 work required for the next stage of analysis:

- final check of group and landuse structure against all dating evidence in consultation with specialists
- finalised phasing/period structure
- complete all Oracle inputs to period level

5.2 The site archive and assessment: stratigraphic

This section brings together an inventory of the complete paper record that has been produced from each phase of fieldwork, representing all periods on the site, from prehistoric to late post-medieval.

Table 4 XSM10 stratigraphic archive

Type	Description	Quantity	Notes
Contexts	Total across all areas and all periods	7410	Context numbers between 1 and 10,000 (gaps)
Plans	MOLA Archive-standard drawing sheets –various scales (Note, many plans cover more than one sheet)	4368	Count equals parent contexts digitised
Matrices	At context, sgp and gp	-	Digital and paper copies
Photographs	Site and finds	11166	Total number of digital photographs, images on Oracle

Table 5 XTB12 stratigraphic archive

Type	Description	Quantity	Notes
Contexts	Total across all areas	43	
Plans	MOLA Archive-standard drawing sheets –various scales (Note, many plans cover more than one sheet)	21	
Sections	MOLA Archive-standard drawing sheets	8	
Matrices		3	Digital and paper copies
Photographs	Site and finds	142	Total number of digital photographs, images on Oracle

5.3 Site archive and assessment: finds and environmental

Table 6 and Table 7 contain a summary of finds and environmental material, from the prehistoric and Roman periods, from XSM10 and XSL10/XTB12 respectively, which will be retained as part of the site archive. Following that are detailed assessments from finds and environmental specialists, outlining the basic data collected from site and highlighting particularly relevant or exceptional finds.

Table 6 XSM10 finds and environmental archive general summary

Category	Description	Weight
Building material	Five crates of ceramic building material (bulk of material discarded after assessment) 65 brick samples (not weighted) 12 shoe boxes and 2 flat boxes of bulk BM retained	277.3kg
Prehistoric pottery	4 sherds	8g
Roman pottery	7516 sherds	193.412kg
Accessioned finds (excluding glass, leather and textiles)	361 items	
Bulk leather	10 crates OF bagged leather	Bulk leather
Accessioned finds (leather)	14 items	Accessioned finds (leather)
Accessioned finds (textile)	1 possible item	Accessioned finds (textile)
Numismatica	1 medallion, 83 coins (plus 22 possible Roman coins)	
Iron working remains - Roman: AD 60-200	Undiagnostic Fe slag (1129g), smithing hearth bottom (1899g), vitrified hearth lining (397g)	3425g
Iron working remains - Roman AD 250-400	Undiagnostic Fe slag (503g), smithing hearth bottom (390g), vitrified hearth lining (55g)	948g
Bulk Soil Samples	Flots from 77 samples; sub-samples from unknown number of samples retained unprocessed.	8 boxes
Animal bone	Estimated 3190 fragments	132.45 kg/equivalent to 50 standard archive boxes
Human Bone	No. contexts: 81 No. of boxes: 10	

Table 7 XSL10/XTB12 finds and environmental archive general summary

Category	Description	Weight
Roman pottery	37 sherds	1055g
Accessioned finds (excluding worked stone)	3 (XSL10 <1>; XTB12 <1>, <5>	
Worked stone	3 items (XTB12 <2>-<4>	

5.4 The building material

Ian M. Betts

Introduction/methodology

All the building material has been recorded using the standard recording forms used by the MoL. This has involved fabric analysis undertaken with a x10 binocular microscope. The information on the recording forms has been added to an Oracle database.

Roman stone building material

Moulded Stone

A wedge-shaped stone moulding cut from a fine white grey veined marble was recovered from the silty fill of a possible tree bowl (context [8383] <2927>). This is probably Carrara marble from northern Italy.

Stone tessera

There are a few hard chalk tesserae from a mosaic floor.

Veneer?

From an occupation dump (context [6730]) is a 23mm thick fragment of unusually glauconitic light grey sandstone with a smoothed top and base. This may be a wall or floor veneer, although sandstone is rarely used for wall veneer in Roman London.

Paving

Probably of Roman date is a slab of fine grained light grey sandstone paving from a road make-up layer (context [2050]). What may be a crude rectangular cobble stone cut from Kentish ragstone was recovered from roadside ditch fill [8369].

Rubble

Apart from one fragment of fine grained sandstone, all the other rubble is of Kentish ragstone from north Kent.

Roman mud brick and daub

There is remarkably little daub from the site, just a few small fragments from six contexts. Some are part burnt, whilst two have a flattish top surface. The only mud brick from the site was a small fragment from compact gravel layer [8321].

Roman ceramic building material

Forms

Tessera

Fabric group 2815, fabric 2454

There are a small number of fairly small and normal size tesserae from either a plain tessellated floor or the plain border around mosaic floor.

Roofing tile

Fabric group 2815, fabric 2451, 2453, 2454, 2457, 2459B, 2459C, 3001, 3011, 3013, 3018, 3023, 3024, 3028, 3050, 3058?, 3060, 3060B, 3226, 3227, 3262, 3267, 3291

All the roofing tiles are fragmentary. There is a mixture of early and later fabric types present. One tegula (from dump [6819]) has been cut into a crude circular shape. This may be a counter or gaming piece.

Box-flue tile

Fabric group 2815, fabrics 2459B, 2459C, 3058?, 3059

The majority of the box-flue tiles from the site have combed keying; including an example with shallow wide combing believe to be from West Sussex (fabric 3054). Other tiles have either knife-scored or roller-stamped ('relief-patterned') keying. The latter are keyed with die types 4 and 46 (Betts et al 1994).

Wall tiles

Fabric group 2815

There are two tiles with knife scored sanded bases, at least one of which is almost certainly a wall tile.

Brick

Fabric group 2815, fabrics 2454, 2459B, 3023, 3028?, 3060, 3069?, 3226/

Based on thickness virtually on the bricks are of basalis, pedalis or lydion type. One brick (from waterlain deposit [6716]) had a deep triangular shaped hole in the brick edge added prior to firing, but this may have been accidental.

Tegula Mammata

Fabric group 2815

The only one definite tegula mammata from the site was recovered from context [2085]. Other broken fragments of brick (from areas without a nib) could be the same tile type.

Markings on tiles and bricks

Stamps

A brick with part of a procuratorial tile stamp was recovered from a small dump of building material underlying road make-up (context [6786]). This is Betts (1995) die type 3, which when complete would have read PP.BRI.LON.

Signature marks

There are a number of tegulae and bricks with signature marks. Most of the common semi-circular variety with between one and three finger marks.

Tally mark

A brick from ditch fill [6611] has a knife cut tally mark in the sanded edge.

Animal prints

Present are a small number of tiles with hoof and paw prints.

Roman painted wall plaster

There are no large assemblages of wall plaster. The largest assemblages came from a rubbish dump (context [6730]) and a waterlain deposit ([6716]), with 28 and 24 fragments respectively. There are two areas of dado (context [6716] and sandy clay dump [6777]), and panel borders with various combinations of red, white, yellow, grey, black and green. Some areas of plain red have a polished top surface.

5.5 The prehistoric and Roman pottery

Amy Thorpe

Introduction/methodology

The pottery from XSM10, XTB12 and XSL10 was recorded in accordance with current MOLA procedure, using standard codes for fabric, form and decoration, with quantification by sherd count, estimated number of vessels (ENV) and weight in grams. The resulting data has been entered onto the MOLA Oracle database.

All stratified pottery was spot dated from both sites and this comprised a total of 7524 sherds (193.420kg) from 293 contexts. The exception to this is five contexts (8 boxes of pottery: [6777], [6819], [6856], [8325] and [8381]) which have only been scanned at assessment stage with full spot date records to be completed at analysis. The vast majority of the assemblage (242 contexts) consists of small sized groups (less than 30 sherds). The remaining groups consist of: 28 medium sized groups (30-99 sherds), 18 large groups (100+ sherds) and five very large groups (3 boxes or more). A large proportion of the assemblage

has the appearance of re-deposited material with small to medium sherds (some abraded) and few linking sherds from the same vessels. However, there are notable exceptions to this pattern in the form of sporadic finds of semi-complete and complete vessels in a good state of preservation. Several of these vessels have been interpreted as probable displaced burial goods (given the proximity of the known Roman cemetery areas).

Pre-Roman pottery

It should be noted that context [2086] contained four sherds of late Iron Age pottery. The material is in poor condition with very heavy abrasion evident.

Early Roman (1st century AD)

The lack of early Roman material from the site is noticeable. Just three contexts contained pottery sherds dating to the 1st century AD (residual in [3] a post-medieval cemetery soil; [1091], a Roman road deposit and [6891], ditch fill). Even within groups of a later date, the only early Roman fabric present in noticeable quantities is La Graufesenque samian (SAMLG); vessels in this fabric are often found to remain in circulation in Roman London after their main period of production/importation and are thus not an unexpected component of 2nd century AD assemblages.

2nd century AD

The profile of the assemblage has a clear dominance of material from the 2nd century AD with over a third of the contexts falling specifically within this date range. Furthermore these contexts include the majority of the large and very large sized groups. There is a noticeable peak in assemblages that date to the Hadrianic and early Antonine periods (AD 120–140 and AD 140–160). The high proportions of black-burnished wares and Highgate Wood ware C (15.3% and 11.5% of total sherd count respectively) are a reflection of this dating. The vessels are predominantly indicative of the typical range of domestic rubbish in the City. The black burnished wares in particular frequently exhibit signs of use as cooking vessels in the form of thick sooting on the exterior and limescale on the interior surfaces from the boiling of liquids. Wear and abrasion are also present being most apparent on samian vessels; a high number of mortaria and cups have the slip worn away on the interior from a long lifetime of use.

The burials, charnel pit and the base of the roadside ditch all fall within this early to mid- 2nd century AD date-range. The base of the roadside ditch, where several complete skulls were found, is a key example which contained a large assemblage of 104 sherds (2163g) dated to AD 120–140. This assemblage is very typical of the material described above but has a further interesting aspect in the form of preservation of two complete vessels. These comprise an unsourced oxidised ware unguentarium (OXID 9N) and a Highgate Wood ware C poppy-head beaker with barbotine dot decoration (HWC 3F BDD); both of these vessels have high potential to be disturbed burial goods. Erosion of graves by migrating stream channels and flooding was identified in the neighbouring western cemetery area and probable displaced burial goods have been identified by such variables as completeness and unusual forms (Thorp 2015, 158-9). The use of Highgate products specifically as accessory vessels is noted in relation to inhumations of the 2nd century AD in this area (Harwood et al 2015, 101).

Important further evidence of cemetery activity is present on the Broadgate site in the form of semi-complete vessels (yellow gravel [1437] and [1391]) and a virtually complete cremation vessel ([1439]) recovered from a sequence of river gravels associated with the Walbrook. The cremation vessel is a Brockley Hill white-slipped ware necked jar with thick squared-off rim (BHWS 2G3); although jars are a common choice for cremations they are a relatively unusual find in this fabric.

The range of dating in the assemblages shows a clear progression into the later 2nd century AD. The relatively high levels (3.5% of total sherd count) of Verulamium/London region coarse white-slipped ware (VCWS) are indicative of this later material. Further reflections of material from this period include the frequent occurrence of ring-necked flagons with cupped mouth (1B7–9) and small quantities of Thameside Kent ware (TSK). The proportions of black-burnished ware 1 (BB1) and black-burnished ware 2 (BB2) are also indicative of the high level of 2nd century AD material with the latter almost twice as common by sherd count.

Late Roman (AD 180/200–400)

Just under a quarter of the contexts present can be dated to the 3rd or 4th centuries AD. Within this range, the balance of fabrics in the assemblage strongly indicates that more material was deposited in the 3rd century AD than in the 4th century AD. The proportions of fine wares are a key indicator, as while Nene Valley colour-coated ware (NVCC) represents 1.7% of the total sherd count the later (post-AD 270) Oxfordshire red/brown colour-coated ware (OXRC) is only accounted for by a few sherds. There are also sherds from Moselkeramik (MOSL) and central Gaulish/Lezoux black colour-coated ware (CGBL) vessels which are most commonly associated with 3rd century AD assemblages. The CGBL vessels are particularly noteworthy as they include sherds from two beakers with exceptionally well executed examples of applied decorative faces ([6609] and [8439]). The beakers are likely to have portrayed religious scenes as the faces depict Silenus and a satyr, both associated with the cult of Bacchus (Seeley in prep). The preservation of two vessels with such high quality decoration is rare: it is possible that their deposition may be linked to the cemetery activity taking place nearby. The coarse wares also lack indicators of 4th century AD date, with sherds from Alice Holt/Farnham ware (AHFA) vessels at low levels (0.5% of total sherd count) while Portchester ware D (PORD) and Roman late 'calcite-tempered' ware (CALC) are almost absent.

The occurrence of further unusual or rare products, some again with religious associations, through the later Roman assemblage increases the likelihood that some of these vessels are linked with the use of the adjacent cemetery areas. The top of a face flagon or flask in Nene valley parchment type ware (NVPA) from a deposit by the side of the Roman road ([6716]) is a particularly fine example; the face is finely moulded with the facial features and hair picked out using brown painted decoration. The closest parallel for this vessel is a find from Stibbington (Howe et al 1980, 27, Fig 8, no 96) of potentially a 4th century AD date. In the same deposit a spout from a central Gaulish samian Dragendorff form 45 mortarium (SAMCG 7DR45 SPT) was found, which again potentially depicts a satyr rather than the more standard versions showing lions. Finally a sherd from a large imported mortarium (IMPT 7 <1042>) found in a dump deposit ([6694]) has very unusual decoration on the flange; possibly an anthropomorphic design or alternatively symbolic representation of tools; if the latter it could be a more abstract design of the type shown on a jar found at 1–7 St Thomas' Street (Dennis 1978). There do not appear to be any parallels for this mortarium in the City and it is of high priority for further research at the analysis stage of this project.

Assessment work outstanding (all periods)

In order to get an overview of the pottery retrieved from the site, within the timeframe for the assessment, selected contexts were scanned rather than spot dated. A priority task when analysis of the site continues will be to complete full spot date records for the eight boxes of pottery that come under this category. In addition to this, sherds separated out from assessment of the ceramic building material and animal bone will need to be added to the spot date records (two boxes in total).

5.6 Roman accessioned finds (excluding glass, coins, leather and textiles)

Michael Marshall

Introduction/methodology

A total of 361 accessioned Roman registered small finds were recovered from XSM10 and submitted for assessment. They were processed and packaged according to standard MOLA procedures (following Grey 2006). X-radiographs were prepared for metal objects, with the exception of the lead artefacts, and basic archival details were entered into the MOLA Oracle database. The finds have been examined and assessed, with advice from Angela Wardle on the hipposandals. Object identifications, dating and, where appropriate, preliminary catalogue descriptions, have been entered into the MOLA Oracle database. The Roman finds assemblage is summarised in Table 8 and briefly discussed below. Full details and a draft catalogue can be accessed on the MOLA finds database.

Dress accessories

Dress accessories from the site span the entire Roman period. Seven brooches include five which can be securely identified at present: 1st C AD simple one piece <1034>; 1st C AD Harlow type Colchester derivative <1662>; an unusual penannular <1320> and two early/light crossbow brooches <1035> & <2801> of 3rd–4th C AD date. The remainder are more fragmentary, but may be fragments of a copper-alloy trumpet brooch and an iron ‘Durotrigan hinged brooch’, and should be identifiable after conservation. The two crossbow brooches are relatively rare finds in London brooch assemblages and may be related to mid–late Roman military activity. Bracelets are relatively well represented by six examples and three types: twisted wire cable, as used throughout the Roman period (four examples eg <1301>); simple knobbed penannular <2885> of a similarly long-lived type and a fragment from a late Roman light bangle with zigzag decoration on the exterior edge <218>. Pins are more numerous with 19 examples, mostly of bone, including Crummy (1983) bone types 1, 2 and 3 and Cool (1991) copper-alloy types 5c, 7b and 9. These pin types span the late 1st C AD to at least the late 2nd C AD, but Crummy type 3 bone pins are predominantly of late Roman date and were still in use during the 4th century AD. A single iron Henig type III finger ring <1070> of 1st–3rd C AD date is missing its intaglio.

Iron ring and shackle

Two other objects can make some claim to be ‘dress accessories’, but are of rather different or unusual character. The first, <1142>, is an iron ring found in an inhumation burial on the right wrist of skeleton ([6853]; 5.13), an adult male c 26–35 years of age. The internal diameter (estimated as corroded) is c 62mm and the section c 15+mm thick, making a total diameter of c 92+mm. The overall size is not unheard of for a Romano-British bracelet, but the section is unusually robust and it weighs 1006g. Even if this is a significant over-exaggeration of the original weight from corrosion, it seems likely that this object would have been large and uncomfortable to wear.

Initial X-rays suggest this is not a shackle or manacle (at least not in the conventional sense), as the hoop appears to have been solid, rather than hinged or open at one side, and the diameter is such that it may have been possible to slip it on or off over the hand. The form and method of manufacture of the ring is not entirely clear, but there are hints that the two ends of a bar are everted where they meet in a butt join or weld. This feature will need further investigative conservation to clarify this. While annular iron armlets/ bracelets are known from Romano-British burials (eg Crummy 1983, 45–47, fig 48, no. 1737), the present arm ring is substantially more robust than is typical and no parallel can be cited for the form. In some ways it invites comparison with the larger thick iron leg rings found associated with

two burials elsewhere in the Upper Walbrook cemetery (Harward et al 2015, 144–145, Bu30 fig 108, F<4> and ibid, 148–149, Bu 73, fig 115, B<30>), one of whom was identified as a probable adult male aged 18–25, and those from the Driffield Terrace cemetery in York (unpub; Wardle pers. comm.) worn by a male of c 26–35 years.

The second object from the Crossrail site which might be tangentially linked to dress accessories is a genuine example of a fetter/ shackle of Manning (1985) type 7 <1040>, [6582] but this does not come from a burial.

Toilet and tool assemblages

The toilet assemblage is quite small and mostly comprises common types including copper-alloy undecorated and decorated scoop ligulae and rectangular mirror plate fragments. A fragment of antler comb <1860> is probably Roman, but is only a small tooth plate fragment and could be of later date. Also of relevance, however, are two reworked/ ground glass palettes and a group of unguent bottles discussed with the rest of the glass assemblage below.

The site has produced a diverse assemblage of tools and industrial waste representing metal, wood, textile and perhaps leather working. A close examination of site contexts may help to determine whether all this material is dumped from within the city or whether any of these industries were being practised in the extra-mural area. More enigmatic but of particular interest and requiring more research are: a very unusual double-ended tool perhaps for leather working <2387>, possible fragments from a Bugelzange arm <2276> (see Humphreys and Marshall 2015) and a spear-shaped spatula <2405>.

Writing equipment

The site has a relatively large assemblage of writing equipment, although the importance of waterlogged conditions to the preservation of such material must be remembered when assessing its significance and comparing it to other sites. The 18 styli from the site would have been used with wood and wax writing tablets of which there are five fragments, none with legible text. This styli assemblage includes a number of decorated examples, many with long points and wide collars, which are features often found on 2nd-/ 3rd-century styli. Amongst these is <1293>, an exceptional copper-alloy stylus with inlaid bands in silver and a different copper-alloy of contrasting colour.

Some of the knives from the site may also have been used as writing equipment, for sharpening pens, and the best candidate is a highly elaborate example with a zoomorphic terminal <2317>, [6580]. The site also produced a single 2nd-century leaf-shaped seal box base <1299>, as Andrews (2012) type P3, but it is increasingly clear that not all seal boxes were used to seal writing tablets, some being used to seal other private or valuable containers.

Transport

The most important single element of the assemblage is the large group of at least 17 hipposandals, a form of temporary horse shoe, many of which are substantially complete and some of which have been found in direct association with Roman road surfaces or the adjacent roadside ditches. Several smaller iron fragments from the site may later be demonstrated to be hipposandals after cleaning. Previous work has begun to show a clear concentration of this class of artefact in the Upper Walbrook valley (Harward et al 2015, 84, fig 57). Taken together with other hipposandals from the immediate vicinity, now in the Museum of London, these represent the largest site assemblage from Roman Britain and are probably amongst the largest in the Roman world.

Two terrets, <1338>, [6726] and <380>, [1091], are vehicle rein rings. These are not common finds from Roman London and their interest is enhanced by their possible association with the extra-mural road and the iron hipposandal assemblage. Complementary

stratigraphic evidence in terms of the road and its ditches and other evidence such as horse burials found nearby (ibid) provide an important opportunity to fully contextualise and characterise this concentration of transport equipment and better understand how these objects were used and how they entered the archaeological record.

Two large iron buckles, if they are indeed Roman, are also perhaps related to horse harnesses, while two ox goads might also be associated with the movement of either draught animals or livestock. An equine connection could also be argued for the single overtly military find from the site, which is a large spearhead with a blade measuring 123mm long by c 33mm wide and the well-defined tip characteristic of Manning type 4 <1013> [2069]. At least one example of this type, an inscribed weapon from Newstead belonged to a cavalry unit, and the size and shape would be appropriate for a lance (Manning 2006).

Miscellaneous items

The other groups of material from the site are smaller and less coherent but include gaming equipment (bone counters of Greep types 1, 2 and 3 and reworked pottery roundels) and a fairly diverse group of more domestic objects including three spoons (various 2nd century or later types), two stone mortars, a bone cylindrical hinge segment, three lamps (two open lamps and a factory lamp stamped [EVCA]RPIVS), two imported lava querns fragments and part of a wooden barrel stave broken across the bung hole <2553>.

The more miscellaneous material from the site includes a large number of structural fittings, rings, chain and fragments of metal sheet and bar. However, there are some objects of greater individual interest: a phallic belt mount <1041>, [+]; an enamelled strip mount with a reserved metal foliate scroll <2800>, [8326] probably of 2nd- or 3rd-century date; a circular decorated lead panel with wave scroll decoration <2143>, [6582], stylistically related to the decoration of some Late Roman pewter vessels and probably a mount or applique from a larger object, and an iron square sectioned 'pin' or 'skewer' with an expanded semi-circular / peltate head <1070>, of a type which can be paralleled in the MoL core collections. This item is rare elsewhere and its function is uncertain, but somewhat resembles the larger iron 'spits' from Moorgate (Wheeler 1930, pl XLIX).

Roman finds tabulation

Table 8 *Quantification of Roman registered finds by object and material type excluding glass, coins, building material and ceramic vessels (continues on next page)*

Function	Object	Bone	Ceramic	Composite	Copper-alloy	Iron	Lead	Stone	Wood	Total
Dress	Bracelet				6					6
Dress	Brooch				6	1				7
Dress?	Buckle					2				2
Dress	Finger-ring					1				1
Dress	'Shackles'					2				2
Dress	Pin	15			4					19
Dress	Shoe					1				15
Toilet	Comb	1								1
Toilet	Ligula				4					4
Toilet	Mirror				2					2
Gaming	Counter	8	4							12
Domestic	Barrel								1	1
Domestic	Lamp		3							3
Domestic	Mortar							2		2
Domestic	Quern							2		2
Domestic	Spoon				2		1			3
Security	Key				1	5				6
Security	Latch lifter					1				1

Function	Object	Bone	Ceramic	Composite	Copper-alloy	Iron	Lead	Stone	Wood	Total
Security	Lock				1					1
Transport & animal	Hipposandal					17				17
Transport & animal	Ox-goad					2				2
Transport & animal	Terret				2					2
Religious	Figurine		1							1
Writing?	Seal box				1					1
Writing	Stylus				1	17				18
Writing	Writing tablet								5	5
Military	Spear					1				1
Craft & industry	Awl					1				1
Craft & industry	Crucible		1							1
Craft & industry	Drill					1				1
Craft & industry	Hammer					1				1
Craft & industry	Hone							4		4
Craft & industry	Knife					7				7
Craft & industry	Needle	8			3	2				13
Craft & industry	Punch					1				1
Craft & industry	Saw					1				1
Craft & industry	Shears					2				2
Craft & industry	Other Tool or Tool?					11				11
Craft & industry	Waste				4		24			28
Misc	Chain				2	1				3
Misc	Collar				1					1
Misc	Disc					1				1
Misc	Double-spiked loop					3				3
Misc	Ferrule				1	1				2
Misc	Handle			1						1
Misc	Hinge	1			1	4				6
Misc	Hook				1					1
Misc	Mount				10	13	1			24
Misc	Nail			1	1	6				8
Misc	Net sinker?						1			1
Misc	Plug						1			1
Misc	Ring				5	8				13
Misc	Rivet					1	2			3
Misc	Skewer?					1				1
Misc	Staple					4				4
Misc	Stud			1	10					11
Misc	T-clamp					2				2
Misc	Water pipe collar					2				2

Function	Object	Bone	Ceramic	Composite	Copper-alloy	Iron	Lead	Stone	Wood	Total
Misc	Weight				1		1			2
Unknown	Sheet, bar and unidentified	6			17	35	16		3	78
Total		39	9	3	87	159	47	8	9	361

Assessment level work outstanding

Table 9 Roman objects that could not be accessed during assessment and still require cataloguing

Acc no	Context	Material	Object
2700	8325	COMP	HAND
1316	2073	COPP	CHAI
1012	2071	IRON	HIPP
1053	6609	IRON	STYL

List of objects for investigative conservation

Objects requiring conservation are noted on the MOLA database and lists have been submitted to conservation

48 iron objects

5 lead objects

19 copper-alloy objects

1 composite object

1 bone object

5.7 The Roman glass

Michael Marshall

Introduction

In total, 92 accessions/ 103 sherds of Roman glass were recovered summarised by colour and form below in Table 10 and Table 11. Common / utilitarian naturally coloured glass vessels dominate. The strongly coloured glass vessels diagnostic of the mid-1st century AD are all but absent and colourless glass, often used for high quality vessels, is very rare. No pieces of late Roman green glass have been identified.

Most of the assemblage is likely to date to the 2nd century AD as, while the range of forms are generally of mid- 1st–late 2nd century date, diagnostic common 1st century forms, such as cast ribbed bowls (Isings 3) and Hofheim cups (Isings 12) are absent. Only one sherd can be proposed to belong to a later vessel, a naturally coloured fire rounded rim from a small example of a later 2nd to mid-3rd century cylindrical cup (probably as Isings 51).

Amongst identifiable vessel forms mould blown prismatic bottles predominate and include both square and cylindrical forms (Isings 50 and 51), but with no complete profiles, relatively few complete/ measurable elements and only a couple of partial base designs. Jugs are represented by six finds, mostly handle fragment with one jug / flask / bottle folded in rim. Jars are rare but along with two forms with flaring / turned out and rolled in rims is one large jar with a horizontal rim <2183>, [6856] which is of a form frequently used for cinerary urns although it is at the bottom end of the typical size range. Bowls are represented by a tiny opaque turquoise rim sherd probably a residual 1st-century cast form <2206>, [6764] and

tubular and applied base rings from uncertain forms which could date from the mid-1st to 3rd century. The sole cup is a middle Roman form as noted above.

The number of phials/ unguent bottles represented in the assemblage is fairly high and includes body fragments from tubular form (Isings 8) and flared out/ rolled in rims which could come from a variety of types. Unguent bottles are common finds from cemeteries and as such the number here may be significant but none are particularly well preserved or conversely burnt to indicate obvious grave or pyre goods. The most unusual exceptional elements of the assemblage are two fragments from discs made from reworked glass with smoothed edges <2202>, [6771] and <3017>, [8381]. These are probably palettes for mixing medicines or cosmetics.

Table 10 Roman glass assemblage by colour

Colour	Fragment	Accession
BLUE	1	1
COL	6	6
NGB	95	84
TURQ	1	1
Grand Total	103	92

Table 11 Roman glass assemblage by form

FORM	Accessions
BEAD	1
Bottle	21
Bowl	3
Cup	1
Jar	3
Jug	6
Jug or jar	2
Palette	2
Phial	8
Vessel (undiagnostic)	38
Window	7
Grand Total	92

Provenance of objects

The finds assemblage comes from a variety of context type including dumps and levelling deposits adjacent to the Walbrook stream, road surfaces and roadside ditches and burial contexts. In most instances detailed stratigraphic information for individual finds is not yet available but will be consulted during analysis.

5.8 Coins

Julian Bowsher

Introduction and methodology

The coins and tokens have been processed in accordance with MOLA procedures, with the occasional aid of X-radiographs. Details of the objects – some preliminary – are held on the MOLA Oracle database. A draft archive catalogue of the coins and tokens prepared during the course of assessment will assist future study and form the basis of the final catalogues.

There are three silver Roman coins; a further 13 are silver-plated counterfeits. The coins range from 1st century AD to the 4th century AD. To date the following categories comprises one Roman medallion, 83 Roman coins, and 22 uncertain Roman coins. Although a number remain illegible, there are a few that remain to be identified. The general condition is poor, though for the Roman coins 83 (78%) can be identified into Reece Coin Periods (see

below) with the remaining 23 only broadly dated within centuries. In the following assessment report the finds are firstly discussed by period.

Medallion

Accession number <2640> represents a Roman medallion of the emperor Phillip I (Arabicus), issued to selected recipients for the New Year celebrations in AD 245. Medallions like this are very rare and this piece is the first found in any London excavation. In provincial terms, it may have a military link but this needs further exploration. Of the few types issued by Phillip, an earlier example of this particular model was found in Rome in 1896: this is only the second to be found anywhere in Europe.

The medallion was found in a patch of gravel [8325] next to the Roman road, almost at the top of the Roman stratigraphic sequence. Other numismatic items found within this context included two sestertii of Hadrian (<2635>, <2636>) two counterfeit denarii of Severus Alexander (<2653>, <2658>) and a radiate of Gordian III (<2637>), as well as a (Roman) lead weight and an unidentified piece of metal that is not a coin. The Hadrianic coins pre-date the medallion by c 100 years, although the coins of Alexander and Gordian are roughly contemporary. Research into this object is an important piece of work to be undertaken before publication.

Coins

The Roman monetary system inaugurated by the first emperor Augustus defined a number of denominations (Table 12; Table 13). An *aureus* is gold and a *denarius* is silver with the rest being *aes* (copper-alloys), although *sestertii* and *dupondii* are regarded as higher denomination bronze. This system broke down in the mid- 3rd century and common *aes* coins are defined from c AD 260 as ‘radiates’ and from the early 4th century as ‘*nummi*’. There are, however, numerous contemporary counterfeit coins that are described as ‘irregular’, where the name of the emperor (if identified) is listed in brackets.

Table 12 The Roman monetary system, 27 BC – c AD 260.

	Aureus	Denarius	Sestertius	Dupondius	As	semis	Quadrans
Aureus	1=	25	100	200	400	800	1600
Denarius		1=	4	8	16	32	64
Sestertius			1=	2	4	8	16
Dupondius				1=	2	4	8
As					1=	2	4
Semis						1=	2
Quadrans							1

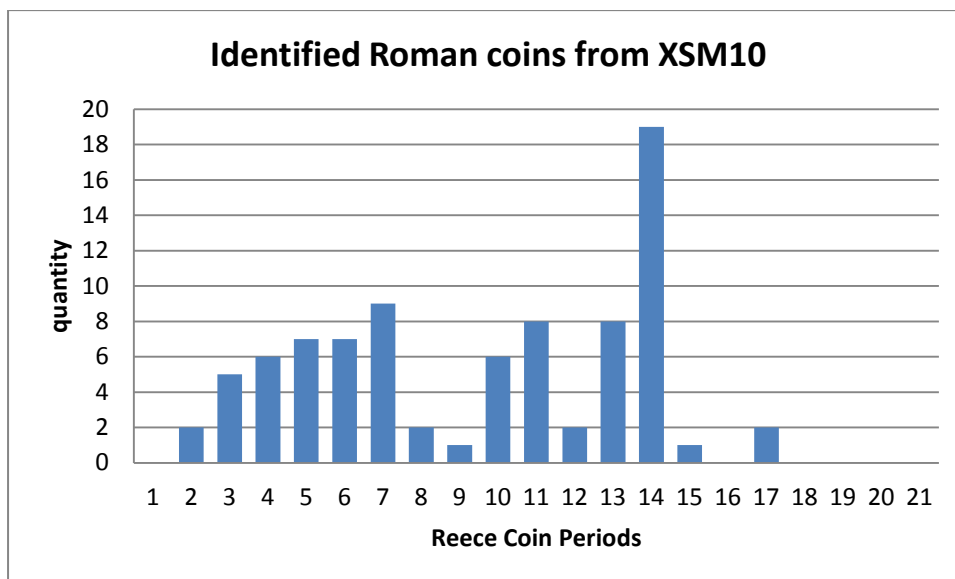
The Roman coins range between the AD 40s to the early 4th century which are divided into the standard ‘Reece Coin Periods’ (RCP) (Reece 1991; 1995) (Fig 1; Table 13). The 1st-century coins (RCP 2–4) from XSM10 are all quite worn coins of Claudius, Nero and Vespasian. Those of Trajan (RCP 5) are only slightly less worn. This would suggest that the coins had been in circulation for some time and that we do not necessarily have proof of 1st century occupation. Nevertheless, the coins of Claudius and Nero particularly are unlikely to have circulated into the 2nd century – though they may well have been discarded by that date.

The most commonly found 1st-century coins tend to be lower denomination *aes*. From the 2nd century price rises led to the reduction of small denominations in circulation. The seven slightly less worn coins of Trajan (RCP 5) include two sestertii. Higher *aes* denominations, 6 out of 7, are more prominent under Hadrian (and Sabina; RCP 6) but this drops to 3/ 9 of the Antonine issues (RCP 7). It might be noted that the dupondius of Antoninus <1233> is a rarity. The relatively high number of 2nd-century coins from this site (Table 13) is slightly uncommon, to London and the country as a whole, although it drops under Marcus Aurelius (RCP 8) and Commodus (RCP 9).

Table 13 Reece Coin Periods by date

Reece Coin Period	Date	Quantity
1	Up to AD 43	0
2	AD 43–54	2
3	AD 54–68	5
4	AD 69–96	6
5	AD 96–117	7
6	AD 117–138	7
7	AD 138–161	9
8	AD 161–180	2
9	AD 180–192	1
10	AD 193–222	5
11	AD 223–238	9
12	AD 238–259	1
13	AD 259–275	6
14	AD 275–296	20
15	AD 296–317	1
16	AD 317–330	0
17	AD 330–348	2
18	AD 348–364	0
19	AD 364–378	0
20	AD 378–388	0
21	AD 388–402	0
unident		23
total		106

Fig 1 The identified Roman coins from XSM10 (histogram)



In the early Severan period (RCP 10), there is an increase in the use of silver – mostly irregular *denarii*. Under Severus Alexander (RCP 11), this is more pronounced, with one regular and six irregular *denarii*, and is a common feature on many London sites. The relatively rarely found coin of Gordian II (RCP 12) is, however, the bronze core of a silver-plated radiate. After about AD 260, there was severe inflation which saw the profusion of copies, generally known as ‘barbarous radiates’. Here, however, RCP 13 has produced a slightly higher ratio of regular coin to the succeeding RCP 14. The histogram peak for RCP 14 is common to the rest of the country, but here it includes five coins of the break-away ‘Britannic Empire’ ruled by Carausius and then Allectus (AD 287–96). There are seldom coins from RCP 15 in London though this example of Licinius I is a common type. There is normally a large histogram peak for RCP 17, but there are only two common copies here

and none of the plentiful issues of RCP 18 and 19, suggesting a fall in coin loss and perhaps usage of the site. The ‘uncertain’ Roman coins suggests a similar pattern, with about half probably dating to the 1st/ 2nd centuries and the other half from the late 3rd to mid- 4th centuries. Comparative analysis to the stratigraphic profile may enhance our understanding of early monetary use at the site. Context will be also studied to determine types of deposition, such as burial association.

5.9 The leather and textiles

Beth Richardson

Introduction/methodology

Ten crates of bagged accessioned and bulk leather from XSM10 Areas 1, 2/3 and 5 were examined while the leather was wet (before conservation). The leather was recorded on paper by context. Most of it is bulk leather (Roman sole fragments), but there are also 14 accessioned items (complete Roman soles). There is an estimated four boxes of Roman nailed and sewn sandal soles, most of which are fragmentary, but include accessioned complete soles and upper fragments. There is one accessioned piece of textile that is possibly Roman; this is currently in conservation and not available for specialist assessment within the project timeframe. This material will be dealt with during the analysis phase.

Leather

The Roman leather consists of sewn and nailed soles from sandals and boots. They appear to be 1st- or 2nd-century in date, with no obvious examples of the wider-toed men’s sandals of the late 2nd-century onwards. A small proportion of the sandals are shaped at the front to show two or more toes (eg <490> [1373]). There is also one possible sandal strap (not seen); <230>, [714]. The majority are fragmentary. Attribution of footwear to military or civilian groups on the basis of their style can only be made where the uppers survive.

Provenance of objects

The Roman shoes are all from Roman layers, probably formed mostly by natural aggradation, although some dumping may have occurred. They are also from pits eg [6795], the fill of a Roman charnel/ rubbish pit [6794].

No leather was recovered from LSS05, XSL10 or XTB12.

5.10 The iron-working remains

Matt Phelps

Table 14 Iron working remains sorted by type and period. Weight in grams.

	Undiag	SHB	VHL	Cinder	Total
Roman: AD 60–200	1129	1899	397	0	3425
Roman: AD 250–400	503	390	55	0	948
Post-medieval: 1500–1800	209	226	0	100	535
Total	1841	2515	452	100	4908

Undiag = Undiagnostic Fe slag; SHB = smithing hearth bottom;
 VHL = vitrified hearth lining

XSM10 yielded small quantities of iron working remains amounting to almost 5 kg. A number of smithing hearth bottoms (SHB) pointed to smithing activities during the early Roman period, although no *in situ* evidence was found. The remains were assessed using visual analysis based on colour, texture and morphology, as well as density and magnetic

susceptibility, with the aim of identifying the metal-working processes occurring on site. The material sorted by type and period is given in Table 14, while a full sample catalogue is presented in Table 15.

Roman (AD 60–200)

The great majority of the identified iron working remains came from contexts dated to 2nd century. This included 1129g of undiagnostic iron working slag, and 1899g of SHB, mainly from two contexts; dump [6751], which included undiagnostic iron slag and all the identified vitrified ceramic hearth lining, and waterlain clay [6822], with undiagnostic Fe slag and a partial fragment of a SHB (543g). A further five smithing hearth bottoms were found in pit backfill [6565], levelling layer [6772], ditch fill [6787], clay deposit [6834] and organic and clay layer [6856]. These averaged 317g in weight, and 9 by 8cm across and 4cm thickness, although some are likely to be partial fragments. These fragments provide evidence for smithing. The contexts were mainly dumps or ditches, with no evidence for in situ working; in addition, no hammerscale was presented for assessment.

Roman (AD 250–400)

Lesser quantities of material were from contexts dated to the 3rd and 4th centuries, the vast majority from [6777], a sandy clay deposit, which contained three fragments of VHL (55g), a single smithing hearth bottom (390g), and eight pieces of undiagnostic iron slag (408g), some with adhering flake hammerscale. Small amounts of undiagnostic Fe slag were also recovered from [6587] and [6716]. This material was likely to have been dumped or transported from elsewhere.

Table 15 *Slag/metalworking debris samples*

Context	Quantity	Weight (g)	Material	Description (measurements in cm)
Roman 60-200AD				
6565	1	264	SHB?	8 by 9.5 and 5 deep
6751	3	397	vitrified hearth lining	adhering Fe slag and charcoal fragments
6751	4	448	undiag Fe slag	embedded charcoal
6772	1	336	SBH?	9 by 9 by 3.5 deep
6787	1	150	small SHB	partial fragment? Iron off-cut in centre and embedded charcoal fragments; 7 by 7 by 3 deep
6822	1	543	SHB	partial fragment; 11 by 7.5 and 4 deep
6822	2	620	undiag Fe slag	
6834	1	263	SHB	corroded iron off-cut in centre; 8.5 by 8.5 and 4.5 deep
6834	1	61	undiag Fe slag	
6856	1	343	SHB	dense; 10 by 8 by 3 deep
Late Roman 250-400AD				
6587	2	36	undiag Fe slag	
6716	1	59	undiag Fe slag	
6777	3	55	vitrified hearth lining	With adhering black Fe slag
6777	1	390	SHB?	slightly rounded base with adhering charcoal fragments; 9 by 7.5, by 5.5 deep
6777	8	408	undiag Fe slag	adhering flake hammerscale
Post-medieval 1500-1800AD				
3010	1	83	undiag Fe slag	black, quite glassy
3023	1	34	undiag Fe slag	siliceous, glassy, embedded fragment of coal
3849	13	100	cinder	low density vitrified ceramic. Unknown high temperature process
6637	1	226	SHB fragment?	partial fragment?; black, high density; 9 X 7 X 4 deep
6637	1	92	undiag Fe slag	

5.11 Ancient woodwork

Damian Goodburn

Introduction/methodology

Detailed timber records were made on site following established procedures laid down in the MoL Excavation Manual which is in-line with the procedures laid out in the English Heritage Guidelines on Waterlogged Wood (Spence, 1990; Brunning, 1996). This section summarises the species range, methods of working and likely function of the recorded timber.

General range of woodwork found

The excavated woodwork summarized in this section includes structural items, such as posts and stakes and small woodwork found in deposits, including some small objects and diagnostic woodwork debris.

Species ID

Nearly all timber was identified during excavation as either oak or elm. Two species ID samples were taken from two smaller roundwood elements that could not be visually identified.

Dating

Following recording, seven oak timbers were sub-selected as suitable (50+ annual rings) for tree-ring analysis and slice sampled: four of these have provided dates (Table 16; Tyers, 2014). Three C14 samples from items with inadequate ring-count for dendrochronology were taken for possible future scientific dating.

Table 16 Seven oak (*Quercus spp.*) samples from XSM10: interpretations using a 10-46 ring sapwood estimate (after Tyers 2014; table 1).

Sample	Size (mm)	Rings	Sap	Date of measured sequence	Interpreted result
1423_1	155 x 5	93	2	3BC–AD90	AD98–134
1423_2	95 x 5	72	10	AD28–AD99	AD99–135
1423_4	170 x 5	120	4	undated	–
1428_5	165 x 5	120	16	undated	–
1428_6	165 x 5	127	14	17BC–AD110	AD110–142
1428_7	135 x 10	89	10	AD18–AD106	AD106–142
1295	125 x 110	86	11	undated	-

Timber structures and diagnostic items

Possible wattle fence remains

An alignment of three, closely-spaced stakes ([1338], [1339], [1340]) beneath the primary Roman road represent the lower parts of a wattle fence – rather than, for example, stakes marking out the line of the road which would not need to have been set closely. All were split, or ‘cleft’ out of small oak logs or ‘poles’. They were either quarter or 1/8th sections up to 75mm across and survived up to a maximum of 0.52m high, in the case of stake [1340]. The tips were axe-cut to a scalloped multi-faceted point. Though the wood-working technique was not intrinsically diagnostic of date, ‘rustic’ oak cleft stakes of this style are commonly found on waterlogged Roman period sites in London and its wider hinterland, particularly those of early date (eg Bryan et al for the Bloomberg London site).

At <c 23 annual rings they were not viable for tree-ring dating, but a C14 sample of stake [1340] was taken. A very similar and adjacent small cleft oak stake [1092] may be associated with the group of three.

Re-used gates

A timber platform – [1423] and [1428] – laid on marginal ground at the western end of the site was formed from two, lightly boarded and virtually identical gates or doors. These are very rare artefacts. The better-preserved gate [1428] survived to its full width of 0.95m and probably close to its original height of 1.75m. The cladding consisted of seven boards of very finely cleft oak, such as were typically used in pale fencing in Roman London. The boards used on both gates were between 160 and 175mm wide but only 7–9mm thick and must have been fine 1/128th cleft sections. Their manufacture would have required a skilled craftsman using specialist tools, a splitting tool or ‘fro’ and holding device or ‘break’. The oak frame of gate [1428] was slightly more robust and much better preserved than that of its twin, and included a main upright post 110mm wide by 45mm thick and three lap jointed cross pieces, secured by iron nails. The cross pieces were also lap jointed and nailed into a lighter upright on the other side of the gate. The height measurement for gate [1428] includes a wooden horn like projection on the main gate-frame upright. This was part of a simple wooden hinge mechanism called a ‘har hinge’ and still seen in some historic barn doors today in England. The same upright was found to have two relict joints, showing that it had been previously used twice before being incorporated into the gate (and therefore the excavated structures represented the fourth use of these timbers). Its first use was as part of a piece of joinery including carefully tenoned-in rail timbers, a broken tenon of which survived. Original joinery layout marks also survived. The lighter-framed gate [1423] was much less well-preserved but its framing included at least one cross batten of light roundwood. On both gates, the pales were set to overlap slightly and were lightly secured with small iron nails through that overlap.

The use of second-hand and light components suggests that these gates were built with whatever was to hand and not designed to last very long. Very few Roman period gates or doors have been found in Britannia as a whole (a slightly heavier gate from Vindolanda is not published in detail, Birley, 1977, 41) though in London the remains of two more heavily-built, domestic-style, board and batten doors have been found, also boarded with cleft oak, at No1 Poultry and Drapers Gardens sites (Goodburn and Goffin et al 2011, 424, Butler and Ridgeway 2009, 11) and smaller sections of two more elaborate panelled doors have been, including very recently on the Bloomberg London site (Bryan et al, in prep).

Truncated remains of light roundwood structures built along ditch edges

The remains of Roman period wooden structures principally comprised the tips of driven stakes (probable fence lines) and displaced small timbers that were probably also once stakes or fencing timber. These were localised remnants of what would once have been much more extensive fences.

The stake tips recorded briefly on-site and examples recorded off-site appeared to be mainly, if not entirely, Roundwood. Diameters generally lay in the range of 60mm ([6604]) – 80mm ([6600]). These examples had tips formed by four axe-cut four facets. These items were found along the edge of E–W ditch cut [6610]. A group of three small timbers, [6603], were also found in the fill of that ditch and appeared to have fallen into it, possibly on the demolition of a nearby fence. The largest and best preserved was cleaned and recorded off-site and found to have been of oak roundwood surviving c 1.11m long by 80mm and had traces of an eroded tip at one end.

Evidence of deliberately planted small trees along a ditch edge

Unusually clear traces of small trees of Roman date – possibly deliberately planted along a ditch edge – were also found *in situ*.

The remains of seven small tree stumps were found *in situ*, fairly evenly spaced along the edge of an E–W Roman ditch. Several of the stumps were lifted for closer study and sampling off-site. The largest diameter tree stump ([6733]) had a diameter of 100mm and a (damaged) height of c 0.27m whilst the smallest ([6735]) was 65mm in diameter and extant (damaged) to 0.22m high. The survival of actual tree stumps *in situ* from the Roman period is very rare, but not totally unknown, and provides an unusual opportunity for the reconstruction of the living landscape. The small diameter of the trees indicates that they were under c 15 years old.

A small double-grooved timber fragment clearly resembling a window glazing bar

A finely-worked timber, carefully planed to an octagonal section from a small section of conifer timber, was excavated from Roman ditch fill [6745]. It survived 85mm long by 16mm diameter. Two fine rectangular grooves c 2–3mm wide had been planed into two opposing faces and is likely to be a glazing bar. One end was broken and the other bore the abraded remains of what appeared to be a joint. Two other London sites have produced broadly similar fragments of Roman conifer timber glazing bars (Angel Court – ACW74; Bloomberg London – BZY10; Bryan et al in prep) as has *Vindonissa*, Switzerland (M Marshall pers comm).

5.12 The plant remains

Karen Stewart and Anne Davis

Introduction/Methodology

A total of 169 environmental samples, ranging from five to 40 litres in volume, were taken during the excavation at Broadgate. They represent a variety of context types and periods, from prehistoric waterlain deposits to post-medieval garden features.

The samples were processed by flotation, using meshes of 0.25mm and 1.00mm to catch the flots and residue respectively. The residues from flotation were dried, and sorted by eye for any finds or environmental material, and any flots which contained waterlogged organic material were stored in water. All other flots were dried and then scanned briefly, using a low-powered binocular microscope. Many of the flots were very large and sub-samples of c 100 ml were assessed in these cases. The abundance, diversity and general character of the plant, animal and artefactual remains present within the samples were recorded on the MOLA Oracle database, and the botanical information is summarised below in *Table 6*.

Plant remains were preserved primarily by waterlogging, with some preservation by charring and mineralisation. The results have been separated by period, to either Roman or post-Roman, but in some cases these are preliminary phasings and may change in the later stages of analysis. Results from previous phases of assessment work have been included in this report and are tabulated below at Appendix 2.

Charred remains

Occasional fragments of wood charcoal were present in around two thirds of the samples, but generally in very low amounts. Charcoal was recorded as abundant in only one sample, <338> from [6710], where the charcoal was recorded in large fragments, and of a non-oak type. Charred grains were occasionally noted in three samples, but in none of these was more than five grains counted.

Waterlogged and mineralised remains

Waterlogged seeds and other waterlogged plant remains were recorded as abundant in over half of the 77 samples dating to the Roman period. Preservation of organic remains was good or excellent in many of the samples with, in many cases, leaves, buds, and other plant parts surviving in addition to large assemblages of seeds and fruits.

Wetland and stream assemblages were particularly well represented, with taxa such as gypsy wort (*Lycopus europaeus*), celery-leaved crowfoot (*Ranunculus sceleratus*) and water-plantain (*Alisma* spp.) very common, particularly in the ditch and other channel fill samples. Dry ground plants were also recorded and in most cases are likely to represent wild plants growing on waste land near the sites. In some cases these are likely to represent deliberate planting, however, as in the case of box (*Buxus sempervirens*). Although leaves from this plant were actually present in {47} [1036], which was the primary fill of the 'deep ditch' dating to the late medieval period (see MOLA XSM10 PXA02), it is thought much more likely that they would have originated in a Roman context, disturbed when the ditch was first dug.

Food remains were also recorded, with plums (*Prunus domestica*), cherries (*Prunus avium/cerasus*), fig (*Ficus carica*) and mulberry (*Morus nigra*) all recorded. Olive was also recorded in the same sample as the box, {47} [1036], again thought much more likely to have belonged, in the first instance, to a Roman deposit.

Mineralised seeds were recorded in just one sample – {425} [6741]. These were a mix of food plants such as fig (*Ficus carica*) and mulberry (*Morus nigra*) and wild wetland taxa such as celery-leaved crowfoot (*Ranunculus sceleratus*). This material is most likely to represent cess material.

Faunal remains

Freshwater molluscs were very common in the samples taken from the site, occurring in almost all of the samples. In most cases these were in low to moderate numbers, but occasional samples with abundant molluscs were noted.

Animal bones were also common from the samples at the site, again mostly in low numbers. Mammal, bird and fish bones were all recorded. All animal bones from sampling are assessed in the animal bone assessment report (5.14).

Fragments of beetle exoskeleton occurred frequently in the samples. In most cases these were in low to moderate numbers. Larval cases of caddis fly (Trichoptera) and leech eggs were also recorded in a number of samples, both of which are good indicators of wet habitats.

5.13 The human bone

Don Walker

Introduction

Work on Roman period human bone from phases of work at Broadgate Ticket Hall previous to 2015 has been reported separately (MOLA 2015b; 2015c), but will be integrated into the future analysis and publication programme.

Eight articulated burials and 73 deposits of disarticulated bone were recovered from the most recent phase of fieldwork in 2015, the majority coming from Areas 2/3. Three of the articulated inhumations had evidence of decapitation, a practice which has been observed at other Roman burial grounds. A large assemblage of disarticulated bone included a number of crania within the fill of a roadside ditch, as well as discrete deposits of bone within the area to the south of the road.

Methods

The articulated inhumations were assessed using MOLA standard procedures and recorded onto Excel sheets and prior to being uploaded onto an Oracle 9i (v9.2.0) relational database system. Numeric coding was used to assign age and sex to each individual (Table 17). Preservation was estimated on a three-point scale from good to poor. Completeness was calculated in 5% increments from (5-95%) based on the following proportions: skull 20%, legs and feet 20%, arms and hands 20%, torso and pelvis 40%. A summary catalogue was produced characterising the presence/absence and condition of the skull, and the presence/absence of the dentition, torso and pelvis, and legs, feet, arms and hands by number present. Subadult age was estimated from the eruption of the permanent molars. Where such indicators were absent, individuals were simply recorded as 'subadult'. Adult sex was estimated from rapid visual assessment of the morphology of the pelvis and skull (Buikstra and Ubelaker 1994) and recorded on a five-point scale as noted in Table 17.

Table 17 Demographic assessment categories

Age
Foetal/neonatal
1 month to 6 years
7–12 years
13–16 years
Adult
Subadult (age unknown)
Sex
Male
Probable male
Intermediate
Probable female
Female
Undetermined
Subadult

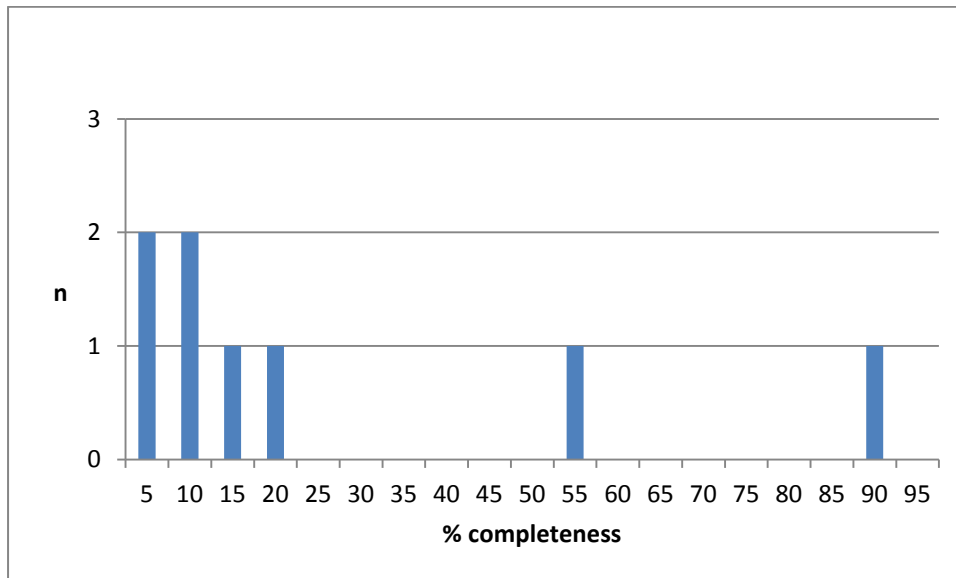
Gross pathological changes were recorded by disease category, coded according to Connell and Rauxloh (2003), with supporting summary descriptions. Intrusive human and animal bone was noted and the minimum number of individuals (MNI) for each context estimated from the maximum number of repeated elements taking age, sex and morphology into account.

The disarticulated bone was catalogued by body area and element and a minimum number of individuals estimated for each context. All results are preliminary and subject to adjustment during detailed observation for full analysis.

Condition and disturbance

The bone of three of the articulated burials was well preserved. However, the majority (five) were poorly preserved. The percentage completeness was variable, with most burials suffering disturbance through intrusion by later burials or modern truncation (Fig 2). Only one individual ([6840]) was recovered largely complete.

Fig 2 Percentage completeness of articulated burials (n=8) (histogram)



Minimum number of individuals (MNI)

At assessment there were a minimum number of eight articulated individuals. However, this may change at analysis if elements from separate contexts can be matched to the same individuals. The disarticulated bone represents an overall MNI of 33.

Results

Articulated burials

All eight articulated contexts contained adult individuals: only two were sufficiently complete to allow estimates of biological sex. Individual [6840] was female and individual [6853] male.

Adult female [6840] was buried in a west-north-west to east-south-east aligned grave (feet pointing east-south-east) in the northern half of Area 2, parallel to the Roman road and ditches just to the north. The burial was supine and extended but was unusual in that the skull was located between the knees, sat in an upright position facing towards the upper body. The grave cut did not appear to allow sufficient room for a skull placed in normal anatomical position, suggesting the head was separated prior to burial. At least two sharp peri-mortem cut marks were evident in the cervical spine, one affecting the fifth and sixth vertebrae and one the sixth and seventh vertebrae. There was also a cut through the spinous process of fourth vertebra. The evidence suggests that the individual was decapitated and that this may have been the cause of death. Vertebral joint disease was present in the lumbar spine, in the form of osteophytes and Schmorl's nodes.

Robust young adult [6844] was orientated north-north-east to south-south-west (parallel to the Walbrook, perpendicular to the road and its ditches) and lay in the southern half of Area 2. The skeleton was supine and extended, although the legs and right arm had been truncated by a Victorian sewer. The skull was absent and there was little space between the top of the neck and the cut at the top end of the grave. A sharp peri-mortem cut was observed through the fifth and sixth cervical vertebrae. Again, this is indicative of decapitation around the time of death.

Context [6846] lay below [6844] and was also truncated by the sewer, although it was orientated in the opposite alignment. It consisted of an articulated adult leg and foot, possibly belonging to the same individual as articulated foot [6852]. Context [6847], a pair of articulated legs and feet, lay below [6846] and on the same alignment. It was also truncated by the sewer. There was no conclusive archaeological evidence to say whether these three

burials were contemporaneous. The accuracy of superimposition and lack of inter-cutting, however, albeit with contrary orientation, favours a stack of interments made at the same time within the same grave.

Also in the southern half of Area 2/3, and on the same south-south-west to north-north-east alignment as [6846] / [6852] and [6847], was adult male burial [6853], truncated at the head and feet by two separate Victorian sewers. Despite this disturbance, the majority of the skeleton survived and was selected for full recording in advance of the assessment report. The burial was supine and extended with the torso twisted slightly to the right side and both hands on the right side of the vertebral column. The right arm was flexed with the hand near the shoulder and on the wrist was a large iron ring <1142>.

Although the cranium was not present, probably having been disturbed by the construction of the sewer, the mandible and associated cervical vertebrae (C3–C6) were found together and in relative anatomical position. They lay to the south of the seventh cervical vertebra and the remainder of the spine, suggesting that they had either been disturbed by the sewer or placed in a different part of the grave during burial. On inspection, at least two peri-mortem cut marks, which probably resulted in decapitation, were found in the sixth and seventh cervical vertebrae and first thoracic vertebra. Healed periosteal lesions were observed in the right lower leg and severe carious lesions in the dentition.

Table 18 A summary table of articulated burials.

Context	Condition	% complete	Skull	Dentition	Torso	Pelvis	Legs	Feet	Arms	Hands	Age	Sex	Pathology	MNI	Comments
6840	1	90	1	1	1	1	2	1	1	2	Adult	Female	Peri-mortem decapitation. Vertebral joint disease.	2	Skull between legs. Adhering Fe frags. Black & orange/yellow staining. Intrusive proximal hand phalanges.
6844	1	15	0	0	1	0	0	0	2	2	Adult	-	Peri-mortem decapitation	2	Intrusive proximal foot phalanges
6846	2	5	0	0	0	0	1	1	0	0	Adult	-	None	1	Below [6844]. May belong to [6852].
6847	2	10	0	0	0	0	2	2	0	0	Adult	-	None	1	Below [6844]
6852	2	5	0	0	0	0	0	1	0	0	Adult	-	None	1	Below [6844]. May belong to [6846].
6853	1	55	0	0	1	1	2	0	2	2	Adult	Male	Peri-mortem decapitation, periostitis, dental caries	1	Iron ring <1142> on right wrist.
6860	2	20	1	1	0	1	1	0	1	1	Adult	-	Dental caries, antemortem tooth loss	1	Below [6853]
6866	2	10	0	0	0	0	0	0	1	0	Adult	-	Articulated arm	1	Articulated arm. Very polished surface.

Beneath [6853] were the truncated remains of an adult burial [6860], aligned north-north-east to south-south-west and consisting of a left forearm, hand, femur and patella. A displaced mandible with evidence of dental caries may also have been part of the same individual. As with the burial stack to the west, these burials may have been contemporaneous, within the same grave.

An articulated adult right arm [6866], aligned approximately east to west, was found in the centre of Area 2. This may have been the remains of a fully articulated burial or the secondary deposition of a disturbed limb.

Of the eight articulated contexts, one (12.5%) had periosteal lesions, one (12.5%) had vertebral joint disease and two (25%) had dental caries. There were three examples (37.5%) of peri-mortem sharp force trauma. Interestingly, only three contexts had the neck portion of the skeleton surviving, and in all three cases, lesions associated with decapitation were observed.

Disarticulated bone

Much of the disarticulated bone was recovered from the fill of a west-north-west to east-south-east aligned ditch, running parallel to the southern edge of the Roman road. Ditch [6782] contained twenty contexts of skull elements. A further two skulls were found in a continuation of the same ditch, [8447] and two other contexts, ([6747] and [8460]) may also have been associated with this ditch. The crania were generally dark brown in colour, reflecting the fill in which they were found. Some elements appeared to have polished surfaces with occasional scratch marks. A single cranium [2076] was recovered from a northern road side ditch [2072]. In total, 26 disarticulated contexts of skull elements were found in ditches running parallel to the Roman road, representing a minimum number of 24 individuals. Only adults were present, with 14 identified as male and five as female. In contrast, the ditch contained only eight contexts of post-cranial bone, representing a minimum number of two individuals, both adults. Other features which contained disarticulated human bone included possible charnel pit [6794] as well as other pits, ditches, dumps and levelling layers.

Further work on the urned cremation burial recovered in 2013 will be included within the analysis programme. A summary table of disarticulated bone can be found at Appendix 3.

Discussion

In general the interments at Broadgate Ticket Hall differ little from others uncovered on the north, west and east sides of London (Barber and Bowsher 2000; Watson 2003; Harward et al 2015; McKenzie and Thomas in prep).

The human remains also have the potential to add to the debate on Romano-British funerary practices. In this, further study will focus on two main areas:

- 1) The three decapitated burials within a formalised roadside cemetery. At least two of the severed heads were buried in the same graves as the bodies, though not in anatomical position. Although other burials were present, the head and neck areas were not preserved, preventing observation of any other possible occurrence. Initial assessment indicates that these examples of peri-mortem neck injuries were caused by very sharp bladed weapons and that at least some of the blows were delivered from behind. Excavated Roman cemeteries with evidence of decapitation are not rare and the practice has been widely debated (Harman et al 1981; Philpott 1991, 77–89; Tucker 2012). Tucker (ibid 75) counted 512 decapitated individuals from 218 Romano-British sites. Recent work focusing on the variability of irregular burials in Western Europe in the first to fifth centuries AD, sought to identify cultural processes at work through geographic and chronological classification of archaeological evidence (Milella et al 2015).

Cases of decapitation have been identified most frequently in late Romano-British rural cemeteries (Harman et al 1981; Boylston et al 2000). Although rarer, urban examples do occur (Clarke 1979; Wells 1982; Farwell and Molleson 1993). Indeed, Tucker notes a total of 156 from 57 sites, including the *coloniae* (Colchester, Gloucester, Lincoln and York) (ibid 80). Wells (ibid) reported very sharp cuts in the necks of six individuals, one of them a woman, carried out from behind. In London, a possible decapitation from the 'northern' cemetery of Roman London was found just to the west of the Crossrail excavations at Finsbury Circus (Harward et al 2015, 43). Other London examples also exist (Barber and Bowsher 2000, 89–90; Mackinder

2000, 15, 26; Watson 2003, 16; McKenzie and Thomas in prep). Interestingly, more examples of decapitation have been found in Britain than in the remainder of the Roman Empire (Tucker *ibid*, 243; Milella et al 2015).

Several different explanations for Roman period decapitations have been proposed, including execution, war trophies, human sacrifice, post-mortem punishment, showing reverence to ancestors and continuation of Iron Age head cults. It may also have been practised in order to prevent the dead returning from the grave or even to prevent, or perhaps to assist, passage to the afterlife (Tucker *ibid* 17–19). Other theories include a socio-cultural crisis in the first half of the 2nd century AD, related to stressors linked to the introduction of urbanisation at the margins of the Roman Empire, as it reached its maximum extent (Milella et al 2015).

The evidence from [6853] may represent both peri- and post-mortem activity, potentially providing clues to the processes of death and funerary ritual of this individual. Initial results from the full analysis of [6853] suggest that this adult male was alive when the neck was severed and that decapitation was therefore the cause of death. At least one of the blows was delivered from behind while the neck was flexed.

- 2) Following the 2013 excavations in the area around manhole MHS1 and the heading from MHS2-100 to Blomfield Street sewer, radiocarbon dates were taken from the teeth of four human skulls. These were discovered within layers of gravel ([1391] and [1437]) deposited during flooding events. The deposit covered two wooden gates, [1423] and [1428], dated by dendrochronology to the early 2nd century AD. The gates were laid flat, perhaps to act as a platform at the edge of the river channel. The results provided an interesting range of dates with one tooth (366571) most likely to date from the first century AD, or earlier, and another to the third century AD or later (Table 19). Further dating of bone within deposits [1391] and [1437] will enhance this work, and may also help to further define the date of construction of the Roman road running east-west across the site (broadly dated to c mid- 2nd to mid- 3rd century AD), particularly if further late dates are encountered. The modelling suggests that re-dating the same skulls will not improve the precision of the dates. However, it also shows that the samples do not come from a single period (two of the skulls are late Roman; one is no later than AD130 (when calibrated and modelled)) (MOLA 2015c; 2015d).

Table 19 C14 dating of four skulls

Lab code	Context	Notes	Material	Age BP	Cal date (2 Sigma)
366574	1437	skull 1437/1	human tooth collagen	1850 +/- 30	Cal AD 80–380
366573	1391	skull 1391/4	human tooth collagen	1760 +/- 30	Cal AD 220–380
366572	1391	skull 1391/3	human tooth collagen	1800 +/- 30	Cal AD 130–320
366571	1391	skull 1391/1	human tooth collagen	1960 +/- 30	Cal BC 40–AD 80

5.14 The animal bone

Alan Pipe and Vicki Ewens

Introduction

This report deals with selected contexts dated as Roman at time of writing and it includes a small number of context and sample groups considered in earlier assessment and evaluation reports.

Hand-collected animal bone from 55 contexts and wet-sieved animal bone from 17 samples were described and recorded onto the MOLA Oracle animal bone assessment database.

This was undertaken in reference to weight (kg), estimated fragment count, faunal composition, measurable and complete bone, modification, recovery of evidence for age at death, epiphyses and mandibular (lower jaw) tooth rows. Context and sample groups were generally small; ranging between 0.001–1.000 kg and 1–50 fragments, but mainly less than 0.1 kg with fewer than 30 fragments. Particularly large groups were recovered from sandy clay deposit [6777]/ 13.450 kg; metalling [6726]/7.125 kg; levelling layer [6772]/16.300 kg; and roadside gully fill [6741]/4.250 kg.

The animal bone context and sample groups are summarised in Appendix 4, with all stratigraphic information available at time of writing. The selected Roman assemblage produced an estimated 3190 fragments (132.45kg), with any surface damage insufficient to obscure fine surface details or to prevent identification of species, skeletal element or body side.

Bone groups

The bone groups largely represent post-consumption and butchery waste derived from preparation and consumption of beef, mutton, lamb and pork, with sparse recovery of non-consumed domesticated species and only occasional fragments of wild 'game'. It was quantitatively dominated by adult cattle *Bos taurus* (45 context/sample groups) with substantial representation of adult pig *Sus scrofa* (21 context/sample groups); and adult sheep/goat including sheep *Ovis aries* and goat *Capra hircus* (19 context/sample groups). Recovery of very young animals was negligible comprising only single examples of juvenile horse femur (thigh bone) from road make-up [1090]; infant lamb mandible (lower jaw) from sandy clay deposit [6777]; and foetal or neonate piglet from levelling layer [6772].

Poultry

Fragments of poultry were recovered from 11 context/sample groups, each of which produced fragments of chicken (domestic fowl) *Gallus gallus*. Goose, probably domestic goose *Anser anser domesticus*, was recovered from only two contexts; levelling [6772] and waterlain deposit [6716]; with a single recovery of mallard or domestic duck *Anas platyrhynchos* from metalling [6726].

Domestic mammals

Other domestic mammals were well-represented; they mainly comprised adult and juvenile horse *Equus caballus* (36 context/sample groups from make-up, metalling and ditch deposits) with sparser recovery of dog *Canis lupus familiaris* (14 context/ sample groups from alluvium, dump, make-up and ditch deposits) and cat *Felis catus* (one context group). A fragment of cat was recovered from one context only, levelling layer [6772].

Wild game

Exploitation of wild game was indicated by a single fragment of wading bird, possibly a plover *Charadrius sp.*, from levelling layer [6772]; game mammal species comprised only single fragments of red deer *Cervus elaphus* tibia (lower hind-leg) in [6772]; roe deer *Capreolus capreolus* metatarsal (hind-foot) from ditch fill [6609] and metacarpal (fore-foot) from dump [6730]; and rabbit *Oryctolagus cuniculus* from possible flood deposit [6726]. Identification of rabbit, a burrowing species and post-Roman introduction into the British fauna, suggests intrusion from a later context.

There was no recovery of wild 'scavenger' species, fish, amphibians or very small wild and commensal mammals such as shrews, mice or rats.

Butchery/gnawing marks

Marks were present on 522 fragments of cattle, sheep/goat and pig, with tool mark evidence of working noted on only 11 cattle and sheep horn cores, each showing transverse chops at the base derived from removal of the horn and subsequent removal of the horn layer for further manufacture. Tool marks from waterlain deposit [6729] included evidence of at least one butchered dog. There was no evidence for antler working. Single examples of roe deer metacarpal (fore-foot) from road metalling [6731] and metatarsal from the backfill of ditch [6609] may indicate local processing of deerskins rather than, or as well as, consumption of venison.

Evidence of burning and gnawing was negligible and present only on single fragments; with burning noted only in ditch fill [306]; and canine gnawing noted in ditch fill [6609]; ditch fill [2056] and ossuary pit fill [6795]. Evidence for pathological change was also very sparse and present only on a cattle femur (upper hind-leg) from [6777]; and horse calcaneum (heel) [6602] and vertebrae from [6856]. All three contexts were sandy clay deposits, [6602] representing the period towards the start of marsh formation.

5.15 The geoarchaeological samples

Virgil Yendell

Introduction

This specialist report provides the results of the geoarchaeological assessment of samples taken during all phases of geoarchaeological investigations (XSM10). An earlier geoarchaeological monolith assessment was carried out on samples taken from Walbrook channel sediments (Crossrail 2015b); those results have also been integrated here. This assessment focuses upon samples from section 310, the first Roman roadside ditch section, section 312, the second Roman roadside ditch section and section 303, the late to post-Roman marsh. Samples relating to the sequence post c AD 1000 are presented in **MOLA XSM10 PXA02**.

Onsite methodology

Monolith tins were placed vertically into the side of sections exposed during the excavation to retrieve continuous stratigraphic samples. The number of tins used was dependent upon the depth and/or significance of the stratigraphic sequence and the suitability of the stratigraphy for sampling. Each monolith tin was plotted on the section drawing and related to m ATD. Preliminary interpretation of the soil and sediment characteristics of the sequences was made and an overview of the stratigraphy produced that characterises the sequence. All of the sediments examined were described according to standard sedimentary criteria, loosely following Jones et al (1999) and Tucker (1988) (relating to colour, compaction, texture, structure, bedding, inclusions, and clast-size). The monolith samples were sealed and labelled and taken to MOLA geoarchaeology laboratories to be kept in controlled storage during the assessment and analysis stages of the work.

Offsite methodology

Suitable deposits within the sequences were sub-sampled and sub-samples of key deposits were submitted to an external specialist for rapid ostracod assessment, in order to identify the preservation, quality, range and abundance of environmental remains and their potential for past environment reconstruction. A report on the ostracods is included at the end of this section.

The assessed sequence of deposits was logged in table format and entered into a digital database (Rockworks15), which was used to compare and correlate the stratigraphy across

the site. Cross-sections were drawn through the data points and correlations were made between key deposits, which were then interpreted in facies (a series of site-wide deposits which are representative of certain environments). The Rockworks data was then transferred to Arc GIS v.10.1 through which the topographic plot of the early Holocene surface was created. These programmes give an approximation of the topography of the site as it existed at the beginning of the Holocene period (ie the early Mesolithic, c 10,000 BP) and its development over time.

Assessed section logs

The logs for the assessed sections are as follows and contain more detailed descriptions of contexts from laboratory examination. The location of the consulted sections is provided on the topographic plot of the surface of the gravels, the early Holocene topography (Fig 4).

Table 20 Section log: first Roman roadside ditch – Section 310 north

XSM10 Section 310 north				Easting	533047
				Northing	181609
Depth (m bgl)		Elevation (m ATD)		Description	Samples
Top	Base	Top	Base		
0	0.7	107.75	107.05	[6781] Roman roadside ditch. Very compact dark grey / brown-grey silt/clay with some humic and organic material. Gravel common (very heterogeneous, mixed upper fills of roadside ditch)	Facies 3a Roman ditch fills
0.7	0.8	107.05	106.95	[6869] Compact dark reddish grey brown very humic silt/clay with occasional medium gravel and organic material	
0.8	1	106.95	106.75	[6869] Fine grained late Pleistocene sands and silts	Facies 1 Pleistocene sediments

Table 21 Section log: first Roman road side ditch – Section 310 south

XSM10 Section 310 south				Easting	533047
				Northing	181608
Depth (m bgl)		Elevation (m ATD)		Description	Samples
Top	Base	Top	Base		
0	0.4	107.65	107.25	[6777] Pale yellow grey clay, signs of root action	Facies 1 Pleistocene sediments (a chance of facies 2b early prehistoric short-lived wetland)
0.4	0.5	107.25	107.15	[6869] Brickearth	
0.5	0.6	107.15	107.05	[6869] Compact dark reddish grey brown very humic silt/clay with occasional medium gravel and organic material	
0.6	0.9	107.05	106.75	[6869] Fine grained late Pleistocene sands and silts	

Table 22 Section 312: second Roman roadside ditch section log

XSM10 Section 312				Easting	533041
				Northing	181612
Depth (m bgl)		Elevation (m ATD)		Description	Samples
Top	Base	Top	Base		
0	0.15	107.75	107.60	[6781] in cut [6782] - moderate mid to dark brown friable humic silt with clay and sand. Common medium sub angular to sub rounded flint gravel (humic silt soil with root action evident)	Facies 3a Roman ditch fills
0.15	0.2	107.60	107.55	[6777] Pale yellow grey clay, signs of root action	Facies 1 Pleistocene sediments grading up to

XSM10 Section 312				Easting		533041	
				Northing		181612	
Depth (m bgl)		Elevation (m ATD)		Description		Samples	
0.2	0.25	107.55	107.50	[6869] gradational / diffuse boundary with moderate - compact mid brown - grey silt clay with common large woody and organic patches. Attributed to rooting in section drawing (possible immature waterlogged gleyed soil forming within sediment in wash over peaty/humic soil)		facies 2b early prehistoric short-lived wetland and soil development	
0.2	0.24	107.55	107.51	[6869] very clear / sharp boundary (erosional contact) with compact mid-dark brown very friable, very humic silt. Well-humified with sizeable wood (twig) inclusions (humic / peaty past soil horizon / dry land surface eroded by sediment in wash described above)			
0.24	0.35	107.51	107.40	[6869] grades down into moderate-compact mid brown less humic silt with fine sand. Occasional modern-looking roots and small humic flecks, otherwise very homogenous and well-humified. Small calcined flint clast noted. (Sub soil of above humic soil forming within substrate. Possible zone of eluviation / B horizon)			
0.35	0.5	107.40	107.25	[6869] diffuse boundary with compact - moderate mid-grey or brown grey silt clay with occasional large gravel clasts (perhaps this is clean palaeo-Walbrook floodplain deposit that forms substrate for the above series of soils. I haven't looked at where this section is)			
0.5	1.1	107.25	106.65	[6869] Fine grained late Pleistocene sands and silts			

Table 23 Section 303 east: late to post-Roman marsh section log

XSM10 Section 303 east				Easting		533038	
				Northing		181604	
Depth (m bgl)		Elevation (m ATD)		Description		Samples	
Top	Base	Top	Base				
0	0.3	110.20	109.90	[4855] compact very dark brown very gritty sandy clay/silt matrix with orange mottling. Common medium and large CBM, gravel and shell inclusions. (very heterogeneous mixed fill with abundant-common inclusions)		Facies 8 late to post-medieval marsh and dumping	
0.3	0.5	109.90	109.70	[6541] Fairly compact, mid grey with darker patches, silty clay, rare medium coarse gravel, angular to sub-rounded, poorly sorted, deliberate backfilling of ditch			
0.5	0.6	109.70	109.60	[6542] Well compacted, dark brown grey, silty clay, rare sub-angular medium gravel			
0.6	0.9	109.60	109.30	[6543] moderately compact, very dark brown grey, silty clay, animal bone mixed throughout, rare pieces of leather, rare angular poorly sorted stones			
0.9	1.3	109.30	108.90	[6544] Firm, well compacted dark brown black, clay slight silty, rare angular to sub rounded stones, poorly sorted, thin band of silty sand, initial fill of ditch			

XSM10 Section 303 east				Easting	533038
				Northing	181604
Depth (m bgl)		Elevation (m ATD)		Description	Samples
Top	Base	Top	Base		
1.3	1.5	108.90	108.70	[6582] moderate - compact / firm dark brown - black very humic (well-humified) clay silt with small molluscs visible. Small rare CBM, small flint pebbles root material and small organic inclusions. Becomes grey and clay-rich towards base as joining base of section (new context?)	Facies 5 Roman to medieval marsh with some waste dumping

Table 24 Section 303 west: late to post-Roman marsh section log

XSM10 Section 303 west				Easting	533034
				Northing	181605
Depth (m bgl)		Elevation (m ATD)		Description	Samples
Top	Base	Top	Base		
0	0.3	110.10	109.80	[4855] compact very dark brown very gritty sandy clay/silt matrix with orange mottling. Common medium and large CBM, gravel and shell inclusions. (very heterogeneous mixed fill with abundant-common inclusions)	Facies 8 late to post-medieval marsh and dumping
0.3	0.6	109.80	109.50	[6569] Compact to soft, mid yellowish brown, slightly silty clay, occasional mollusc shells, occasional sub angular gravel, flooding between ditches	Facies 6 medieval alluvial silting and dumping
0.6	1	109.50	109.10	[6496] compact dark orange brown silt/clay with some sand. Inclusions are small-medium bone, charcoal, flint and shell. Similar to {4855} but smaller inclusions and lighter colour (weathered - iron veins and staining -ditch fill)	
1	1.5	109.10	108.60	{6582} moderate - compact / firm dark brown - black very humic (well-humified) clay silt with small molluscs visible. Small rare CBM, small flint pebbles root material and small organic inclusions. Becomes grey and clay-rich towards base as joining base of section (new context?)	Facies 5 Roman to medieval marsh with some waste dumping

Ostracods

Dr John E. Whittaker, Natural History Museum

Introduction

A total of three sections (303, 310 and 312) were sampled from the Roman phases at the Crossrail Broadgate Ticket Hall site (XSM10), for post-excavation assessment. Comprising seven samples, they are listed with their respective monolith numbers, elevation (m ATD) and weight processed under 'Method' below. The purpose of this assessment was to analyse any ostracods (a class of *Crustacea* which can denote marine, fresh water or terrestrial conditions) or other organic remains that might be present and that might further

our understanding of the environments of deposition, asking such questions as to whether any might reflect running water. As this is an assessment, no other specialist analysis has been integrated at this stage and the information provided here aims to be as comprehensive as possible. This report assesses sediments from Roman roadside ditches (sections 310 and 312) and late Roman/post-Roman marsh deposits (section 303).

Method

Ostracod sample details are shown in Table 25. The samples were broken into small pieces by hand, placed in ceramic bowls and dried in an oven. Boiling-hot water was then poured over them, with a little sodium carbonate added to help disaggregate the clay fraction. Each was left to soak overnight. Washing was with hand-hot water through a 75 micron sieve, the remaining residue being returned to the ceramic bowl for final drying in the oven. Most gave a good breakdown, but one or two hard silty peats required processing several times. The residues were then stored in labelled plastic bags. For examination, each sample was placed in a nest of sieves (>50, >250, >150 microns, and base pan) and thoroughly shaken. Each grade was then sprinkled onto a picking tray, a little at a time, and viewed under a binocular microscope.

Table 25 Ostracod assessment samples

	Monolith and ostracod sample number		Elevation (m ATD)	Weight processed (g)	Context
Section 303	325_O4	109.98	109.96	110	4855
	325_O3	109.72	109.70	110	6496
	326_O2	109.38	109.36	110	
	327_O1	109.12	109.10	110	6582
	357_O1	108.37	108.35	55	
	359_O3	108.51	108.49	70	6556
Section 310	414_O4	107.83	107.81	95	6781
	414_O3	107.69	107.67	110	
	414_O2	107.57	107.55	110	
	414_O1	107.51	107.49	150	-
Section 312	415_O6	107.57	107.55	55	Possibly part of 6869. Thin organic band below road side ditch
	415_O5	107.55	107.53	45	

Fortuitously almost all the microfauna was contained in the >500 and >250 micron fraction, which speeded up examination and logging. Organic and any other remains were recorded on a presence(x)/ absence basis and are shown in the uppermost section of Table 26 and Table 27 below. The abundance of each species of freshwater ostracod, on the other hand, was estimated semi-quantitatively (one specimen, several specimens, common and abundant) by experience and by eye. This information is provided on the lower sections of Table 26 and Table 27. For archive purposes, a representative fauna of ostracods was also placed in labelled 3x1" faunal slides. At a later stage the residues can be made available for further analysis, if required.

Ostrocod results

Table 26 Section 310: first Roman road side ditch section ostracod assessment results

ORGANIC REMAINS				
MONOLITH	414			
Elevation (m ATD)	107.83–107.81m	107.69–107.67m	107.57–107.55m	107.51–107.49m
Sample	414_O4	414_O3	414_O2	414_O1
plant debris + seeds	x	x	x	x
insect remains	x	x	x	x
cladoceran ehippia	x	x	x	
fish bone		x		
shall (oyster)		x		
charcoal			x	
mortar/burnt clay			x	
freshwater ostracods			x	x
Ecology	<i>Ditch with semi-permanent, often stagnant water and some decaying vegetation</i>			
FRESHWATER OSTRACODS				
MONOLITH	414			
Elevation (m ATD)	107.83–107.81m	107.69–107.67m	107.57–107.55m	107.51–107.49m
Sample	414_O4	414_O3	414_O2	414_O1
<i>Candona neglecta</i>			x	
<i>Cyclocypris ovum</i>			x	x
<i>Cypria ophtalmica</i>			x	
Organic remains are recorded on a presence (x)/absence basis only				
Ostracods are recorded: x - several specimens				

Table 27 Section 312: second Roman road side ditch section ostracod assessment results

ORGANIC REMAINS		
MONOLITH	415	
Elevation (m ATD)	107.57–107.55m	107.55–107.53m
Sample	415_O6	415_O5
plant debris + seeds	x	x
insect remains	x	x
cladoceran ehippia		x
Ecology	<i>Ditch</i>	
Organic remains are recorded on a presence (x)/absence basis only		

Table 28 Section 303: late to post-Roman marsh ostracod assessment results

ORGANIC REMAINS				
MONOLITH	325		326	327
Elevation (m ATD)	109.98–109.96m	109.72–109.70m	109.38–109.36m	109.12–109.10m
Sample	325_O4	325_O3	326_O2	327_O1
charcoal	x	x	x	x
tile/brick/slag	x	x	x	x
bone (mammal/fish)	x	x		x
freshwater molluscs	x	x	x	x
shell (oyster)	x	x		x
plant debris + seeds	x	x	x	x
earthworm granules	x			
slug plates	x			
freshwater ostracods	x	x		x
<i>Bithynia opercula</i>		x		x
insect remains		x		x
charophyte oogonia			x	x
cladoceran ehippia				x
Ecology	<i>Vegetated ditch or pool, with accumulated or dumped waste; lower samples somewhat cleaner</i>			

Table 29 Section 303: late to post-Roman marsh ostracod assessment results (continued)

FRESHWATER OSTRACODS				
MONOLITH	325		326	327
Elevation (m ATD)	109.98–109.96m	109.72–109.70m	109.38–109.36m	109.12–109.10m
Sample	325_O4	325_O3	326_O2	327_O1
<i>Candona neglecta</i>	x	x		xx
<i>Cypria ophthalmica</i>	o			x
<i>Cyclocypris ovum</i>		x		x
<i>Pseudocandona compressa</i>				x
Organic remains are recorded on a presence (x)/absence basis only				
Ostracods are recorded: o - one specimen; x - several specimens; xx – common				
Charophytes require shallow, clean, well oxygenated, still or at most, slow-flowing water				

The results of the Microfaunal Assessment of the three sections examined are given below with their age (as understood at present): 310 and 312 (Roman road-side ditches) and 303) late to post-Roman marsh). They are shown in tabular form in Table 26–Table 28, respectively. Freshwater ostracods (colour-coded light blue) were found in five of the seven samples. These assemblages, where they occur, were all very similar with species which can live virtually anywhere. These are, with their preferred ecology (after Meisch, 2000), as follows:

- *Cyclocypris ovum* – Found in almost every type of aquatic habitat, both permanent and temporary. From ditches to the littoral of lakes, springs and swamps.
- *Cypria ophthalmica* – Widespread and tolerant of a wide range of environmental factors – both permanent and temporary waterbodies, stagnant and flowing waters – (littoral of) lakes, ponds, springs; quite acid bogs; waters with decaying vegetation. Has been termed the “slum ostracod”.
- *Ilyocypris bradyi* – prefers springs, slow waters flowing from springs and ponds fed by springs. Both muddy and sandy substrates.
- *Pseudocandona* spp. (including *compressa* and *rostrata*) – both live in permanent and temporary small waterbodies, ponds, shallow lakes, ditches, bogs; also in springs and streams.
- *Candona neglecta* – widespread in springs, ponds and brooks connected to springs; shallow littoral zone of lakes; pools and ditches; permanent and temporary waters.

In most cases, *Cyclocypris ovum*, *Cypria ophthalmica* and *Candona neglecta* occur together (with or without *Pseudocandona*) and would seem to suggest muddy, vegetated ditches and pools. This in turn may need some reconciliation with human waste (eg food and industrial, evidenced by bone, shell, brick/tile and slag and charcoal) which has been dumped or has accumulated in several of the samples.

SECTION 310: MONOLITH 414 and SECTION 312: MONOLITH 415 (Roman roadside ditches, Table 20, Table 21 and Table 22)

Four samples were examined from Section 310 (414_O4 – 414_O1), covering the interval 107.83–107.49m ATD). Two samples were examined from Section 312 (415_6 and 415_O5), covering the interval 107.57–107.53m ATD. Whereas Section 310 contains a wider selection of organic and other remains, including ostracods, Section 312 contains only plant remains, insect remains and, in one sample, cladoceran ehippia (egg cases of water-fleas) and can be confirmed only as a ditch. The ditch represented by the Section 310 sequence, on the other hand, seems to have accumulated, in addition fish bone, oyster shell, charcoal and mortar/burnt clay (the latter two items possibly as the result of natural fire in the vicinity). The ostracods in samples 414_O2 and 414_O1 are all found in the other sections at the site (but of younger age) and, as already reported, are not particularly diagnostic ecologically, save to say they are not out of character for a ditch with semi-

permanent often stagnant water and some (decaying) vegetation. The lack of ostracods in some of these samples may be as a result of decalcification.

SECTION 303: MONOLITHS 325, 326, 327 (late to post-Roman marsh, Table 23 and Table 24)

Four samples were examined from Section 303: 325_O4 and 325_O3 from Monolith 325; 326_O2 from Monolith 326; and 327_O1 from Monolith 327. They are from the sequence with the highest elevation on the site, covering the interval 109.98–109.10m ATD. The 'organic remains' are shown in the upper part of the table. Freshwater ostracods were found in three of the four samples, the species being listed semi-quantitatively in the lower part of the table. Of remains that can be construed as being 'waste', all four samples contained charcoal and tile/brick/slag, three (less 326_O2) containing, in addition, bone (animal and fish) and oyster shell. All four samples contained plant debris and seeds, and freshwater molluscs (bivalves and planorbid gastropods, with two, in addition containing *Bithynia opercula*). Freshwater ostracods occur in three of the four samples. Those from Monolith 326 and 327 contain charophyte oogonia (the reproductive organs of the stonewort plant), with the latter (327_O1) occurring in large numbers and with the external cortex; in those from 326, on the other hand, only the inner organic lining is preserved and this, coupled with the lack of ostracods suggest this sample (326_O2) has been subject to decalcification. To conclude, the ecological synopsis of Section 303 is that it represents a vegetated pool, with accumulated or dumped waste; lower samples are somewhat cleaner.

Geoarchaeological discussion

The site lies within the floodplain of the Walbrook Valley. The underlying geology is Taplow Gravels and London Clay. The surface of the London Clay and the overlying Pleistocene sandy gravels rise outside of the site to the east and west (c 111–113m ATD; Fig 4 and Fig 5) towards the higher edges of the valley (likely the Taplow Gravel formation). Within the site the surface of the Pleistocene gravels range from c 106.5–109m ATD with variable alluvial deposits sealing them. The palaeo-ecological results for the assessed sections (section 310, the first Roman roadside ditch section, section 312, the second Roman road side ditch section and section 303, the late to post-Roman marsh) will be discussed below within a broad preliminary understanding of the site-wide deposit sequence, the landscape and site formation processes. The complex site-wide deposit sequence has been separated into groups (facies), representing formation processes and/ or natural environments, whilst also attempting to impose distinct chronological periods as understood at this stage of the assessment. Reference to archaeological features will be relatively general and will predominantly relate to supposed contemporary landscape features, elevation and environment. A topographic plot of the surface of the gravels (the early Holocene topography) is presented in Fig 4. The following facies (ie the physical, chemical, and biological aspects of a sedimentary bed) give an outline of the landscape evolution of the site.

Facies 1 Pleistocene gravels and underlying London Clay

The wider landscape of the Walbrook valley surrounds the location of the site with a branch running roughly north to south through the site (Fig 4; Fig 6 et seq). The late Pleistocene gravels forming this valley were laid down during the end of the last glacial period as the glacial outwash waters ameliorated. The present course of the River Thames was established about 0.5 million years ago. Subsequent cold and warm climate periods caused alternating erosion (down-cutting) and deposition. This, together with a background gradual tectonic uplift, led to a sequence of progressively younger Quaternary (476,000–121,000 BC) deposits down the valley sides. These Pleistocene (mainly gravel) deposits form a series of terraces, which represent former floodplains of the river that subsequently became incised and left dry as the river Thames and its tributaries, such as the Walbrook down-cut to

lower levels. In some cases, the bedrock underlying the gravels is exposed and is recorded as London Clay, an even earlier Eocene marine deposit. In other cases, the gravel surface is overlain by late glacial fining up sequence or brickearth-like Pleistocene periglacial deposit.

The valley edges rise to the east and west, up to c 111–113m ATD and the site lies upon the floodplain of the Walbrook valley, c 106-109m ATD. The nature of the early prehistoric floodplain is difficult to discern in any kind of detail because the majority of the elevation data for the surface of the gravels represents later Roman or medieval truncation rather than the early prehistoric level. Generally the information recorded as part of this work does indicate that for the western and central portions of the site the early prehistoric surface is between 106–107m ATD, whilst it rises to c 109m ATD in the eastern third of the site. During the early prehistoric the abating glacial outwash waters would likely have meant that a network of channels covered the relatively flat floodplain separated by gravel and sand bars. One such channel thread appears to have been recorded to the west of the site (section 37; Fig 4 and Crossrail 2015b) with the gravel surface recorded at 106.25m ATD.

A previous palaeoenvironmental assessment (Crossrail 2015b) of facies 1 sand and gravel sediment found that diatom remains were either fragmented or absent and the differential preservation of pollen in favour of robust types with substantial numbers of pre Mesolithic pollen also provided poor results. Both the diatom and pollen remains could be a result of fluvial transportation/reworking and provided little potential for further work.

Facies 2 Prehistoric to Roman high energy deposits and slower marginal flow

This facies is separated into two types of depositional environment; two phases of high energy deposits (facies 2a, Fig 5) separated by lower energy deposition and vegetation (facies 2b, Fig 5). Significant differences in the elevation of the underlying early Holocene surface (signified by the top of the pre- Holocene sediments ie brickearth, gravels, London Clay) across the site may identify the location of channel threads, but as the surface of the floodplain appears relatively flat it is possible that no single channel thread dominated during the prehistoric or that later truncation has obscured its route. The lowest level for the early Holocene surface is recorded in section 37 (Fig 4 and Crossrail 2015b) and the depression it formed is filled with moderately low energy fluvial deposits, indicating the natural infilling of this route of part of the suspected prehistoric multi-channel Walbrook (the lower portion of facies 2a; Fig 5). This may represent a period of landscape stability and accumulation of sandy silts and clays within the lower-lying areas of floodplains and within/adjacent to channel routes during the Mesolithic. This can also be seen as a fining up sequence in redundant channels as the pattern of water flow changed in the Late Pleistocene and Early Holocene.

Finer-grained silting and organic deposits in marginal channel or pooling water locations are recorded between c 107.0–107.5m ATD, predominantly across the west but also in limited locations in the centre of the site (facies 2b; Fig 5). These deposits represent the finer deposition of the Mesolithic silting up of low-lying areas as mentioned in the previous paragraph. Additionally, they may include mudflat to wetland development and vegetation encroachment as a result of hydrology changes, possibly connected to sea level fluctuations that led to the widespread development of peat (the partially decomposed vegetation of a marshland/ former land surface) across the wider Thames valley during the Mesolithic to Iron Age, and may even stretch to early Roman in date. The ostracod assessment from sections 414 and 415 (see above) recorded freshwater aquatic environments in these sediments. However, a previous assessment (Crossrail 2015b) of facies 2b deposits recorded diatoms suggestive of a non-marine high salt content in a flowing water environment and further work to clarify a freshwater or saline hydrology may be required.

The previous pollen assessment (Crossrail 2015b) for facies 2b deposits shows little discernible variation with the pollen dominated by nearby grassland and herbs with few trees or shrub. Arable land is likely in the vicinity with some possible cereal cultivation/processing

onsite or at least the dumping of faecal matter. Some aquatic plants are indicated, attesting to waterlogged or marginal landscape position. The pollen remains from the upper facies 2a deposits discussed below maybe more enlightening concerning the facies 2b vegetation.

An additional phase of coarse grained higher energy deposition (the upper portion of facies 2a; Fig 5) overlies or is contemporary with the mudflat and wetland development as represented by facies 2b (Fig 5). These units are suggestive of higher energy deposition across the floodplain or within relic or infrequently used channel threads. Broadly high energy flow appears to be limited to this western side of the site with any other depressions in the gravel surface being in filled with fine grained or organic deposits. The upper portion of this second phase of facies 2a formed part of a wider deposit to the west which contained human bone of a Roman date.

A previous assessment (Crossrail 2015b) of these upper facies 2a deposits showed a significant reduction of the pre-Quaternary pollen compared to the facies 1 sands and gravels and the initial formation of an onsite herb fen to alluvial floodplain (probably signifying the facies 2b environments) with latter suggestions of arable land to disturbed grassland (cereal levels were at a consistent but low level). Diatom remains suggested freshwater pooling waters, possibly subsequent to the flood events suggested by the lithology and even later drying out and soil formation adjacent to these ephemeral water flows or pools (Crossrail 2015b).

Facies 3 Roman features; ditches and roads

This facies constitutes two broad groups of activity as shown in the sections; cut features such as ditches (facies 3a) and the Roman road (facies 3b; Fig 5). The activity represented by these phases could be considered roughly contemporary with the environments represented by facies 2. The Roman road [1084] and underlying consolidation deposits [1085] and [1087] appear to overlie a depression in the gravel surface which was in filled with low energy waterlain deposits and vegetation during the prehistoric or early Roman. Road layers themselves were recorded between 107.7 and 108.2m ATD and were likely constructed and used as the mudflat to vegetated margins existed (facies 2b; Fig 5) and the upper high energy waterlain deposition occurred (upper phase facies 2a; Fig 5), that contained human bone. The elevation of the road layers suggests that it may still have been usable as the late to post Roman alluvial silting occurred (facies 4; Fig 5 and discussed in more detail below). However, the road definitely went into disuse and abandonment with vegetation encroachment as the post Roman marsh (facies 5; Fig 5), and also discussed in more detail below) developed and appeared to directly overlie the road layers. At this point the road was definitely not higher than the surrounding waterlogged floodplain.

During its use the road was flanked by small drainage ditches or gullies (eg [6782] on). The fills of these ditches also contained a mix of cranial and post-cranial human bone, thought to be related to that found in the upper high energy waterlain deposition that occurred in facies 2a (upper phase; Fig 5). However, the fills of these ditches are fine grained and organic, representing sediment deposition in predominantly slow or still conditions. The ostracod assessment from sections 310 and 312 (see above and Fig 4) did record semi-permanent, often stagnant water, and supports this interpretation. In addition it highlighted the presence of decaying plant matter, fish bone, oyster shell and charcoal fragments in the fill, indicating some degree of waste disposal into the ditch as it silted up. The human bone found in the upper high energy waterlain deposition (upper phase facies 2a; Fig 5) is redeposited.

Facies 4 Late to post Roman alluvial silting and some dumping

This facies ranges from c 107.5 to 109m ATD and records fine-grained alluvial deposition most frequently recorded and surviving in the west of the site. Across the Thames valley, such deposition is associated with a regional trend for rising water levels as a result of relative sea level (RSL) rise which created a gradual transition from marshland to mudflats /

saltmarsh as alluvium was intermittently deposited on the floodplain. This differed from facies 2b by being more widespread across the landscape and not limited to the lower-lying areas. Such alluvial deposition would have made occupation on the floodplain unlikely but occupation nearby, on the drier higher ground, is suggested by the artefactual material contained within the fine grained alluvial deposition. This artefactual material, animal bone, pottery fragments and other kinds of waste appears to have been disposed of on the floodplain at the site or nearby. The amount of artefactual material within the matrix of silty clay alluvium is not generally suggestive of any concerted or widespread effort of dumping for ground raising or ground consolidation. However, as previously stated, the human activities evidently still occurring in the wider area (such as vegetation clearance, farming and drainage management) would have potentially increased the amount of erosion, the propensity for flooding and, as such, could have been major contributor to the alluviation here.

Facies 5 Post Roman marsh and dumping

Facies 5, recorded between c 107.5 and 111m ATD, represents some stabilisation of the landscape with less deposition from alluvial silting and more significant vegetation encroachment into waterlogged and wetland areas of the floodplain. These deposits are generally thicker in the lower lying western two thirds of the site, apparently thinning out to the east where late glacial (facies 1) deposits have created slightly higher drier areas on the generally low floodplain. The ostracod assessment from section 303 (see above and Fig 4) recorded vegetated freshwater pools of clean water, or at least slightly cleaner than the overlying facies 6 sediments. The pools were likely shallow, permanent and still, or at most containing a slow flow of water.

Within the general trend of sea level rise there were regional periods of recession where active flooding reduced and only standing water remained allowing for stable more vegetated environments to take hold. However, it was not unusual for such regional organic deposits to form in the wider Thames valley in the post Roman period. Radiocarbon dating may provide a better chronology for this marsh development across the site and possibly tie it to regional trends or highlight other more anthropogenic factors. The alluviation of the previous facies, signifying landscape instability and flooding, was likely to have been partially influenced by the human activity in the wider valley.

Conclusion and recommendations

The site wide deposit sequence has been characterised into five facies summarised below.

- Facies 1 record the basal London Clay, Pleistocene gravels and fine grained late Pleistocene to brickearth layers that form the wider landscape of the north south branch of the Walbrook valley. Although, a possible channel depression was identified in the west of the site it was likely only in use in the early prehistoric. The coarse nature or age of these sediments provides little potential for further palaeoenvironmental work.
- Facies 2 Prehistoric high energy waterlain deposits likely fill in the early prehistoric channel routes identified in the west of the site. Subsequently, the floodplain was relatively flat and a mix of mudflats to herb fen, developed apparently alongside a series of Roman flood events that carried and deposits eroded human bone from elsewhere. The flood events themselves are in part at least likely driven by the human agriculture activity (vegetation clearance and soil erosion) and ad hoc river management. Plant remains highlighted in the marginal prehistoric to Roman deposits may provide a valuable prehistoric baseline of the vegetation record for prior to the Roman use of the site.
- Facies 3 constitutes roughly contemporary cut features such as ditches and the Roman road. The Roman road overlies a depression in the gravel surface which was

in filled with low energy waterlain deposits and vegetation during the prehistoric or early Roman. The elevation of the road suggests it was likely in use during the deposition of the facies 2 flood deposits and potentially even the formation the later mudflats (facies 4). However, the road definitely went into disuse and abandonment with vegetation encroachment as the post Roman marsh (facies 5) developed. The small drainage ditches flanking the road record slow to still water in stagnant ditch conditions. The human bone found within these roadside ditches are likely to be related to those found in higher energy flood deposits but little evidence of a flood remains in the ditch fills. The roadside ditch sediments have further potential (pollen, seeds and insects) to investigate the depositional environment in order to investigate the relationship between the two human bone contexts and their representation of possible flood events.

- Facies 4 represents late to post Roman widespread alluvial silting, no longer limited to the low lying areas of the Walbrook floodplain and driven by some dumping a regional trend for rising water levels as a result of relative sea level (RSL) rise which created a gradual transition from marshland to mudflats / saltmarsh as alluvium but contributed to by human activities (such as vegetation clearance, farming and drainage management). Such alluvial deposition would have made occupation on the floodplain unlikely and would have driven human communities to higher ground but activity in the vicinity is noted by the dumping of waste onto the floodplain.
- Facies 5 indicates late to post Roman stabilisation of the landscape, with less deposition through alluvial silting and more significant vegetal encroachment into waterlogged and wetland areas of the floodplain where shallow pools of relatively clean freshwater existed. Considering regional trends for continued alluvial silting, this marsh development was likely to be a result of the local topography and hydrology in combination with human landscape alteration and/or lack of maintenance of water management practices (eg ditches and revetments) already in place as communities moved away from the floodplain during this period. The assessment highlighted the survival of seed, insect and freshwater mollusc remains for future analysis, which could provide a valuable insight into the environment and development of the marsh allowing further comments on the cause of its formation.

5.16 Conservation

Liz Goodman

Introduction

The following is an assessment of conservation needs for the registered and bulk finds from the excavations at Broadgate and Blomfield Street, in accordance with currently accepted standards of best practice (as defined in MAP2, now incorporated within MoRPHE) for the transfer of the assemblage to the receiving organisation. It also incorporates conservation tasks needed to fulfil the requirements laid out in the MoL's Standards for Archive Preparation (Museum of London 2009).

Conservation support at the time of the excavation was provided by MOLA conservators. Records of conservation carried out at the fieldwork stage are held in the conservation department of the MoL and any reports are copied to the site project directory. Copies of these records are transferred to the receiving organisation at archive deposition.

Methodology

Conservation treatments at the fieldwork stage includes the stabilisation of vulnerable materials and composites such as wet organics and lifted assemblages, X-radiography and cleaning of coins for dating purposes according to archaeological priorities. Treatments are

carried out under the guiding principles of minimum intervention and reversibility. Whenever possible, preventive rather than interventive conservation strategies are implemented. Procedures aim to obtain and retain the maximum archaeological potential of each object: conservators will therefore work closely with finds specialist and archaeologists.

Most conservation work on metal artefacts begins with visual examination under a binocular microscope followed by mechanical cleaning using scalpel and other hand tools. Occasionally other mechanical devices such as air abrasive and power pen are used. Mechanical cleaning will reveal detail and a conservation surface beneath corrosion products (which can be substantial) to permit the true shape and purpose of the artefact to be understood.

Due to the anoxic nature of the site, a large quantity of organic objects were found on site. All leather was pre-treated with glycerol, freeze dried to stabilise it and then packaged for long term storage. In the case of wood, the species was identified and treatment decisions made from this information. The textiles and fibres were carefully washed with natural sponges and soft brushes under running water and underwent controlled air drying for several days.

Due to the large quantities of bone, ivory and wet inorganic objects found, the objects were treated within their context groups and were dried according to best practice.

A number of objects were also conserved for a small exhibition to showcase the archaeology found during the Crossrail excavations.

All conserved objects are packed in archive quality materials and stored in suitable environmental conditions. All object treatment work is recorded on the MoL collections management system (Mimsy XG) and on record cards, stored at the MoL. Detailed conservation or analytical reports are filed on the site project directory and transfer with the site archive.

Finds analysis/investigation

The registered finds and their X-radiographs, where appropriate, were assessed by eye. When necessary closer examination was carried out using a binocular microscope at up to 40x magnification. The registered and general finds were reviewed with reference to the finds assessments by Beth Richardson and Michael Marshall (registered finds), Ian Betts (CBM), Julian Bowsher (coins), Jacqui Pearce (CTP), Nigel Jeffries (post Roman pot), Amy Thorpe (Roman pot) and Damian Goodburn (structural wood).

The majority of the objects included in this assessment are in good condition and identifiable. A large proportion of the objects were from waterlogged contexts and these have only minimal soil and/or corrosion present. However the metal objects excavated from the dry contexts tend to be heavily encrusted with hard corrosion mixed with stones.

The estimated time reflects the mix of preservation types, with the waterlogged materials requiring only a small amount of time and the dry concreated objects requiring considerably more to conserve the objects identified by the specialists.

Work required for illustration/photography

A number of metal items have been identified by the finds specialist as requiring illustration and photography. As a default, it is assumed that illustration will be by photography.

Preparation for deposition in the archive

The majority of the objects excavated from this site appear to be stable, however 15 iron, one copper alloy and one lead alloy accessions are exhibiting signs of active corrosion and need conservation input to stabilise them before deposition. The rest of the finds from this site are appropriately packed for the archive.

6 Potential of the data

6.1 Realisation of the original research aims

This section aims to examine the extent to which preliminary assessment of the results of the archaeological investigation indicates that the original Roman research aims (in the *Project design*) have been or can be answered.

ORA-RM 1 *Investigate the natural topography and geomorphic development of the site prior to human intervention*

Realisation: London Clay, Pleistocene gravels and fine-grained late Pleistocene to brickearth layers form the wider landscape of the north south branch of the Walbrook valley. The valley edges rise to the east and west, up to c 111–113m ATD and the site lies upon the floodplain of the Walbrook valley, c 106–109m ATD. The nature of the early prehistoric floodplain is difficult to discern in any kind of detail because the majority of the elevation data for the surface of the gravels represents a later Roman or medieval truncation rather than the early prehistoric level.

A possible channel depression was identified in the west of the site although it is likely to be an early prehistoric feature. The Possible prehistoric high energy waterlain deposits fill in the early prehistoric channel routes identified and the resulting relatively flat floodplain provided a mix of mudflat to herb fen environments. However, this more even and flat floodplain and environs are potentially associated with a series of Roman flood events, in part at least likely driven by human agricultural activity (vegetation clearance and soil erosion) and ad hoc river management.

ORA-RM 2 *Investigate the form of the River Walbrook in its various phases, any crossing points, including any waterlaid deposits with potential for organic preservation and palaeo-environmental remains.*

Realisation: Low-lying waterlain deposits indicate potential low-energy silting of the prehistoric Walbrook channel courses within or adjacent to the site. As climate induced regional patterns of water flow changed in the prehistoric, land surfaces stabilised around the multiple courses of the River Walbrook allowing for the formation of vegetated wetlands. Later, high-energy waterlain deposition is suggestive of a series of flood events of characterised by strong then abating flow across the floodplain or within relic or infrequently used channel threads. In broad terms, high-energy flow appears to be limited to this western side of the site, with any other depressions in the gravel surface being infilled with fine-grained or organic deposits. Increased human activity, in the form of water and/or land management, during the Roman period would have contributed to the power and frequency of flood events. A group of stakes may represent a former wattle fence line near the water's edge. It is hoped that further analysis may determine its date.

Whilst the Roman road was identified, its Walbrook crossing point (as can be inferred from an alignment extrapolated from other observations of the same road to the west) lay outside the site boundary. It is very likely that the Roman crossing took the form of a bridge, which could itself have altered the flow rates etc of the Walbrook stream. The environment continued to alter: the presence of an undisturbed cremation urn in the vicinity of the watercourse suggests water stability, but the brushwood base to the road suggests water-affected and marshy ground.

- ORA-RM 4** *Characterise and understand the nature, form, and dating of the different phases of Roman extra-mural activity and land use, including potential settlement occupation and date of any building remains and the function and date of drainage features and how they relate to the Walbrook and Moorfields Marsh*
- Realisation:** Evidence for land-use took consisted of water management (including a timber platform) and road-building, which included several phases of roadside drainage ditch. Cumulatively the evidence points to a relatively damp area immediately; the process of Moorfields Marsh formation, and the concomitant evidence for declining land use from the 4th century onwards can be presented in fuller detail after analysis. The pottery assemblage is predominantly domestic refuse, typical of City assemblages, and demonstrates a relatively high level of activity between the 2nd and 3rd centuries AD (possibly with minor activity into the 4th century AD). There is the likelihood that certain vessels represent disturbed burial goods from the established Roman burial ground cemetery to the north and north-west.
- ORA-RM 5** *Determine the structure, form, phasing and dates of use of the probable Roman road alignment [which] continues across the site and, if so, how it relates to other Roman activity within the area*
- Realisation:** There are two principal phases of Roman road, the original construction and a resurfacing. The pottery assemblage shows a progressive sequence of dumping into the roadside ditches from the beginning of the 2nd century AD (earliest group AD 120–160) to the late 3rd century AD (AD 240–300). A gravel deposit covering the road ([6731]) gives a date of AD 300–400, which has the potential to be refined during analysis. Roman road appears to have been built during a period in which the Walbrook tributary had either silted up significantly or slowed in terms of flow. Burials to the south are likely to post-date it. Other elements within the Roman landscape include features such as a probable hedgerow.
- ORA-RM 6** *Are there any further primary Roman burials within the site area? How do apparently primary context deposits of human skulls and cremation deposits recovered from the west of the site relate to re-deposited human remains recovered from parts of the site? What can the human remains tell us of the lives of individual Londoners in the Roman period?*
- Realisation:** Eight Roman burials were recorded during the last phase of fieldwork in 2015. Although these form a sample of limited size, the analysis of these individuals will provide information on their health and on the manner of their deaths, which in at least three cases probably resulted from decapitation. A minimum of twenty-two contexts containing cranial elements were recovered from the fill of a roadside ditch, together with post-cranial elements both within the ditch and within separate discreet deposits. These will be investigated in light of evidence from previous work to the west.
- ORA-RM 9** *What is the distribution of disarticulated Roman, or pre-Roman, human remains, and what can be inferred from it, eg from where may it have originated, and under what conditions? What does it suggest about nearby Roman cemeteries west and east of the Walbrook?*
- Realisation:** The presence of any pre-Roman human remains is yet to be finally determined, but the assessment results suggest it is unlikely. The distribution of Roman remains is of interest in that the fills of certain features – the Walbrook channel deposits and a roadside ditch – contain unusually large proportions of cranial bones when compared to post-cranial elements.

Excavation of the Roman cemetery immediately to the west, on the west side of the Walbrook (at modern Finsbury Circus north side), demonstrated that bones were washing out of graves during the 2nd–4th centuries. This, together with the identification of funerary-related associated ceramic forms at Crossrail Broadgate, suggests that the disarticulated human remains are likely to some extent to be derived from this source. However, it is possible that some of the crania were deposited on site through different processes (see also 6.2 *General discussion of potential*). These issues will be addressed at analysis.

Discrete assemblages of bone from pits will be analysed in light of stratigraphic data.

ORA-RM 10 What is the significance of the Roman shackles?

Realisation: Accession <1040> is a shackle, probably intended for a person rather than an animal, and more likely intended for attaching to the ankle than a wrist, given its size. It therefore provides evidence for the imprisonment of criminals or slaves in Roman London, an idea supported by other finds from elsewhere in the city, and perhaps in the vicinity of Broadgate/ Liverpool Street in particular.

ORA-RM 11 What can be understood of the relationship between this known floodplain and evidence for burial practices in the Roman period?

Realisation: Excavations to the west of Broadgate Ticket Office identified 125 inhumations and ten cremation burials in an area subject to periodic flooding and resulting erosion of graves and associated burials (Harward et al 2015). In London, at least, there is evidence that areas which might appear unsuitable for permanent interment were nevertheless put to use as cemeteries, whether by choice or necessity. The additional presence of the undisturbed cremation urn points to at least one period of relatively dry conditions.

ORA-RM 12 What is the significance of the decapitation burials? How do these relate to the cremation urn found only few metres away to the west?

Realisation: In general terms, decapitation burials in the Roman period are not rare and have been found at several sites across Britain. Burials, decapitated or not, are also relatively common by the side of roads, particularly outside the gates of a Roman town.

The decapitation burials' significance lies in the treatment of the affected individuals, and their corpses, at and around the time of death. Decapitation may well have been the cause of death rather than a post-mortem rite. While the purpose of the separation of the head from the body is normally to kill, and these remains may well represent victims of execution, there may be very different reasons for the specifics of the placement of the head within the grave, and this should be considered in the light of Roman period funerary customs rather than purely archaeological criteria.

The burial of the cremation urn to the west currently appears to be largely contemporary with the burials and proposes the widespread use of the area for funerary practices.

6.2 General discussion of potential

The potential of the material recovered from the site at Crossrail's ticket hall at Broadgate, to answer research questions on early development in this northern part of the Walbrook valley, is considerable. The evidence for late Iron Age activity represented by the pottery sherds may reflect a pre-Roman presence by this section of the eastern bank of a Walbrook

tributary. Analysis will seek to determine whether this context is genuinely pre-Roman rather than early Roman

The evidence for water management in the form of ditches, a timber platform and a road with an absorbent brushwood base all dates to the first half of the 2nd century AD. Despite attempts to control water flow, it is clear that the area sustained episodic flooding. With this in mind, the real potential for this site is two-fold: firstly from the fragmented items that have made their way into this area of relative wasteland just beyond the edge of town, whether in waves of water or rubbish dumps; secondly from the choice of such an area for the structural and buried remains that were left there.

Remains from dumps and water movement

The extra-mural Roman landscape defined at Sites and B was a marginal zone used as a dumping ground and lay on the fringes of a cemetery which contained both inhumation and cremation burials. Some burials were present within the project area. The date range of the artefactual evidence spans the 2nd and 3rd centuries: the pottery contains material reflecting both the discard of domestic waste and the use of vessels within funerary practise. The former has the potential to inform on patterns of use of ceramic types in Roman London, particularly for the 3rd century which is an underrepresented period; there are unusual and rare vessel types found within the second category, with intrinsic potential for the greater understanding of these categories and, through research into parallels, into the use of the site.

Two sets of Roman accessioned finds have particular interest and potential. Firstly, the objects associated with transport/animal traction, mostly hipposandals and teretts, constitute the largest assemblage of this category from a London excavation and provide further evidence for its concentration (previously noted by Wardle, Harward et al 2015, Fig 57) in this part of the Walbrook valley. The assemblage has close stratigraphic association with the road.

At least one object should be regarded as a grave good: the iron arm ring <1142>. It is possible that other objects will be determined, at analysis, to also be cemetery related. These should provide useful insights into burial practice and identity (Museum of London 2002; R7, R11). The bias towards dress and toilet equipment in the assemblage has been noted in other extra-mural assemblages from the area, for example at Moor House and Finsbury Circus. Some of these items have been considered as redeposited grave goods (Wardle in Harward et al 2015, 159–161) and it is possible that a similar association can be made from the Broadgate evidence: however, assessment work has not demonstrated any clear association between copper-alloy finds of these types and an articulated burial, and detailed consideration of the context of the find, particularly checking for any association with disarticulated human bone, will be necessary to contribute to this argument.

The explicitly military component of the assemblage – a spearhead and two 3rd-century crossbow brooches – is small but of interest, especially given the possible relationship between the road and the Cripplegate fort. Exploring the stratigraphic context of these objects and looking for parallels elsewhere in London will be important (Museum of London 2002, 39, R10) The medallion, which could well have a military connection, is extremely rare and its presence in this part of the Empire is of great interest.

The presence of iron working slag and smithing hearth bottoms indicate iron working activity in this area principally during the earlier part of the Roman use of the site. Vitrified ceramic hearth lining infers the use of simple clay lined hearths, but no additional information is discernible. On the other hand, the recovery of leather shoes, which can suggest aspects of gender and can often be dated intrinsically, has excellent potential for tightening the dating of the contexts in which they were found.

The disarticulated crania and other deposits of skeletal elements will be investigated in light of previous work in the upper Walbrook valley, including those from Finsbury Circus (Harwood et al 2015) and from Moor House to the west (Butler 2006, 38–44). Forensic studies of fluvial effects on human remains will be assessed to investigate the taphonomic changes observed in the disarticulated assemblages (Nawrocki et al 1997; Haglund and Sorg 2001; Brewer 2005) and to further investigate both the origins/ century and journey of the remains. Ten crania excavated from the fill of the roadside ditches in Areas 1, 2/3 and 5 in 2015 will be submitted for scientific dating. Particularly important will be the spread of values when compared to the dating and phasing of the ditches from where they came. This will help to understand whether the crania could have entered the ditch soon after death or were secondary deposits, disturbed or washed out of graves or other features. MOLA aim to restrict the level of destructive sampling of human remains and as a general rule sample less than 50% of bones from any deposit. A total of ten samples, from a minimum number of 24 individuals, was considered sufficient for the purposes of characterising the assemblage within the roadside ditch deposits. The significance and size of this assemblage determined that scientific analysis concentrated on this in favour of other smaller disarticulated deposited of bone.

Several of the samples include rich and diverse food remains, including those from imported taxa such as figs and olives, which have the potential to provide information about diet and trade in the Roman period. Closer to home, the presence of ceramic tiles suggests trade across southern England. The very large and generally well-preserved animal bone assemblage has definite potential for further study of meat diet, with particular emphasis on selection of carcase-part, age-group and butchery techniques relating to butchery, consumption and disposal of beef, mutton, lamb and pork and, to a lesser extent, poultry and game.

The size of the assemblage is sufficient to allow comparison of the species, skeletal element, age and modification in the faunal groups derived from ditch, dump, metalling and make-up deposits and therefore allow analysis of spatial distribution of activity and disposal. The spatial distribution of non-consumed domesticates, in comparison with that of post-consumption waste, may provide an insight into the local distribution of carcase disposal practice.

Remains from structures and burials

The potential for further analysis of the historic woodwork, in general, is modest for the Roman period, although the limited woodwork found is part of the character of the use the extramural land. The two reused gates remain the focus of the analysis, but the more recent discovery of the finely-worked wooden window frame is also of considerable interest.

The road was well made and regularly maintained, with periodic re-cutting of the roadside ditches, as well as pothole and wheel rut repairs and one complete resurfacing. More work should be carried out on the roadside ditch sediments in order to build a better understanding of water-management, drainage and the local conditions. A combination of tree stumps and stakeholes found along the southern edges of two Roman ditches suggest a degree of landscape management. Stumps have also been found in situ on several sites lying to the south along the Walbrook valley, such as at Drapers Gardens and Token House Yard. It is anticipated that species identification work will assist in understanding the local vegetation during the Roman period.

A high proportion of the waterlogged plant remains seen at assessment came from wild plants, and, although some may have arrived on the site in dumped material, a large proportion would have arrived through natural dispersal from the local environment. Further analysis of plant groups from these assemblages should therefore make it possible to reconstruct aspects of the natural environment of the site, in particular the character of the ditches that cut across the site. Study of these wild plant remains should also be integrated

with that of micro-faunal analysis (5.15), namely molluscs and insects from the same samples, where present, in order to maximise the information about vegetation and landscape on and around the site throughout the period of formation.

The ostracod assessment highlighted the survival of seed, insect and freshwater mollusc (reiterating the clean nature of the wetland) remains for future analysis, which could provide a valuable insight into both the exact nature of the silting up/ infilling of the roadside ditches, as well as the environment and development of the later marsh. The causes of the latter's formation may be addressed fully, in relation to a reduction or change in human activity in the vicinity, and therefore whether its development is associated directly with Roman abandonment or the area.

The assessment has shown that palaeo-environmental preservation within the fine-grained and organic sediments provides potential for further work. However, this should be targeted in certain priority areas. Firstly, a broad suite of palaeo-environmental work is suggested (ie pollen, diatoms, plant macrofossils and radiocarbon dating) on the conditions and nature of two key archaeological features: the deposits underlying the road and the conditions of the later road side ditches. Secondly, a similar broad suite of palaeo-environmental work is suggested on the full natural sequence, focusing on the possible prehistoric organics at the base of the profile, the late to post Roman marsh at the centre and the medieval marsh towards the top. This would provide comparative data between the natural and the cultural elements, enabling a broad outline of the changing environment on site. It would also enable a targeted commentary on aspects of the human activity, notably landscape and activity changes, before and after the increased Roman activity signified by the road. Furthermore, in order to publically convey conclusions drawn from the proposed work in an easier and more appealing way the information should be summarised and depicted simply on an interpretative cross-section of the site and Walbrook valley, noting environments and human activity through time.

In terms of burial remains, it may be impossible to identify the specific reasons for the decapitations at Broadgate, though it should prove possible to determine whether it was the cause of death or conducted *post-mortem*. Decapitation and head displacement, while obviously linked to some extent, need not have been the work of the same party or indeed the result of the same motive. It is possible that each of these actions was the result of different, or even diametrically opposed, attitudes towards the individual (Milella et al 2015). Further evidence will come from the demographic profile and health status of the burials.

Radiocarbon dating of the three decapitated burials will be carried out in order to establish the period of use and possibly the minimum length of time the ground was used for this form of burial. Spot dating suggests an approximate range of AD120–160, earlier than the majority of Roman-British decapitation burials which tend to be 3rd- and 4th-century (Tucker, 2012, 243). Strontium and oxygen stable isotopes, supplemented by lead isotope analysis of the decapitated burial [6840] with sufficiently preserved teeth, will establish whether this individual was local to the London area or was raised elsewhere (Montgomery et al 2010). It may also provide indications of status: beheading was considered to be a suitable method of execution for Roman citizens.

The second chief area of interest involves the long-standing debate on the large number of crania recovered from riverine deposits in the upper Walbrook valley. Traditionally attributed to victims of decapitation during Boudica's revolt in AD 60/61 (RCHM(E) 1928, 16, n1), an argument now largely abandoned, the source of the crania is still disputed. Marsh and West (1981, 97) examined both museum collections and antiquarian accounts of large numbers of crania, concluding that their deposition was deliberate and was the result of Celtic religious activity, such as Iron Age head cults. Others have suggested that in some cases skulls were collected as war trophies or in veneration of ancestors (Tucker *ibid*, 17). Specific studies on human bone deposition in the Walbrook and other London rivers reflect continuing interest in the subject (Maloney 1990; Wilmott 1991; Knüsel and Carr 1995). Samples from three

further disarticulated skulls will be sent for radiocarbon dating. Ultimately further Bayesian analysis, by means of stratigraphic input, should improve the current model, as well as our knowledge of the taphonomic processes at work. Four disarticulated crania from the road side ditch contained sufficiently preserved dentitions for stable isotope analysis to be carried out on the teeth. As well as indicating the geographic origins of these individuals, evidence of diet may give indications of the broad range of foods consumed.

7 Significance of the data

With the help of archaeological evidence from the recent investigations, the story of the site of Crossrail's ticket hall at Broadgate can be charted more fully from its beginnings as a landscape of water channels and mud flats in the Walbrook valley, to its development as a managed Roman environment that enabled transport to skirt the Roman city along its northern edge.

The near complete pair of Roman yard gates, partially made of reused furniture timbers, is of national importance. They represent a class of timber construction very rarely found. Less than eight partially preserved doors and gates of various forms are known from Roman Britain. The other Roman woodwork found earlier and in this recent archaeological work is of local interest as part of the extramural setting; the same is true for the 'living' wood of the collection of trees in situ which also sheds some light on Roman arboricultural practices. In terms of evidence for skilled joinery, the recovery of the window glazing bar is of wider significance as a sample of an increase in Roman occasional use of elaborate paned-glass windows.

The Roman road would have crossed the eastern upper Walbrook tributary below what is now modern Blomfield Street and ran along the approximate line of Liverpool Street. At its eastern extremity, it is thought to have joined up with Ermine Street, a major Roman precursor to modern Bishopsgate that ran from Londinium to the north of England. To the west, the alignment of the road suggests that it may have connected with another road heading north from the town's fort. If so, it may have acted as a 'bypass' around the north of the town, allowing those using it to avoid entering the settlement. The road may have provided additional access for the digging of burials in the largely undeveloped land north of the town. Initial construction of the road is dated circa early to mid-2nd century, when Londinium was at its height, and it appears to have been in use for about a hundred years. Wheel ruts worn into the surface of the road, as well as pothole repairs and periodic re-cutting of the roadside ditches, demonstrate maintenance of this fairly substantial route.

The large collection of discarded hipposandals, recovered from either the surface or immediate vicinity of the road, is of significance on an international scale. If taken with the terrets and other finds from the immediate area, this transport assemblage forms probably the largest and most important of its type from Britain and perhaps amongst the largest from north-western Europe. It offers a genuine opportunity to push forward both our understanding of a widespread, but quite poorly understood class of objects (hipposandals), to better understand how London's road network functioned, as well as to fine-tune the role of this northern extra-mural area, in terms of the flow of goods and people into and out of Londinium.

Although Roman burial alongside roads outside of Londinium is to be expected, and decapitated burials are not rare in the Roman period, the burial of the individuals within the relatively unstable landscape of the Walbrook valley is of considerable interest. Periods of flooding, followed by relative stability, appear to have characterised the area. Evidence of this was seen in the form of large layers of alluvial clay, representing water coverage, across much of the site. A significant volume of disarticulated human bone recovered from remains of the Walbrook itself further attests to forays by the stream. With that in mind, there is a lack of evidence for flowing water in the ostracods or sediments, but this may be because the flows of water from flood events may not have persisted long enough for those indicators to be visible within the background signal of the stagnant ditch water. If the human bone is regarded as coarse material carried by high energy waters, then the fact that more human bone was recorded in the upper facies 2a deposits (ie the fast-flowing yellow gravel) than in the roadside ditch fills coincides with the interpretation that the former were accumulated high water energy deposits and the latter were low energy deposits.

There is the possibility that some of the bone was placed in the ditch as part of a 'tidying up' exercise after flooding: a charnel pit was also present by the road (Fig 12). Either way, the origins of the human remains present in the earliest roadside ditch are less conclusive - and a great deal more speculative - and it is likely that further analysis will shed more light on these processes.

It seems likely that some of the Roman individuals buried here met a violent death and evidence for execution will hopefully be confirmed during full analysis of the human remains. Although it is tempting to explain the large number of crania at Broadgate Ticket Hall in terms of the decapitated burials, the evidence shows that different mechanisms were at work. Both of the heads of the decapitated burials that survived had been buried with the bodies, not deposited elsewhere (ie with other heads) and the identification of potentially displaced burial goods in the Broadgate pottery assemblage cannot be overlooked. The additional presence of the cremation urn in situ demonstrates that a combination of funerary practices was being carried out.

Of significance is the heavy iron ring on the right forearm of one of the decapitated individuals [6853], which may have been added post-mortem, possibly to prevent the deceased from returning to haunt the living. In the case of a similar decapitation burial from York, with iron rings on the legs rather than the arms, it has been suggested that the individual may have been of high status, due to the value of iron at the time (Cool 2006, 3). Two burials with similarly heavy iron rings on their legs were found at Finsbury Circus (Harward et al 2015, 41–3). With all of these factors to consider, the combination of water flow and burial practices warrants further study in this area outside of the Roman city.

River management in the pre-Roman and Roman periods in this stretch of the Walbrook valley is poorly understood and may have been essentially undertaken on an essentially *ad hoc* basis but each change could have had an unforeseen knock-on effect on the river regime as a whole. However, it can be suggested that with little other evidence for consistent higher energy flow during this period, the coarse-grained sediments in the west of the site and Walbrook valley containing human bone were likely to have been reworked or eroded from elsewhere in the Walbrook valley and therefore deposited as part of a series of contemporary flood events. At least two events of primary coarse gravel deposition, followed by secondary fining upwards, as the flood waters abated, could possibly be identified within the sediment.

The stabilisation of the landscape (ie reduction of alluvial sedimentation and vegetation colonisation) could have been driven by the Roman abandonment of the area; the resulting lack of water management allowing widespread waterlogging as opposed to infrequent flooding. In addition, a reduction of human activities in the wider landscape would no longer increase erosion and subsequent alluvial sedimentation to such a degree. The presence of some artefactual remains within the deposits, however, suggest some activity and waste dumping onto the now marshy and vegetated wetland and this brings into question the level and type of inactivity after any form of Roman abandonment.

8 Publication project: aims and objectives

8.1 Revised research aims

The updated research design is presented here as a series of research aims which the archive has the potential to address. Original research aims were identified previously in section 3 and answered in section 6.1. They may have been reworded in light of the assessment of the archive. This section presents research aims for further analysis, where further analysis is needed.

- RRA-RM 1 Were the decapitated individuals executed?*
- RRA-RM 2 How did the human bones end up in the first Roman roadside ditch? Why do bones from the cranium dominate the assemblage and how does it compare with the assemblage recovered from the Walbrook channel?*
- RRA-RM 3 How do the probably displaced burial goods in the Broadgate assemblage relate to material from other cemetery sites? A priority for further analysis will be to identify all potential cemetery-related vessels across the site and examine their significance as a whole in relation to other cemetery material. Can the processes through which the redeposition occurred be clarified and better understood.*
- RRA-RM 4 Is it possible to characterise different types of Roman finds deposition on site in terms of rubbish dumping from within the city, finds related to local activity, votive deposition into the Walbrook, grave goods etc? Are any other finds likely to represent disturbed grave goods or relate to funerary rituals? How do assemblages from different areas/ context types vary?*
- RRA-RM 5 What can the hipposandals and related equipment tell us about transport and travel into, out of and around Londinium? Is it possible to characterise the assemblage to reveal more about its date and function? How does this compare to other assemblages with London and elsewhere?*
- RRA-RM 6 How common are shackles in Roman London and what is the significance of this shackle for activity at Broadgate in particular? Can additional parallels be found for this example to shed further light on its function, social context or date?*
- RRA-RM 7 What information can the plant assemblages provide about past activities and land-use on the site, in all periods? In particular, what species of tree formed a barrier at the side of roadside ditch?*
- RRA-RM 8 What can the wild plant, insect and mollusc assemblages tell us about the vegetation and appearance of the area, and is there any evidence of change through time?*
- RRA-RM 9 Can the environmental evidence be useful in characterising the depositional environment of the Walbrook channel? How does the regime of the stream relate to the depositional processes in, for example, the roadside ditches.*
- RRA-RM 10 Are the animal bone assemblages from ditch, dump, make-up and metallurgic deposits distinctive in terms of species, skeletal element, age at death, modification and disposal?*

8.2 Preliminary publication synopsis

The Roman/early medieval period results of the Broadgate ticket hall and Blomfield Street excavations and associated archaeological works will be published as a volume in the Crossrail Archaeology Series. The medieval and post-medieval sequence, principally relating to the New Churchyard, will be published as a companion volume in the series. The presence of the Moorfields Marsh provides a natural break in the sequence, which makes sense of the division in terms of all aspects of the data. The first publication would therefore broadly outline development on the site from the natural landscape through to the formation of the marsh during the later Roman period and later. The publication will aim to be to be c 70,000 words in length excluding additional appendices.

Introduction

About this book

background (Crossrail)

The archaeological site

the site in relation to the prehistoric/pre-Roman landscape and settlement

The site results

The course and environment of the prehistoric Walbrook

This section may include a discussion of the late Iron Age pottery and its context, though this section may migrate to the next part of the book depending on analysis results

Roman: in general this section will incorporate specialist data, However, 'boxed' inserts on the geoaerchaeology, selected finds groups and aspects of the burials will be included

Phase 1

Discussion of the character of the Walbrook valley in the 1st and 2nd centuries AD

Changes in the environment and nature of the Walbrook

The earliest Roman activity: dumping in an extramural environment.

The construction of the road and its relation to cemetery activity: the impact of the road upon the topography

The inhumations and other human osteological evidence

General discussion of burial practices

Discussion – the site in a 2nd century landscape?

Phase 2

Modifications to the road

The character of continued Roman activity, including the status of the adjacent cemetery.

Evidence for marsh development

Discussion

General discussion of the development of the site during the Roman period

Conclusions

Attainment of the research aims of the project

Revised research aims for the future

Overview: significance of the site to Roman Londinium

Specialist reports as appendices

Bibliography

8.3 Publication project: task sequence

Table 30 *Tabulated resource requirement of analysis and publication (does not include print and archive requirements)*

TASKS NUMBERED TO FOLLOW THOSE OF PXA2a. Tasks 24–118 and External Tasks E_6–E_11 and E_15–E_18 to be invoiced against ICE59. External Tasks E_12 – E_14 to be invoiced against item 10 'Off-Site - Laboratory Items' (Contract Ref C257-XRL-W-AEE-CRG03-5004)

Task No	Done by	X-rail approved grade	Task description	Resource (person days)
			STRATIFICATION (1) FINALISED LU/PERIOD STRUCTURE TO BE IN PLACE BY 26/02/2016	
25	STRATIFICATION TEAM/AT	3	Prepare detailed publication synopsis . This will comprise a description of the final form with estimated word count, figure and table lists. The synopsis will be disseminated to the project archaeologist (task to initiate 08/02/2016: FY15/16)	1.00
26	STRATIFICATION TEAM/AT	3	Finalisation of all datasets and sign-off on land-use/period structure (to run from 08/02/2016: FY15/16)	7.50
27	STRATIFICATION TEAM/AT	3	Production of detailed Landuse-period text for baseline report (to run from 08/02/2016: FY15/16)	7.50
				16.00
			CERAMIC BUILDING MATERIAL	
28	IB/MOLA CBM	8	Compare/integrate CBM assemblage with the stratigraphic sequence and all other available dating evidence	0.25
29	IB/MOLA CBM	8	Petrological identification of registered finds	0.125
30	IB/MOLA CBM	8	Write publication text and supporting grey literature	2.00
				2.38
			ROMAN POTTERY	
31	AT/MOLA RPOT	8	Spot date remaining 10 boxes of Roman pottery	5.00
32	AT/MOLA RPOT	8	Spot date Roman pottery from LSS85	1.00
33	AT/MOLA RPOT	8	Full integration of spot-date information with stratigraphic sequence on the Oracle database and checking of discrepancies to finalise phasing. Production of combination reports and interpretation.	2.50
34	AT/MOLA RPOT	8	Write discussion text on sequence of assemblages associated with the roadside ditch	1.00
35	AT/MOLA RPOT	8	Further research into parallels for unusual and rare vessels	2.00
36	AT/MOLA RPOT	8	Background reading and comparison of Broadgate potential displaced burial vessels with other London cemetery assemblages	2.00
37	AT/MOLA RPOT	8	Write thematic text discussing Broadgate pottery assemblage in comparison to other cemetery assemblages (incorporating results of task 3)	1.00
38	AT/MOLA RPOT	8	Compile burial catalogue of potential displaced accessory vessels (for inclusion in site archive to enable future comparison with cemetery material)	1.00
39	AT/MOLA RPOT	8	Compile catalogue of 4 mortaria stamps (for inclusion in site archive and dating purposes)	0.50
40	AT/MOLA RPOT	8	Liaison with and preparation/packing of pottery for external specialists	1.00
41	AT/MOLA RPOT	8	Refinement of dating of relevant contexts from analysis of samian by external specialist	1.00
42	AT/MOLA RPOT	8	Check illustrations/photographs @ 50 vessels per day	0.50
				18.50

Task No	Done by	X-rail approved grade	Task description	Resource (person days)
ROMAN REGISTERED FINDS				
43	MM/RREG	8	Complete basic finds research and produce final analysis level finds report for archive and digital dissemination: Integrate stratigraphic and finds information and read preliminary stratigraphic chronological narrative	0.50
44	MM/RREG	8	Update catalogue entries after conservation and re-examining objects and undertake additional research on selected objects of intrinsic importance (including dress accessories, grave goods, tools, styli and basic cataloguing of XSM10 hipposandals. The research of the hipposandal assemblage is covered by separate tasks below)	4.00
45	MM/RREG	8	Make final selection for illustration and create finds review boxes and update database	1.00
46	MM/RREG	8	Check illustrations	1.00
47	MM/RREG	8	Generate and finalise catalogue	2.00
48	MM/RREG	8	Write brief specialist summary discussing the significance of the finds and placing them in their typological and chronological context (excluding the hipposandals which are covered separately below)	2.00
49	MM/RREG	8	Hipposandal assemblage: additional research, catalogue, type and extract all available contextual information for the 19 hipposandals in the Museum of London and British Museum in addition to 2 from BCD03 and 2 from LSS85 to add these to the data from XSM10	1.50
50	MM/RREG	8	Hipposandal assemblage: update the pre-existing London data and distribution map to include XSM10 and other recent finds and add copper-alloy terrets	0.50
51	MM/RREG	8	Hipposandal assemblage: summarise contextual information and produce phased distribution mapping for all examples from excavated contexts in the Crossrail Broadgate area.	0.50
52	MM/RREG	8	Hipposandal assemblage: research topographical location of hipposandals in other Roman urban centres and within the wider landscape and their significance (will require visit to the Institute of Classical studies library).	1.00
53	MM/RREG	8	Hipposandal assemblage: write full analysis text for inclusion in the digital report	2.00
54	MM/RREG	8	Roman leather: Integration of the Roman leather finds within the site sequence	0.25
55	MM/RREG	8	Roman leather: production of catalogue (onto Oracle database) for approximately 14 accessioned Roman leather items. Summary of the finds within the site sequence, selection of finds for catalogue and illustration	1.50
56	MM/RREG	8	Write period by period chronological narrative for baseline archive report	2.00
57	MM/RREG	8	Produce text for Crossrail publication: Write a brief overview of the assemblage in terms of 'everyday life in Roman London' and local activity specific to the site tailored to principle author's text	2.00
58	MM/PRREG	8	Write thematic texts on grave goods (in situ and disturbed) and topographic significance of the assemblage (extramural dumping / activity) and edit text for transport (hipposandals etc).	1.50
59	MM/PRREG	8	Select a sub-set of illustrations for the popular book and write captions	0.25
				23.50
TIMBER - WOODWORK				
60	D Goodburn	8	Production of a fully referenced text and several draft figures including reconstructions of the Roman gates and the previous furniture use of some of the timbers. Does not include C14 or tree ring dating	6.00
				6.00

Task No	Done by	X-rail approved grade	Task description	Resource (person days)
ENVIRONMENTAL (1) HUMAN OSTEOLOGY				
61	MOLA osteo	8	Human bone recording: Record 7 contexts of articulated human bone (@ 2.5per day)	3.00
62	MOLA osteo	8	Inter context matching of elements	0.50
63	MOLA osteo	8	Fully record 26 disarticulated skulls	3.00
64	MOLA osteo	8	Stratigraphic consultation (burials and disarticulated deposits)	1.00
65	MOLA osteo	8	Photography – including disarticulated skulls (osteologist)	2.00
66	MOLA osteo	8	Inputting digital photographs details into Oracle	1.00
67	MOLA osteo	8	Osteologist preparation and set up of studio photography	1.00
68	MOLA osteo	8	Osteologist preparation and photography of biochemical samples	2.00
69	MOLA osteo	8	Human bone analysis: Liason with Senior Archaeologists and external specialists	1.00
70	MOLA osteo	8	Data interrogation and generation of tables	2.00
71	MOLA osteo	8	Integration of 2013 work	1.00
72	MOLA osteo	8	Production of baseline report	3.00
73	MOLA osteo	8	Integration of external text and tables	1.00
74	MOLA osteo	8	Editing to form publication report	1.00
75	MOLA osteo	8	Peer reviewed articles, public lectures and dissemination	2.00
				24.50
ENVIRONMENTAL (2) GEOARCHAEOLOGY (THE ENTIRETY OF THIS DISCIPLINE IS COSTED HERE, ALTHOUGH SOME OF THE RESULTS RELATING TO THE TOPMOST PART OF THE SEQUENCE MAY BE PRESENTED IN THE MEDIEVAL VOLUME)				
76	MOLA Geoarch	8	Managing and retrieval of core samples from long term stores	2.00
77	MOLA Geoarch	8	Prehistoric to Roman environment: Sub sampling and preparation of briefing notes for specialist(s)	0.50
78	MOLA Geoarch	8	Geoarchaeology integration of results	1.00
79	MOLA Geoarch	8	Roman roadside ditches: Sub sampling and preparation of briefing notes for specialist(s)	0.50
80	MOLA Geoarch	8	Geoarchaeology integration of results	1.00
81	MOLA Geoarch	8	Full natural sequence part 1 (prehistoric to late Roman) Sub sampling and preparation of briefing notes for specialist(s)	0.50
82	MOLA Geoarch	8	Geoarchaeology integration of results	1.00
83	MOLA Geoarch	8	sequence part 2 (late Roman to medieval) Sub sampling and preparation of briefing notes for specialist(s)	0.50
84	MOLA Geoarch	8	Geoarchaeology integration of results	1.00
85	MOLA Geoarch	8	Publication text and figures Write associated text	3.00
86	MOLA Geoarch	8	Update and turn schematic transect of the Walbrook from PXA, which used existing MOLA borehole data and placing the XSM10 sections within their landscape position into interpretative cross-section of the site and Walbrook valley noting environments and human activity through time to inform the archaeological interpretations and compare their contrasting environments and conditions.	1.50
87	MOLA Geoarch	8	Prepare illustrations for report which may include: section(s) / surface plot(s) /location plan/sample location	1.00
88	MOLA Principal Geoarch	8	Geoarchaeological management advice	1.00
				14.50
ENVIRONMENTAL (3) ANIMAL BONE				
89	AP/MOLA ANBN	8	Roman animal bone: Recording onto post-assessment database	10.00
90	AP/MOLA ANBN	8	Analysis and report preparation	10.00
91	AP/MOLA ANBN	8	Edit/archive	0.25
				20.25

Task No	Done by	X-rail approved grade	Task description	Resource (person days)
ENVIRONMENTAL (4) BOTANY				
92	KS/MOLA BOTANY	8	Roman accessing stratigraphic data & selection of samples for study (in consultation with strat. team)	0.50
93	KS/MOLA BOTANY	8	Scanning & id of 21 rich waterlogged samples	15.25
94	KS/MOLA BOTANY	8	ID of plant remains from sample residues	0.50
95	KS/MOLA BOTANY	8	Data entry, production & editing of tables	1.00
96	KS/MOLA BOTANY	8	Analysis and research, production of archive report	5.00
97	KS/MOLA BOTANY	8	Wood specied identifications of RREG	0.25
				22.50
CONSERVATION (NOMINAL 50% OF TOTAL COST FOR XSM10 PX WORK)				
98	CONS	8	Analysis and investigative work	37.00
99	CONS	8	Stabilisation	6.15
100	CONS	8	Detailed cleaning	20.35
				63.50
GRAPHICS (NOMINAL 50% OF TOTAL COST FOR XSM10 PX WORK)				
101	MOLA DO	8	Finds review: all staff	1.50
102	MOLA DO	8	Production of site location plans, topographic plots, photographs, transects, sections	15.00
103	MOLA DO	8	Illustration of maximum 35 vessels, 13 CBM, 23 PMGLASS, 7 CTP Estimate required from drawing office	20.00
104	MOLA DO	8	Production of graphics for human bone decapitations	0.25
105	MOLA DO	8	Geoarch illustrations	0.50
106	MOLA DO	8	Photography of selected items	5.00
107	MOLA PHOTO	8	Photography for human bone	0.75
				43.00
PUBLICATION TEXT				
108	AT	3	Integrate publication text	15.00
109	SR	6	Integrate publication text	30.00
				45.00
REVIEW AND INTERNAL EDIT				
110	MOLA/ME	3	Managing Editors all tech and content edit @ up to 4000 words p/d	18.00
111	STRATIFICATION TEAM	8	Authors revisions to text	2.00
112	MOLA DO	8	Revisions to figures/illustrations	2.00
113	MOLA/PXM	1	MOLA sign-off first draft to Crossrail	0.50
				22.50
PRODUCTION				
114	MOLA/TW	2	Design, layout, typesetting and production management	25.00
115	MOLA DO	8	Contributors proof sign off	2.00
116	MOLA/ME	3	Managing Editors proof sign off	4.00
117	MOLA/PXM	2	Oversee project and administration	10.00
118	MOLA/PXM	2	Project liaison with Crossrail for publication monthly meetings and progress reports	3.00
				44.00

Task No	Done by	X-rail approved grade	Task description	Resource (person days)
EXTERNAL SPECIALISTS (ANALYSIS)				
Task	Contractor		Task description	unit
Pottery				
(E) 6/6a	Jo Mills (EXT)		External specialist analysis of maximum 178 sherds (158 ENV) decorated samian vessels and 45 samian stamps	
(E) 7	ES		External specialist analysis of unusual mortarium from context [6694]	0.5
Registered finds				
(E) 8	G Bankhead (Ext)		Identification, catalogue and popular publication summary of lead cloth seals by external specialist Gary Bankhead	2
(E) 9	Colin Brain/ John Shepherd/ Hugh Willmott (EXT)		External comment/opinion re. glassmaking waste	
(E) 10	British Museum		Consultation on coins <1009>, <2710>, <2712>, <1243>, <1242>, <1228>	1
Metalworking				
(E) 11	Matt Phelps		Review the finalised stratigraphic details and update the chronological and spatial context of the material and write chronological narrative	1
Environmental				
(E) 15	External specialist		Analysis of insect remains	
Human Osteology				
(E) 16	CHRONO Belfast		Radiocarbon dating: £280 plus VAT per date(16 dates)	
(E) 17	Durham University/ University of Bradford)		Stable isotope analysis: £430 plus VAT per tooth sample (10 samples), £30 plus VAT per rib sample (1 sample), lead (Pb) analysis: £35 plus VAT (10 samples), report £600.00	
Tree-ring dating				
(E) 18	Dendro Consultancy		Provision for dating up to an additional 10 samples as required if viable	
(E) 19	Dendro Consultancy		Report	
External copy edit				
(E) 18	Copy edit		External copy edit	
SUB-TOTAL EXTERNALS (ANALYSIS)				

2) ITEMS TO BE CHARGED UNDER ITEM 10 'OFF-SITE - LABORATORY ITEMS' (CONTRACT REF C257-XRL-W-AEE-CRG03-5004)				
Geoarchaology				
(E) 12a	Rob Scaife		Pollen rapid analysis - prehistoric to Roman environment	5
(E) 12b			Pollen rapid analysis - Roman roadside ditches	8
(E) 12c			Pollen rapid analysis - prehistoric to late Roman	8
(E) 12d			Pollen rapid analysis - sequence part 2 (late Roman to medieval)	5
(E) 13a	Nigel Cameron		Diatom rapid analysis - prehistoric to Roman environment	5
(E) 13b			Diatom rapid analysis - Roman roadside ditches	8
(E) 13c			Diatom rapid analysis - prehistoric to late Roman	8
(E) 13d			Diatom rapid analysis - sequence part 2 (late Roman to medieval)	5
(E) 14a	Beta Analytic		Radiocarbon dating - prehistoric to Roman environment	1
(E) 14b			Radiocarbon dating - Roman roadside ditches	2
(E) 14c			Radiocarbon dating - prehistoric to late Roman	2
(E) 14d			Radiocarbon dating - sequence part 2 (late Roman to medieval)	2
SUB-TOTAL EXTERNALS (ANALYSIS)				

9 Acknowledgements

Acknowledgements for the 2011–2015 site (XSM10):

Museum of London Archaeology (MOLA) would like to thank Crossrail for funding the project, and in particular Jay Carver, lead archaeologist at Crossrail Ltd.

We would like to extend our thanks to: John Doyle, Luke Mason Iain Williamson, Marit Leenstra, Visu Mathan, James Wildgoose, Chris Sharples and, Rohan Perrin and Victoria Richardson (Crossrail); Brian Beatty, Siu Mun Li, Kieran Murphy, Rebecca McDonough, Martin McDonagh, Gintaras Gelazanskas, Vaidas Cvilikas, Valdas Dauparas, Tarlochan Singh, Balvir Ram, Mann H Singh and Petrit Bajraktari (LOR); Matt Hadden (VCUK); Thomas Cribbs and Sons (TCS), particularly Mark Lund; Chris Murray, Jon Booth and Seni Agidew (McNicholas); Lee Chapman, Tim MacKessy and Owen Sweeney (Galldris); as well as Neil Carlsson and Tom Bourke (JB Riney).

The fieldwork was managed by MOLA Project Manager Nicholas Elsdon, with Elaine Eastbury and Simon Davis; the post-excavation work was managed by Julian Hill and Fiona Seeley.

Excavation Team: the MOLA field team was led by Alison Telfer and comprised Andy Daykin, Gregory Laban, Robert Hartle, Serena Ranieri, Martin Banikov, Portia Askew, Robert Tutt, Stephen Foster, Sasathorn Charoenphan, Richard Ward, Jessica Bryan, Jeremy Taylor, Antonietta Lerz and Emily Wright. Steve White

James Alexander, Waltraud Baier, Vesna Bandelj, Adam Barker, Tony Baxter, Silvia Barlassina, Dan Bateman, Isa Benedetti, James Best, Charlotte Booth, Hannah Bosworth, Tanya Bowie, Barbora Brenderova, Matt Bosomworth, Andrew Brown, Ashley Bryant, Jonathan Buttery, Rose Calis, Jude Children, Harry Clarke, Tegan Daley, Jozef Doran, Brigid Geist, Chris Gerontinis, Cathernine Gibbs, Matthew Ginnever, Emily Glass, Catherine Godsiffe, Lara Gonzalez Carretero, Simon Davis, Daniel Harrison, Chris Hawksworth, Sam Herbertson, William Herring, Tim Johnston, Rebecca Jones, Bonnie Knapp, Giulia Lazzeri, Rachel Legge, Paul McGarrity, Karl Macrow, Laura Malric-Smith, Ruairi Manktelow, Alice Marconi, Sinead Marshall, Roberta Marziani, Charlotte Mecklenburgh, Jacqui Mellows, Tara Mundy, Lauren Neal, Cosimo Pace, Jorge Parreira, Dave Parry, Chris Pennel, Sam Pfizenmaier, Dalia Anna Pokutta, Stefano Ricchi, Philip Roberts, David Sankey, Gideon Simons, Gavin Smith, Jack Smith, Toria Stanfield, Mick Steel, Jessica Stevens, Alexa Stevenson, Leo Sucharyna Thomas, Mark Sycamore, Piotr Szmyd, Claudia Tommasino, Sarah Trehy, Adam Tuffey, Michael Tunnicliffe, Lorna Webb, Tomasz Wisniewski and Nicolas Zorzin.

Many thanks also to the Osteology team: Don Walker, Michael Henderson, Niamh Carty and Elizabeth Knox.

Other key MOLA staff to thank are Maggie Cox (photography), Raoul Bull, Mark Burch, Neville Constantine, Catherine Drew and Moises Hernandez Cordera (Geomatics), Mary Ruddy, Graham Spurr Jason Stewart and Virgil Yendell (geoarchaeology) and James Wright (worked stone). Karen Stewart,

Acknowledgements for the 1985–86 site (LSS85):

Particular thanks to Rosehaugh Stanhope Developments Plc, Arup Associates, the site management team of Bovis Construction Ltd and Griffith (McGee Demolition) for provision of funding, site plant, shoring, advice on excavation strategy, safety requirements and general site welfare.

The fieldwork was managed by John Maloney (DUA) and post-excavation by DUA Post Excavation Supervisor Frederike Hammer.

Excavation Team: Dick Malt, Ken Steedman, Tracy Wellman, Pam Mead, Craig Spence, Fiona Spence, Lis Dyson, Doug Killock, Wendy Murphy, Aedan Woodger, Simon Nicholls, Tony Mackinder, Marrieta Ryan, Portia Askew, Sue Cole, Deirdre Power, Jo Coomb, Julian Ayre and Chantalle Charron.

Other key staff to thank are Fiona Spence (Finds, Coffins and Skeletal Material, MOL), Bill White (Skeletal studies), Paul Tyres (Computer Applications, MOL), Julie Jones (Environmental), and Vanessa Harding (Historical Research, Birkbeck College, UL).

10 Bibliography

- Archaeological Archive Forum, 2011 *Archaeological Archives: a guide to best practice in creation, compilation transfer and curation* located on intranet and:
http://www.archaeologyuk.org/archives/aaf_archaeological_archives_2011.pdf
- Barber, B, and Bowsher, D, 2000 *The eastern cemetery of Roman London: excavations 1983–90*, MoLAS Monogr Ser 4, London
- Birley, R, 1977 *Vindolanda: A Roman frontier post on Hadrian's wall*, Thames and Hudson, London
- Blatherwick, S, and Bluer, R, 2009 *Great Houses, moats and mills on the southbank of the Thames*. MoLA Monograph 47
- Boylston, A, Knusel, C, Roberts, C A, and Dawson, M, 2000 Investigation of a Romano-British rural ritual in Bedford, England, *Journal of Archaeological Science*, 27(3), 241–54
- Brewer, V L, 2005 *Observed taphonomic changes and drift trajectory of bodies recovered from the tidal Thames, London, England. A 15 year retrospective study*, unpub MSc dissertation, Univ Bournemouth
- Brunning, R, 1996 *Waterlogged Wood*, English Heritage Guidelines 2nd edition
- Bryan, J, Tetreau, M, and Watson, S, in prep full title tbc *Bloomberg London: excavations 2005–14*, MOLA Monogr Ser
- Buikstra, J E, and Ubelaker, D H, (eds.) 1994 *Standards for data collection from human skeletal remains: proceedings of a seminar at the field Museum of Natural History*. Arkansas Archaeological Survey research series No. 44, Fayetteville, Arkansas
- Butler, J and Ridgeway, V, 2009 *Secrets of the Gardens: Archaeologists Unearth the Lives of Roman Londoners at Drapers' Gardens*, Pre-Construct Archaeology, London
- Butler, J, 2006 *Reclaiming the marsh: archaeological excavations at Moor House, City of London, 1998–2004*, PCA Monogr Ser 6
- Chartered Institute for Archaeologists, (CIFA), 2014 *By-Laws, Standards and Policy Statements of the Chartered Institute for Archaeologists, Standard and guidance: excavation*
- Chartered Institute for Archaeologists, (CIFA), 2014 *By-Laws, Standards and Policy Statements of the Chartered Institute for Archaeologists, Standard and guidance: the creation, compilation deposition and transfer of archaeological archives*
- Clarke, G, 1979 *The Roman Cemetery at Lankhills*, Oxford
- Connell, B, and Rauxloh, P, 2003 *A rapid method for recording human skeletal data (2nd edition)*. Museum of London Specialist Services
- Cool, H E M, 2006 *Selected Roman small finds from 3 Driffield Terrace and 6 Driffield Terrace, York*, unpub YAT rep
- Corporation of London Department of Planning and Transportation, 2004 *Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance*,.
- Crossrail, 2008 *Archaeology Detailed Desk Based Assessment Liverpool Street Station* (Doc. No. CR-SD-LIV-EN-SR-00001) [DDBA]

- Crossrail, 2009 *Archaeology Generic Written Scheme of Investigation* (Doc. No. CRPN-LWS-EN-SY-00009) [WSI]
- Crossrail, 2010, *Liverpool Street Station, Site-specific Written Scheme of Investigation* (Doc. No. C138-MMD-T1-RST-C101-00004, Rev.1.0) [SS-WSI]
- Crossrail, 2011 *C257 Method Statement Archaeological Evaluation and Watching Briefs Broadgate Ticket Hall* (Doc. No. C257-MLA-X-RGN-CRG02-50002, Rev.4.0), unpub MOLA report for Crossrail
- Crossrail, 2012a, *Watching Brief & Detailed Excavation – Blomfield Worksite – (XTB12) Blomfield Box* (Doc. No. C502-XRL-T1-RST-C101-50001, Rev.1.0) [WSI Addendum] (this supersedes the earlier addendum C138-MMD-T1-RST-C101-00005), unpub MOLA report for Crossrail
- Crossrail, 2012b *C257 Fieldwork Report Archaeological Evaluation & Watching Brief Broadgate Ticket Hall (XSM10)* (Doc. No. C257-XRL-X-XCS-CRG02-50010, Rev.2.0), unpub MOLA report for Crossrail
- Crossrail, 2012c *C257 Method Statement Archaeological Watching Brief, Evaluation, and Sample Excavation Broadgate Ticket Hall* (Doc. No. C257-MLA-X-RGN-CRG02-50046, Rev.4.0), unpub MOLA report for Crossrail
- Crossrail, 2012d *Central Section Project, Fieldwork Report, Archaeological Evaluation at 11–12 Blomfield Street (XSL10)* (Doc. No. C257-MLA-X-RGN-CRG02-50126, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2013a *C257 Method Statement Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Utilities Corridor* (Doc. No. C257-MLA-X-GMS-C101-50001, Rev.3.0), unpub MOLA report for Crossrail
- Crossrail, 2013b *C257 Fieldwork Report Crossrail Broadgate Ticket Hall Excavated Evaluation and GWBs, (XSM10)*(Doc No. C257-MLA-X-XCS-CRG02-50015, Rev. 2.0), unpub MOLA report for Crossrail
- Crossrail, 2013c *C257 Archaeology Central, Method Statement, Archaeological Targeted Watching Brief, Blomfield Box, 11–12 Blomfield Street* (Doc. No. C257-MLA-X-GMS-C101-50002, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2013d *C257 Archaeology Central, Method Statement, Archaeological Excavation, 11–12 Blomfield Street* (Doc. No. C257-MLA-T1-GMS-CRG03-50001, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2014a *C257 Method Statement Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Pile Line* (Doc. No. C257-MLA-T1-GMS-C101-50001, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2014b *C257 Method Statement Archaeological Excavation and General Watching Brief Archaeological Targeted Watching Brief Broadgate Area 5 West* (Doc. No. C257-MLA-T1-GMS-CRG03-50002, Rev.3.0), unpub MOLA report for Crossrail
- Crossrail, 2015a *C257 Method Statement for the Watching Brief and Excavation of the Crossrail Broadgate Ticket Hall Areas 1–6* (Doc. No. C257-MLA-T1-GMS-C101-5002, Rev.4.0), unpub MOLA report for Crossrail
- Crossrail, 2015b *C257 Fieldwork Report Archaeological Excavation and Watching Briefs Broadgate Ticket Hall Utilities Combined Report 2013 (XSM10)*(C257-MLA-T1-RGN-CRG03-50014, Rev.2.0), unpub MOLA report for Crossrail

- Crossrail, 2015c *C257 Fieldwork Report Crossrail Broadgate Ticket Hall Pile Line General Watching Brief (XSM10)*(Doc. No. C257-MLA-T1-RGN-CRG03-50072, Rev.2.0), unpub MOLA report for Crossrail
- Crossrail, 2015d *C257 Archaeology Central Fieldwork Report Blomfield Box Site Archaeological Watching Brief and Excavation Blomfield Box (XTB12)*(Doc. No. C257-MLA-X-RGN-CRG02-50126, Rev.1.0), unpub MOLA report for Crossrail
- Crossrail, 2015e *Post-excavation assessment and updated project design PXA02a* (Doc. No. C257-MLA-T1-ASM-CRG03-50001, Rev. 2a), unpub MOLA report for Crossrail
- Dennis, G, 1978 1–7 St Thomas Street, in Bird, J, Graham, A H, Sheldon, H L, and Townend, P (eds), 1978 *Southwark excavations 1972–4* (2 vols), Joint Publ London Middlesex Archaeol Soc/Surrey Archaeol Soc 1, 291–422, London
- Dyson, L, Malt, R, & Wellman, T, 1987 Excavations at Broad Street Station (LSS85), Parts 1 and 2: the Walbrook and associated features, MOLA unpub archive report
- English Heritage, 1991 *Management of Archaeological Projects (MAP2)*
- English Heritage, 1997 *The Management of Research Projects in the Historic Environment (MoRPHE) Project Planning Note 3: Archaeological Excavations.*
- English Heritage 2013 Science and the dead: a guideline for the destructive sampling, APABE
- Farwell, D, and Molleson, T, 1993 Poundbury, Vol 2: the cemeteries, *Dorset Natural History and Archaeological Society Monograph series* 11, Dorchester
- Gnecchi, *I Medaglioni Romani* (1912), p. 95, no. 9 (Pl. 107, no. 7)
- Goodburn, D, and Minkin, J, 2002 Timber Studies, in J, Ayre, and R, Wroe-Brown,
- Goodburn, D, Goffin, R, J, Hill and P, Rowsome 2011 Domestic buildings and other timber structures, in J. Hill and P. Rowsome. Roman London and the Walbrook stream crossing. MOLA monograph 37, London
- Haglund, W D, and Sorg, M H, 2001 Human remains in water environments, in *Advances in forensic taphonomy: method, theory and archaeological perspectives* (eds W D Haglund and M H Sorg), 202–216, Boca Raton
- Harman, M, Molleson, T I, and Price, J L, 1981 Burials, bodies and beheadings in Romano-British and Anglo-Saxon cemeteries, *Bulletin British Museum of Natural History (Geology)* 35, 145–188
- Harward, C, Powers, N, and Watson, S, 2015 *The upper Walbrook valley cemetery of Roman London: excavations at Finsbury Circus, City of London, 1987-2007*, MOLA Monogr Ser 69, London
- Howe, M D, Perrin, J R, and Mackreth, D F, 1980 *Roman pottery from the Nene valley: a guide*, Peterborough City Mus Occas Pap 2, Peterborough
- Hunting, P, Malt, D, Bennet, J and Gray, C, 1991 *Broadgate and Liverpool Street Station*, London Rosehaugh Stanhope Developments
- Knüsel, C J, and Carr, G C, 1995 On the significance of the crania from the River Thames and its tributaries, *Antiquity* 69, 162–69
- Mackinder, A, 2000 *A Romano-British cemetery on Watling Street: excavations at 165 Great Dover Street, Southwark, London*, MoLAS Stud Ser 4, London

- Maloney, C, with de Moulins, D, 1990 *The Upper Walbrook in the Roman Period*. CBA Research Report 69
- McKenzie, M, and Thomas, C, in prep *The northern cemetery of Roman London: excavations at Spitalfields Market, London E1, 1991–2007*, MOLA Monogr Ser, London
- Milella, M, Mariotti, V, Belcastro, MG, Knüsel, CJ, 2015 Patterns of irregular burials in Western Europe (1st-5th Century A.D.), *PLoS ONE* 10(6): e0130616
- MOLA (Ruddy), 2015 *Radiocarbon dating of Roman tooth samples from the Crossrail Broadgate Tickethall (XSM10)*, unpub MOLA report
- Montgomery, J, Evans, J A, Chenery, S R, Pashley, V, and Killgrove K, 2010 'Gleaming, white and deadly': using lead to track human exposure and geographic origins in the Roman period in Britain, *Journal of Roman archaeology* suppl ser 78, 199–226
- Montgomery, J, Knüsel, C, Tucker K, 2011 Identifying the origins of decapitated male skeletons from 3 Driffield Terrace, York, through isotope analysis: reflections of the cosmopolitan nature of Roman York in the time of Caracalla, in *The bioarchaeology of the human head: decapitation, decoration and deformation* (ed M Bonogofsky), Gainesville (FL), 141–78
- Museum of London (2002) *A Research Framework for London Archaeology. Museum of London (Authors Bateman et al, eds Nixon, Macadam, Tomber and Swain)*
- Museum of London, 2009 *General standards for the preparation of archaeological archives deposited with the Museum of London* <http://www.museumoflondon.org.uk/collections-research/laarc/standards-deposition/> Museum of London, 2002 A research framework for London archaeology 2002
- Nawrocki, S P, Pless, J E, Hawley, D A, and Wagner, S A, 1997 Fluvial transport of human crania, in *Forensic taphonomy: the post-mortem fate of human remains* (eds WD Haglund and M H Sorg), 529–52, Boca Raton
- Philpott, R, 1991 *Burial practices in Roman Britain: a survey of grave treatment and furnishing A.D. 43–410*, BAR Brit Ser 219, Oxford
- RCHM(E), 1928 Roy Comm Hist Monuments (Engl), *An inventory of the historical monuments in London: Vol 3, Roman London*, London
- RIC (Roman Imperial Coinage) 1 (1923) Sutherland, C H V and Carson, R A G *Roman imperial coinage: Vol 1, From 31 BC to AD 69*, rev edn 1984, London
- RIC 2 (1926) Mattingly, H, and Sydenham, E A, 1926 *Roman imperial coinage: Vol 2, Vespasian to Hadrian*, London
- RIC 3 Mattingly, H, and Sydenham, E A 1930 *Roman imperial coinage: Vol 3, Antoninus Pius to Commodus*, London
- RIC 4(1) Mattingly, H, and Sydenham, E A 1936, 1938 and 1949 *Roman imperial coinage: Vol 4(1), Pertinax to Uranius Antoninus*, London
- RIC 5(1) Webb P H, 1927 *Roman imperial coinage: Vol 5(1), Valerian I to Florian*, London
- RIC (7) Bruun, P M, 1966 *Roman imperial coinage: Vol 7, Constantine and Licinius, AD 313 to 337*, London
- Seeley, F, in prep, Religious and ritual imagery on Roman pottery, JRPS
- Spence, C (ed), 1990 *Archaeological Site Manual*, Museum of London, 2nd edition.

- Swift, D, 2003 Roman burials, medieval tenements and suburban growth, 201 Bishopsgate, City of London, MOLA Archaeological Studies Series 10, London
- The London Millennium Bridge, excavations of the medieval and later waterfronts at Peter's Hill, City of London, and Bankside, Southwark, MOLA Archaeological Studies Series 6, London
- Thorp, A, 2015, The Roman pottery in Harward, C, Powers, N, and Watson, S, 2015 *The upper Walbrook valley cemetery of Roman London: excavations at Finsbury Circus, City of London, 1987-2007*, MOLA Monogr Ser 69, London
- Toynbee, JMC, 1944, Roman medallions: their scope and purpose, *The Numismatic Chronicle and Journal of the Royal Numismatic Society* Sixth Series, Vol. 4, No. 1/4 (1944), 27-44
- Tucker, K, 2012 "Whence this severance of the head?" *the osteology and archaeology of human decapitation in Britain*, Winchester
- Tucker, K, 2014 The osteology of decapitation burials in Roman Britain: a post-mortem burial rite? in *The Routledge handbook of the bioarchaeology of human conflict* (eds C Knüsel and M Smith), Abingdon, 213–36
- Tyers, I, 2014 *Tree-ring spot-dates of archaeological samples: Crossrail Broadgate Ticket Hall, Liverpool Street, City of London (sitecode XSM10)*, Dendrochronological Consultancy Limited Report No. 658
- Watson, S, 2003 *An excavation in the western cemetery of Roman London: Atlantic House, City of London*, MoLAS Archaeol Stud Ser 7, London
- Wells, C, 1982 The human burials, in *Romano-British Cemeteries at Cirencester* (eds A McWhirr, L Viner, and C Wells), 135–202, Cirencester
- Wilmott, T, 1991 *Excavations in the Middle Walbrook Valley*, London and Middlesex Archaeological Society special paper 13, London

11 OASIS archaeological report form

OASIS ID: molas1-241917	
Project details	
Project name	Crossrail Broadgate Ticket Hall
Short description of the project	<p>Following previous fieldwork in 2011 to 2013, a final phase of excavation and watching briefs was undertaken at the site, located at the western end of Liverpool Street. A further three large open area trenches were investigated. Remains of the Walbrook stream itself were seen at the western edge of the site, comprising bands of alluvial clay and gravel. No human activity was present in the earliest phase of these bands, but a later sequence dated to the Roman period. A shallow series of deposits containing late Iron Age pottery and burnt flint suggests prehistoric activity on the site. Evidence was found for several phases of Roman activity between the first half of the 2nd century and the 4th century; the earliest phases took the form of water management. A c mid- 2nd century road was traced across the entire site. Roman burial activity to the south of the road included up to eight articulated individuals burials, three of which showed signs of decapitation. The post-Roman to medieval sequence was characterised by a series of marsh deposits. Reclamation of this marsh occurred between the 12th and early 15th centuries, and evidence was found of the revetment of the Walbrook stream to the west of the site. This period was also characterized by a series of large boundary/drainage ditches. Post-medieval archaeological remains also included early garden features. Further remains of the 'New Churchyard' (1569-1739) were excavated, including burials, boundary walls and burial structures. Archaeological remains associated with the developed of the site from the mid-18th century were discovered, as well as remains representing the construction of Liverpool Street (the road) (1823-24) and Broad Street Station (1864-65).</p>
Project dates	Start: 09-12-2013 End: 09-10-2015
Previous/future work	Yes / Not known
Any associated project reference codes	XSM10 - Sitecode
Any associated project reference codes	molas1-111282 - OASIS form ID
Any associated project reference codes	molas1-166476 - OASIS form ID
Any associated project reference codes	molas1-124320 - OASIS form ID
Type of project	Field evaluation
Site status	Area of Archaeological Importance (AAI)
Current Land use	Transport and Utilities 1 - Highways and road transport
Monument type	ROAD Roman
Monument type	BOUNDARY DITCH Post Medieval
Monument type	WALLS Post Medieval
Significant Finds	COINS Roman
Significant Finds	COINS Medieval
Significant Finds	COINS Post Medieval

Project location	
Country	England
Site location	GREATER LONDON CITY OF LONDON CITY OF LONDON Crossrail Broadgate Ticket Hall
Postcode	EC2M 7NH
Study area	2741 Square metres
Site coordinates	TQ 81610 33028 51.067225456787 0.592343408529 51 04 02 N 000 35 32 E Point
Site coordinates	TQ 81603 33054 51.067461261494 0.592256654536 51 04 02 N 000 35 32 E Point
Height OD / Depth	Min: 6.4m Max: 11.8m
Project creators	
Name of Organisation	MOLA
Project brief originator	Crossrail
Project design originator	Crossrail
Project director/manager	Nicholas Elsdon
Project director/manager	Simon Davis
Project supervisor	Alison Telfer
Project supervisor	Andy Daykin
Project supervisor	Greg Laban
Project supervisor	Rob Tutt
Project supervisor	Serena Ranieri
Project supervisor	Portia Askew
Project supervisor	Martin Banikov
Project supervisor	Catherine Gibbs
Project supervisor	Jez Taylor
Project supervisor	Jessica Bryan
Project supervisor	Robert Hartle
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Crossrail
Project archives	
Physical Archive recipient	LAARC
Physical Contents	"Animal Bones", "Ceramics", "Environmental", "Glass", "Human Bones", "Industrial", "Leather", "Metal", "Textiles", "Wood", "Worked bone", "Worked stone/lithics", "other"
Digital Archive recipient	LAARC
Digital Contents	"Stratigraphic", "Survey"

Digital Media available	"Database","GIS","Images raster / digital photography","Moving image","Spreadsheets","Text"
Paper Archive recipient	LAARC
Paper Contents	"Stratigraphic","Survey"
Paper Media available	"Context sheet","Correspondence","Diary","Drawing","Map","Matrices","Notebook - Excavation"," Research"," General Notes","Section"
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	BROADGATE Liverpool Street and Blomfield Street London EC2M (XSM10, LSS85 and XSL10 / XTB12) PXA01
Author(s)/Editor(s)	Telfer, A
Author(s)/Editor(s)	Hill, J
Date	2016
Issuer or publisher	MOLA
Place of issue or publication	London
Description	Unpublished A4 PXA report
Project bibliography 2	
Publication type	Grey literature (unpublished document/manuscript)
Title	BROADGATE Liverpool Street and Blomfield Street London EC2 (XSM10, LSS85 and XSL10 / XTB12) PXA02
Author(s)/Editor(s)	Hartle, R
Author(s)/Editor(s)	Hill, J
Date	2016
Issuer or publisher	MOLA
Place of issue or publication	London
Description	Unpublished A4 PXA report
Project bibliography 3	
Publication type	Grey literature (unpublished document/manuscript)
Title	BROADGATE TICKET HALL (XSM10) Liverpool Street Station London EC2M (XSM10) PXA02a
Author(s)/Editor(s)	Walker, D
Author(s)/Editor(s)	Henderson, M
Author(s)/Editor(s)	Knox, E
Author(s)/Editor(s)	Carty, N
Author(s)/Editor(s)	Hill, J
Date	2016
Issuer or publisher	MOLA
Place of issue or publication	London

Description	Unpublished A4 PXA report
Entered by	Robert Hartle (rhartle@mola.org.uk)
Entered on	8 February 2016

Appendix 1: management, delivery and quality control

MOLA is a 'Registered Organisation' with the archaeological professional body, the Chartered Institute for Archaeologists (CIfA). The *CIfA Register* is a rigorous Quality Assurance scheme for archaeologists. In order to be accepted, MOLA has passed a Board resolution to comply with the CIfA Code of Conduct and Standards, to demonstrate that compliance through bi-annual re-registration, to submit to regular IfA inspections, and to ensure that all MOLA activities are under the overall direction of a Member grade (MifA) 'responsible post-holder'. The Registered Organisation scheme also provides procedures for investigating and handling of external complaints.

MOLA is also currently working with a specialist consultant towards achieving the ISO9001 Quality Management standard.

MOLA subscribes to and abides by the general principles and specific terms of the *Code of Good Practice On Archaeological Heritage in Urban Development Policies* established by the Cultural Heritage Committee of the Council of Europe, and adopted at the 15th plenary session in Strasbourg on 8-10 March 2000 (CC-PAT [99] 18 rev 3). In particular to the following points: *...archaeologists shall be aware of development costs and adhere to agreed timetables* (Para 3 'The Role of the Archaeologist'), with all work 'carried out to written statements setting out standards timetables and costs' (para 4 *ibid*).

MOLA further subscribes to and ensures that its activities comply with and/or are guided by the following policies, procedures and guidance:

- Appropriate local and regional planning authority archaeology guidance – eg for London: Historic England, *Standards for archaeological work* (2015)
- Appropriate Archaeological Research Framework for the region – eg for London: English Heritage Archaeology Division, *Research Agenda* (1997); Museum of London, *A research framework for London archaeology* (2002); and *Historic Environment Research Strategy for Greater London* (in prep. CBA/MoL/Rowsome).
- English Heritage, *Management of Archaeological Projects* (MAP2), (1991)
- English Heritage Centre for Archaeology, *Guidelines* (various)
- Museum of London Archaeological Service, *Archaeological Site Manual* (1994)
- Museum of London Archaeological Service, *Archaeological Finds Procedure Manual* (2006)
- National archive disposition standards including Museum and Galleries Commission, *Standards in the Museum Care of Archaeological Collections* (1992) and Society of Museum Archaeologists, *Towards an Accessible Archaeological Archive: the Transfer of Archaeological Archives to Museums: Guidelines for Use in England, Northern Ireland, Scotland and Wales* (1995)
- Relevant local archive deposition standards, eg for London, Museum of London, *General Standards for the preparation of archaeological archives deposited with the Museum of London*, (2009).

MOLA governance and organisational strategy are determined by the Senior Management Group (SMG), led by the Chief Executive Officer and comprising the Finance Director, the Head of Operations, and four Directors heading the Planning, Development Services Research & Education and Northampton divisions. The SMG reports regularly to an independent Board of Trustees, who oversee MOLA's performance and strategic direction. As a charitable company MOLA is monitored and regulated by the Charities Commission.

All written documentation, eg initial '*written scheme of investigations*' ('*wsis*'), evaluation reports, post-excavation *Assessment Reports* and final publications undergo stages of internal review and sign-off prior to final issue to clients. For both field and reporting work PMs and SSs meet and liaise with the client and the Local Authority's archaeological advisor

or officer to ensure delivery according to wsis and to review progress, research aims, archaeological procedures, and site strategies as appropriate..

At all stages, what constitutes an appropriate archaeological response will be assessed against criteria of local, regional and national significance and within frameworks of valuable archaeological research topics identified in local or regional Archaeological Research Frameworks (where these exist).

Appendix 2: botany tabulation

Table 31 Summary of botanical assessment data (Roman)

A: abundance, D: diversity (1 = occasional, 2 = moderate, 3 = abundant) F: Flot, W: Residue

Sample	Context	Flot. Vol.	Process	Charred grain		Charred chaff		Charred seeds		Charred misc		Charred wood		W'logged seeds		W'logged misc		Mineralised seeds		Comments
				A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
11	299	200	F									1	1	3	3	1	1			WET,&DRY WASTELAND PLANTS. V MANY SNAILS
12	306	300	F									1	1	3	3	3	3			WET.WET, & DRY DISTBD GND SEEDS
13	309	800	F									1	1	3	3	3	3			WET.MOSTLY DRY GRND PL - STABLE WASTE?
14	314	100	F									1	1	3	3	3	3			WET. WET & DRY GROUND PLANTS
31	979	100	F									1	1	3	3	3	1			WET. MUCH STEM/RT.WETLND & DISTBD SEEDS
31	979	100	W									1	1			1	1			2 BAGS
33	1019	150	F									1	1	3	3	3	1			WET. MARGINAL WETLAND SPP, ROOTS
35	1029	20	F											1	1	3	1			WET. ROOTS/ROOTLETS. DISCARDED
42	1041	80	F									1	1	3	3	3	2			WET. WETLAND PLANTS, MANY MOLLUSCS
43	1042	80	F	1	1							1	1	3	3	3	1			WET. MOSTLY MARG WETLAND SPP.
45	1035	800	F									1	1	3	2	3	1			WET. USUAL WETLAND ETC SEEDS
45	1035	800	W											1	1					FEW CERATOPHYLLUM SEEDS
46	1037	120	F											3	2	3	1			WET.MOST AQUAT/WETLAND SPP.
47	1036	1600	F					1	1			2	1	3	3	3	3			WET.V RICH.FEW FOODS,BOX LVS
47	1036	1600	W											1	1					FEW FOODS, INCL ?OLE
52	1054	50	F									2	1	2	2	3	2			WET. ROOTLETS, FEW SEEDS
53	1047	800	F									1	1	3	3	3	3			WET. MOSTLY WETLAND SPP.
56	1063	100	F													3	1			WET.LUMPS OF DECAYED WOOD. NO SEEDS. DIS
57	1063	200	F											1	1	3	1			DECAYED WOOD/ROOTS. DISCARDED.ALSO {56}
59	1068	150	F											3	3	3	3			WET. MOST AQU/WETLAND SPP.
59	1068	150	W					1	1											1 VITVI
60	1070	200	F											3	3	3	2			WET. FEW FOODS, WETLAND SPP.
61	1071	150	F											3	3	3	3			WET. WETLAND & DRY SPP.

Sample	Context	Flot. Vol.	Process	Charred grain		Charred chaff		Charred seeds		Charred misc		Charred wood		W'logged seeds		W'logged misc		Mineralise d seeds		Comments
				A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
62	1072	200	F									1	1	3	3	3	1			WET. DRY & WET GRND SPP.
63	1073	400	F											3	3	3	3			WET. MANY MOLLUSCS. MOD DIV SEEDS
64	1074	400	F									1	1	3	2	3	1			WET. MOSTLY AQU/WETLAND SPP, LOW DIVERSI
65	1085	800	F											3	3	3	2			WET. SML WOOD FRAGS, SEEDS V SPARSE
66	1096	350	F									1	1	2	2	3	1			WET. MOSTLY MOSS
76	1335	300	F									1	1	2	2	3	1			WET. MOSTLY WOOD FGS, INCL ROUNDWOOD
77	1337	500	F											2	1	3	3			2 BAGS. WET. LEAF LITTER?
83	1397	200	F			1	1	1	1			2	1	2	2	3	1			WET.
84	1401	70	F									1	1	3	2	3	2			WET. V FINE SEDIMENT
89	1403	20	F									1	1	2	2	3	1			WET. V FINE (MOST <1MM).WETLAND
90	1430	250	F											3	2	3	1			WET.
90	1430	250	W											1	1					FEW FOODS
93	1429	60	F									1	1	2	2	3	2			WET. MANY CAREX SEEDS
95	1437	600	F			1	1					1	1	3	2	3	1			WET.
99	1446	10	F											1	1	3	2			WET.FEW SEEDS
101	1442	20	F											1	1	3	1			WET. ALL ROOTS.
113	2071		F									1	1	1	1	3	1			
330	6496	25	F									1	1	1	2	1	1			
331	6582	150	F											2	2	2	1			
334	6586	150	F									1	1	2	3	2	2			
338	6710	300	F									3	1	1	1					V.F CHARCOAL (NON-OAK)
338	6710	300	W									3	1							
340	6741	400	F									1	1	3	3	2	1			
341	6730	350	F	1	1			1	1			1	1	2	2	2	1			
342	6716	500	F											3	3	2	1			
343	6743	400	F									1	1	3	2	3	1			
350	6747	700	F											3	3	3	2			WOOD CHIPS
354	6766	400	F					1	1			1	1	2	3	2	2			

Sample	Context	Flot. Vol.	Process	Charred grain		Charred chaff		Charred seeds		Charred misc		Charred wood		W'logged seeds		W'logged misc		Mineralise d seeds		Comments
				A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
355	6738	800	F									1	1	3	2	2	2			
355	6738	800	W											1	1					
389	6778	500	F									1	1	1	2	3	1			
391	6795	250	F									1	1	2	2	2	1			
421	8433	600	F									1	1	3	2	3	2			2 BAGS BIG BLACK INDET
422	8439	150	F									1	1	2	2	2	1			
423	6781	500	F									1	1	3	3	2	1			
424	6781	500	F									1	1	3	3	2	1			
425	6741	200	F	1	1							1	1	3	2	1	1	2	2	
426	8363	430	F									1	1	3	3	2	1			2 BAGS
426	8363	430	W											1	1					
427	6770	500	F											3	3	3	1			2 BAGS
433	6556	400	F									1	1	3	3	2	1			
435	6868	100	F											2	2	1	1			
436	6870	40	F									1	1	1	1	2	1			
437	6872	150	F									1	1	2	2	2	2			
438	6875	400	F									1	1	3	3	2	1			
439	6879	150	F	1	1									2	1	2	1			
441	6757	600	F									1	1	3	3	2	2			
600	8784	150	F									1	1	1	1	3	1			
601	8475	20	F									1	1	2	2	1	1			
602	8476	20	F									1	1	1	2					
603	8477	25	F											1	2	2	1			
604	8478	20	F											1	1	3	1			
605	8479	20	F											1	1	2	1			
606	8480	10	F											1	1	1	1			
607	8481	50	F									1	1	1	1	2	1			
608	8482	40	F									1	1	1	1					

Sample	Context	Flot. Vol.	Process	Charred grain		Charred chaff		Charred seeds		Charred misc		Charred wood		Wlogged seeds		Wlogged misc		Mineralised seeds		Comments
				A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
609	8483	200	F											1	2	1	1			
610	8484	20	F					1	1			1	1	1	1	2	1			
611	8485	40	F									1	1	1	1	1	1			
612	8486	20	F											1	1	1	1			
613	8487	30	F											1	1	2	1			
615	8489	15	F									1	1	1	1					
616	8490	20	F									1	1	1	1	1	1			

Appendix 3: disarticulated human bone tabulation

Table 32 A summary table of disarticulated human bone.

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
2076	Skull	Frontals, parietals, temporals, occipital	?Female	Adult	Porotic hyperostosis	Pale colouring, orange staining	1	0
2076						MNI	1	0
+	L. limb	Right femur	-	Adult	-	-	1	0
+						MNI	1	0
6557	Skull	Mandible	?Male	Adult	Antemortem tooth loss	-	1	0
6557						MNI	1	0
6562	Torso	Left rib	-	Adult	-	-	1	0
	U. limb	Left 1st metacarpal	-	Adult	-	-	1	0
6562						MNI	1	0
6574	Skull	Left parietal, occipital	?Female	Adult	-	-	1	0
6574						MNI	1	0
6602	U. limb	Left humerus	-	Adult	-	-	1	0
6602						MNI	1	0
6611	Torso	Right rib	-	Adult	-	-	1	0
6611						MNI	1	0
6689	Torso	Right rib	-	Adult	-	-	1	0
6689						MNI	1	0
6694	Skull	Left zygomatic	-	Adult	-	-	1	0
	U. limb	Left humerus	-	Adult	-	-	1	0
6694						MNI	1	0
6716	Skull	Right frontal, occipital	Female	Adult	Antemortem tooth loss, enamel hypoplasia	-	1	0
		Right parietal, occipital	-	Adult	-	Dark staining, polishing	1	0
	U. limb	Left humerus	-	Adult	-	-	1	0
6716						MNI	2	0
6726	Skull	Left parietal	-	Adult	-	-	1	0
	Torso	Right & left rib	-	Adult	-	-	1	0
	L. limb	Left fibula	-	Adult	-	-	1	0
6726						MNI	1	0
6747	Skull	Right parietal	-	Adult	-	-	1	0
	U. limb	Left humerus	-	Adult	-	-	1	0
		Right radius	-	Adult	-	-	1	0
	L. limb	Left ilium	Male	Adult	-	-	1	0
6747						MNI	1	0
6752	Skull	Frontals, parietals, left temporal, occipital	-	Adult	Porotic hyperostosis	Dark staining, polishing	1	0
6752						MNI	1	0
6766	U.	Right humerus	-	Adult	-	-	1	0

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
	limb							
		Left humerus	-	Adult	-	-	1	0
	L. limb	Right ilium, ishium & pubis	Male	Adult	-	-	1	0
		Left femur & fibula	-	Adult	-	-	1	0
6766						MNI	1	0
6771	Skull	Left parietal & zygomatic	-	Adult	-	-	1	0
	U. limb	Left ulna	-	Adult	-	-	1	0
6771						MNI	1	0
6772	Skull	2 x right parietals	-	Adult	-	-	2	0
	Torso	Right rib	-	Adult	-	-	1	0
	U. limb	Left scapula	-	Adult	-	-	1	0
		Right clavicle	-	Adult	-	-	1	0
		Left clavicle	-	Adult	-	Small cut marks	1	0
		Right humerus	-	Adult	-	-	1	0
		2 x left humeri	-	Adult	-	-	2	0
	L. limb	3 x left femora, right tibia and fibula, left fibula	-	Adult	-	-	3	0
6772						MNI	3	0
6777	Skull	Left zygomatic	-	Adult	-	-	1	0
	Torso	2 x left ribs	-	Adult	-	-	1	0
	U. limb	Left humerus	-	Adult	-	-	1	0
	L. limb	Right femur, 3 x left femora, right tibia & fibula, left tibia, 5 x left metatarsals, 3 x proximal phalanges, middle phalanx, distal phalanx	-	Adult	-	-	3	0
		Right femur	-	13–16 years	-	-	0	1
6777						MNI	3	1
6780	Skull	Right parietal, occipital	-	Adult	-	-	1	0
6780						MNI	1	0
6781	Skull	Mandible	?Female	Adult	-	-	1	0
	Torso	Right rib, 3 x left ribs	-	Adult	-	-	1	0
	U. limb	Right humerus	-	Adult	-	-	1	0
	L.limb	Right femur, 2 x left femora, right fibula	-	Adult	-	-	2	0
6781						MNI	2	0
6783	Skull	Mandible	?Male	Adult	-	-	1	0
6783						MNI	1	0
6793	U. limb	Right radius	-	Adult	-	-	1	0
6793						MNI	1	0
6795	Skull	2 x mandibles	?Male	Adult	2 x enamel hypoplasia	-	2	0
	U.	Left scapula	-	Adult	-	-	1	0

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
	limb							
		2 x right humeri	-	Adult	-	-	2	0
		2 x right ulnae	-	Adult	-	-	2	0
	L. limb	2 x right femora, 5 x left femora, 6 x right tibiae, 3 x left tibiae, 3 x right fibulae, left fibula	-	Adult	Periostitis: right tibia, 2 x left tibiae	-	6	0
		Right ischium, Left ilium & ischium, right femur	-	Subadult	-	-	0	1
		Right & left ilium, right and left ischium	Male	Adult	-	-	1	0
		Left ilium & ischium	Female	Adult	-	-	1	0
6795						MNI	6	1
6800	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, left zygomatic	Female	Adult	Enamel hypoplasia	Dark staining	1	0
6800						MNI	1	0
6801	Skull	Frontals, parietals, temporals, sphenoid, occipital, left zygomatic	Male	Adult	-	Dark staining, polishing	1	0
6801						MNI	1	0
6802	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, zygomatics, nasal bones	Male	Adult	Deviated septum	Dark staining, polishing	1	0
6802						MNI	1	0
6803	Skull	Frontals, parietals, temporals, sphenoid, occipital	?Male	Adult	Healed blunt force injury, porotic hyperostosis	Orange staining	1	0
6803						MNI	1	0
6804	Skull	Frontals, parietals, temporals, occipital	-	Adult	-	Dark staining, polishing	1	0
6804						MNI	1	0
6805	Skull	Frontals, parietals, temporals, sphenoid, occipital	?Male	Adult	-	Dark staining	1	0
6805						MNI	1	0
6806	Skull	Frontals, parietals, temporals, sphenoid, occipital, zygomatic	Male	Adult	-	Scratches	1	0
6806						MNI	1	0
6807	Skull	Frontals, parietals, temporals, sphenoid, occipital	?Male	Adult	Porotic hyperostosis	Dark staining, polishing	1	0
6807						MNI	1	0
6808	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, right zygomatic, nasal bones	?Male	Adult	Porotic hyperostosis	Orange staining	1	0
6808						MNI	1	0
6809	Skull	Frontals, parietals, temporals, sphenoid, occipital	Male	Adult	Porotic hyperostosis	Dark staining	1	0
6809						MNI	1	0
6810	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, left zygomatic	?Male	Adult	-	Dark staining, tide mark	1	0
6810						MNI	1	0
6811	Skull	Frontals, parietals, temporals, sphenoid,	-	Adult	Deviated septum	Dark staining, polishing	1	0

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
		occipital, maxillae, zygomatics, nasal bones						
6811						MNI	1	0
6812	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, zygomatics	Female	Adult	Antemortem tooth loss	Dark staining, polishing	1	0
6812						MNI	1	0
6813	Skull	Frontals, parietals, occipital	?Male	Adult	Porotic hyperostosis	Differential staining & concretions	1	0
6813						MNI	1	0
6814	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, zygomatics	Female	Adult	-	Dark staining, polishing	1	0
6814						MNI	1	0
6815	Skull	Frontals, parietals, temporals, occipital, maxillae, zygomatics, nasal bones	?Male	Adult	-	Dark staining, scratches	1	0
6815						MNI	1	0
6816	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae	Male	Adult	-	Dark staining, scratches	1	0
6816						MNI	1	0
6817	Skull	Frontals, parietals, temporals, sphenoid, occipital, maxillae, left zygomatic	?Female	Adult	-	Yellow/orange staining	1	0
6817						MNI	1	0
6818		Frontals, parietals, temporals, occipital	Male	Adult	Severe caries	Yellow/orange staining, adhering Fe frag.	1	0
6818						MNI	1	0
6819	Skull	Left temporal	?Male	Adult	-	-	1	0
6819						MNI	1	0
6820	L. limb	Right tibia	-	Adult	-	-	1	0
6820						MNI	1	0
6821	L. limb	Right femur	-	Adult	-	-	1	0
6821						MNI	1	0
6822	Skull	Occipital	-	Adult	-	-	1	0
	U. limb	Right humerus	-	Adult	-	-	1	0
	L. limb	Left ischium	-	Adult	-	-	1	0
6822						MNI	1	0
6827	U. limb	Left humerus	-	Adult	-	-	1	0
6827						MNI	1	0
6828	U. limb	Left humerus	-	Adult	-	-	1	0
6828						MNI	1	0
6829	U. limb	Right ulna	-	Adult	-	-	1	0
6829						MNI	1	0
6830	L. limb	Right ilium	-	Adult	-	-	1	0
6830						MNI	1	0
6856	Skull	Right parietal, maxilla, zygomatic &	-	Adult	-	-	1	0

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
		mandible						
	U. limb	Left humerus	-	Adult	-	-	1	0
	L. limb	Left tibia	-	Adult	Periostitis	From orangey-blue clay removed in eastern slot.	1	0
6856						MNI	1	0
6862	U. limb	Left humerus	-	Adult	-	-	1	0
6862						MNI	1	0
6863	Torso	Right & left rib	-	Adult	-	-	1	0
	L. limb	Right femur	-	Adult	-	-	1	0
6863						MNI	1	0
6869	Skull	Frontals, left temporal, sphenoid, occipital, maxillae, left zygomatic	?Male	Adult	-	-	1	0
6869						MNI	1	0
6870	U. limb	2 x left humeri	-	Adult	-	-	2	0
6870						MNI	2	0
6872	L. limb	Right femur	-	Adult	-	-	1	0
6872						MNI	1	0
6875	L. limb	Right femur	-	Adult	-	-	1	0
6875						MNI	1	0
6879	U. limb	Left scapula	-	Adult	-	-	1	0
6879						MNI	1	0
6886	L. limb	Left fibula	-	Adult	-	-	1	0
6886						MNI	1	0
6888	L. limb	Right ilium	Male	Adult	-	-	1	0
6888			Female	Adult	-	-	1	0
6888						MNI	2	0
6891	Torso	Unsided rib	-	Adult	-	-	1	0
	L. limb	left ilium & fibula	-	Adult	-	-	1	0
6891						MNI	1	0
8250	U. limb	Right ulna	-	Adult	-	-	1	0
	L. limb	Right tibia	-	7-12 years	-	-	0	1
8250						MNI	1	1
8287	L. limb	Right femur	-	Adult	-	-	1	0
8287						MNI	1	0
8293	Skull	Occipital	-	Adult	-	-	1	0
8293						MNI	1	0
8311	Skull	Right parietal	-	Adult	-	-	1	0
8311						MNI	1	0
8321	Skull	Right frontal, sphenoid, temporals	?Male	Adult	-	Orange/yellow staining, concretions	1	0

Context	Body area	Elements	Sex	Age	Pathology	Comments	MNI adult	MNI subadult
8321						MNI	1	0
8325	L. limb	Right tibia	-	Adult	-	-	1	0
8325						MNI	1	0
8359	Skull	Right parietal	-	Adult	-	Orange/yellow staining, concretions	1	0
8359						MNI	1	0
8381	Skull	Mandible	?Male	Adult	Enamel hypoplasia	Orange/yellow staining, concretions	1	0
8381						MNI	1	0
8410	L. limb	Right femur, left patella	-	Adult	-	-	1	0
8410						MNI	1	0
8436	Skull	Right mandible	-	Adult	-	-	1	0
8436						MNI	1	0
8455	L. limb	Right ilium & ishium	?Female	Adult	-	-	1	0
8455						MNI	1	0
8456	Skull	Frontals, parietals, occipital	Female	Adult	-	Dark staining, polishing, concretions	1	0
8456						MNI	1	0
8457	Skull	Frontals, parietals, left temporal, sphenoid, occipital, left zygomatic	-	Adult	-	Dark staining, polishing, concretions, deep scratches	1	0
8457						MNI	1	0
8460	Skull	Frontals, parietals, temporals, sphenoid, right zygomatic	Male	Adult	Cribr orbitalia	Orange/yellow staining, concretions	1	0
8460						MNI	1	0

Appendix 4: animal bone tabulation

Table 33 Animal bone tabulation

	[n]	{n}	FEATURE	WT (kg)	cattle	pig	dog	human	game	sheep/goat	horse	poultry	foetal/neonate	lmam	mmam	smam	vsam	bird	fish	epiphyses	mandible	measurable	complete	butchery	pathology	burnt	gnawed	worked	Summary	
217	230	0	metalling	0.075	Y	Y								2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
525	301	0	ditch	0.125	Y						Y			2	0	0	0	0	0	4	0	0	0	1	0	0	0	0		
522	306	0	ditch	0.02			Y							1	3	0	0	0	0	6	0	3	3	1	0	0	0	0	dog foreleg	
522	306	12	ditch	0.002										0	1	0	0	0	0	0	0	0	0	0	0	1	0	0		
521	314	14	ditch	0.002										0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		
514	318	0	ditch	1.8	Y						Y			3	0	0	0	0	0	4	0	2	2	1	0	0	0	0		
462	1019	33	dump, external	0.25	Y						Y			2	0	0	0	0	0	2	0	1	1	0	0	0	0	0		
461	1023	0	dump, external	0.075	Y		Y							1	1	0	0	0	0	2	0	1	1	0	0	0	0	1	cattle horn core chopped	
462	1025	0	metalling	1.9	Y		Y				Y			4	3	0	0	0	0	11	0	3	3	0	0	0	0	0		
458	1047	53	ditch	0.001										1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
630	1074	0	external	0.02	Y									3	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
629	1076	0	make-up	0.65	Y						Y			3	0	0	0	0	0	3	0	1	0	1	0	0	0	0		
624	1083	0	metalling	0.3	Y									2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
624	1085	0	make-up	0.01			Y							0	1	0	0	0	0	1	0	0	0	0	0	0	0	0		
624	1089	0	make-up	0.2	Y									1	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
624	1090	0	make-up	0.5							Y			1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	horse juvenile femur	
624	1091	0	make-up	0.1							Y			1	0	0	0	0	0	2	0	1	0	0	0	0	0	0		
619	1096	0	ditch	0.05			Y							2	1	0	0	0	0	1	0	0	0	0	0	0	0	0		
619	1096	66	ditch	0.025			Y							0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		
256	1310	0	external	0.175	Y	Y				Y				3	2	0	0	0	0	2	0	1	1	2	0	0	0	0		
498	1314	0	external	0.075	Y					Y				4	1	0	0	0	0	3	0	0	0	0	0	0	0	0		
482	1335	76	make-up	0.05		Y								5	5	0	0	0	0	1	0	0	0	0	0	0	0	0		
655	1352	0	dump, external	0.9	Y						Y			5	0	0	0	0	0	3	0	2	1	0	0	0	0	0		
260	1393	0	ditch	0.05							Y			2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
263	1397	0	dump, external	1.5	Y	Y				Y		Y		15	5	0	0	1	0	6	1	2	0	10	0	0	0	1	cattle horn core chopped	
263	1397	83	dump, external	0.025	Y	Y				Y				1	10	0	0	1	0	1	0	0	0	0	0	0	0	0		
253	1399	0	dump, external	0.1	Y	Y					Y			5	1	0	0	0	0	2	1	0	0	1	0	0	0	0		
247	1401	84	alluvium	0.005								Y		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	chicken	
245	1403	0	alluvium	0.15	Y						Y			3	0	0	0	0	0	1	0	0	0	0	0	0	0	0		

	[n]	{n}	FEATURE	WT (kg)	cattle	pig	dog	human	game	sheep/goat	horse	poultry	foetal/neonate	lmam	mmamm	smam	vsam	bird	fish	epiphyses	mandible	measureable	complete	butchery	pathology	burnt	gnawed	worked	Summary
243	1426	0	alluvium	0.15							Y			1	0	0	0	0	0	2	0	1	1	0	0	0	0	0	
243	1426	94	alluvium	0.025	Y									1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
241	1429	0	alluvium	2.75	Y	Y	Y			Y	Y			100	40	0	0	0	0	45	6	6	1	40	0	0	0	2	cattle horn core
235	1432	0	alluvium	1			Y				Y			4	1	0	0	0	0	0	0	3	0	0	0	0	0	0	
434	2056	0	ditch	0.5	Y					Y	Y			7	1	0	0	0	0	3	0	0	0	2	0	0	1	0	canine gnawing
434	2060	0	ditch	0.8	Y									8	0	0	0	0	0	3	0	0	0	2	0	0	0	0	
436	2063	0	ditch	0.25	Y					Y				7	1	0	0	0	0	1	0	0	0	1	0	0	0	0	
102	6557	0	metalling	0.4		Y					Y			1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	
128	6589	0	metalling	0.005		Y								1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
72	6598	0	metalling	1.15	Y	Y				Y	Y			10	5	0	0	0	0	5	0	1	1	5	0	0	0	0	
175	6602	0	metalling	0.55	Y	Y					Y			14	11	0	0	0	0	8	1	3	3	5	1	0	0	0	horse calcaneum eburnation
71	6609	0	ditch	4.4	Y	Y	Y		Y	Y	Y	Y		100	74	0	0	2	0	55	5	7	4	35	0	0	1	0	chicken/canine gnawing/roe deer metatarsal
188	6611	0	ditch	0.95	Y	Y	Y			Y	Y			22	9	0	0	0	0	2	0	1	0	1	0	0	0	0	
66	6623	0	ditch	0.5	Y							Y		9	0	0	0	1	0	4	0	0	0	3	0	0	0	0	chicken
282	6716	0	metalling	16.4	Y	Y	Y				Y	Y		260	65	0	0	4	0	60	12	9	4	50	0	0	1	2	chicken/goose/cattle horn core chopped
282	6716	342	metalling	0.005										1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
281	6726	0	metalling	7.125	Y	Y			Y		Y	Y	Y	125	135	1	0	4	0	95	3	13	8	50	0	0	0	0	chicken/mallard/very small dog skeleton/rabbit
99	6729	0	metalling	1.3	Y	Y	Y				Y			15	15	0	0	0	0	10	1	2	0	10	0	0	0	0	dog butchered
90	6730	0	occupation	0.025	Y									4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	
90	6730	341	occupation	0.05										5	2	0	0	2	0	0	0	0	0	0	0	0	0	0	
84	6731	0	metalling	2.4	Y	Y			Y	Y	Y			75	5	0	0	0	0	20	0	5	1	0	0	0	0	0	roe deer metacarpal
182	6737	339	pit	0.001										0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
83	6741	0	ditch	4.25	Y	Y				Y	Y	Y		95	15	0	0	1	0	42	2	7	3	25	0	0	0	0	chicken
83	6741	340	ditch	0.1										2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
77	6747	0	ditch	2.5	Y	Y				Y	Y	Y		20	8	0	0	1	0	17	1	3	2	10	0	0	0	0	chicken
77	6747	350	ditch	0.001		Y								0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
78	6752	0	ditch	0.075	Y						Y			2	0	0	0	0	0	2	0	0	0	1	0	0	0	0	
176	6772	0	make-up	16.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	415	205	2	0	14	0	141	9	14	7	80	1	0	1	3	chicken/goose/cattleshee phorncorechop/rabbit/?wa der/red deertibia/pigfn/cat
60	6776	0	metalling	0.125	Y									4	1	0	0	0	0	0	0	0	0	2	0	0	0	0	
25	6777	0	metalling	13.45	Y	Y	Y	Y		Y	Y	Y		230	170	0	0	17	0	95	13	14	7	120	1	0	0	0	chicken/cattlefemur eburnation/lambinfant mandible
59	6781	0	ditch	1.5	Y						Y	Y		30	5	0	0	1	0	9	0	3	1	9	0	0	0	0	chicken

	[n]	{n}	FEATURE	WT (kg)	cattle	pig	dog	human	game	sheep/goat	horse	poultry	foetal/neonate	lmam	mmamm	smam	vsmam	bird	fish	epiphyses	mandible	measurable	complete	butchery	pathology	burnt	gnawed	worked	Summary	
59	6781	423	ditch	0.05		Y								0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
59	6781	424	ditch	0.15										5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
52	6795	0	pit, ossuary	3.7	Y	Y				Y	Y			45	29	0	0	0	0	23	5	6	2	17	0	0	1	0	canine gnawing	
52	6795	391	pit, ossuary	0.3				Y		Y				7	17	0	0	0	0	2	1	1	0	0	0	0	0	0		
9	6856	0	metalling	6.2	Y	Y	Y			Y	Y			138	15	0	0	0	0	66	4	5	4	20	1	0	0	0	horse vertebra articulated/eburnation	
183	6880	0	XX	29	Y						Y			363	0	0	0	0	0	98	6	15	11	1	0	0	0	0	horse skull pole-axed/1 cattle phalange 1	
45	6892	0	XX	2.9							Y			30	0	0	0	0	0	15	0	0	0	0	0	0	0	0		
346	8355	0	surface	0.45	Y	Y				Y				5	3	0	0	0	0	2	1	0	0	2	0	0	0	2	goat horn cores (2) chopped	
315	8397	0	metalling	0.05							Y			2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
319	8400	0	ditch	1.1							Y			8	0	0	0	0	0	2	0	0	0	0	0	0	0	0		
340	8405	0	ditch	0.15	Y									4	0	0	0	0	0	0	0	1	0	2	0	0	0	0		
352	8436	0	ditch	0.125	Y									3	0	0	0	0	0	0	0	0	0	3	0	0	0	0		
304	8451	0	grave	0.1										3	5	0	0	0	0	0	0	0	0	3	0	0	0	0		
TOT				132.4	45	26	15	3	4	19	36	11	2	2253	884	3	0	50	0	888	72	137	72	522	4	1	5	11		

The figures

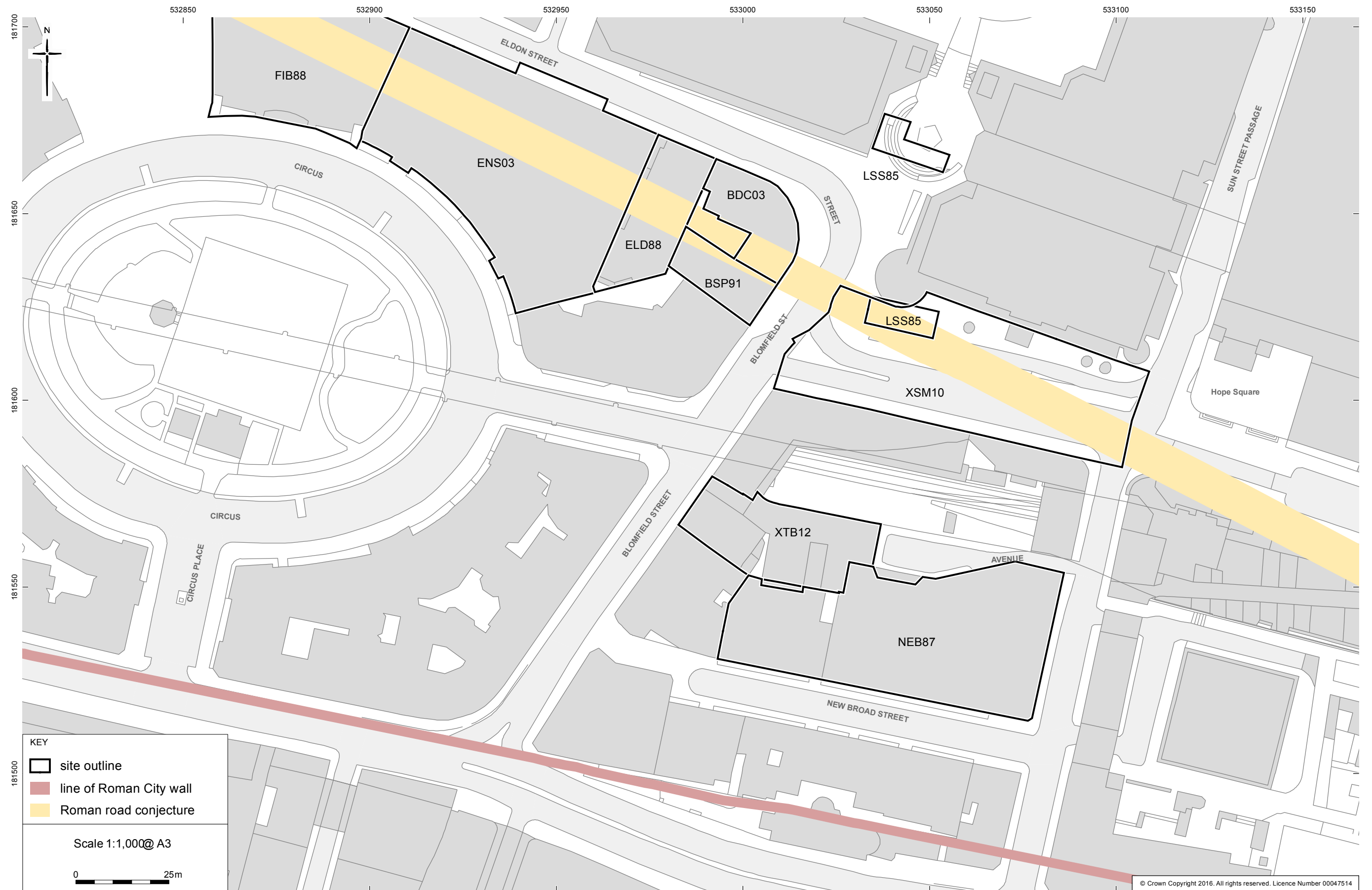


Fig 3 the study area in relation to the extrapolated alignment of the Roman road recorded at XSM10, LSS85 and sites to the west, the Roman city wall, the modern street plan and other sites referred to in the text

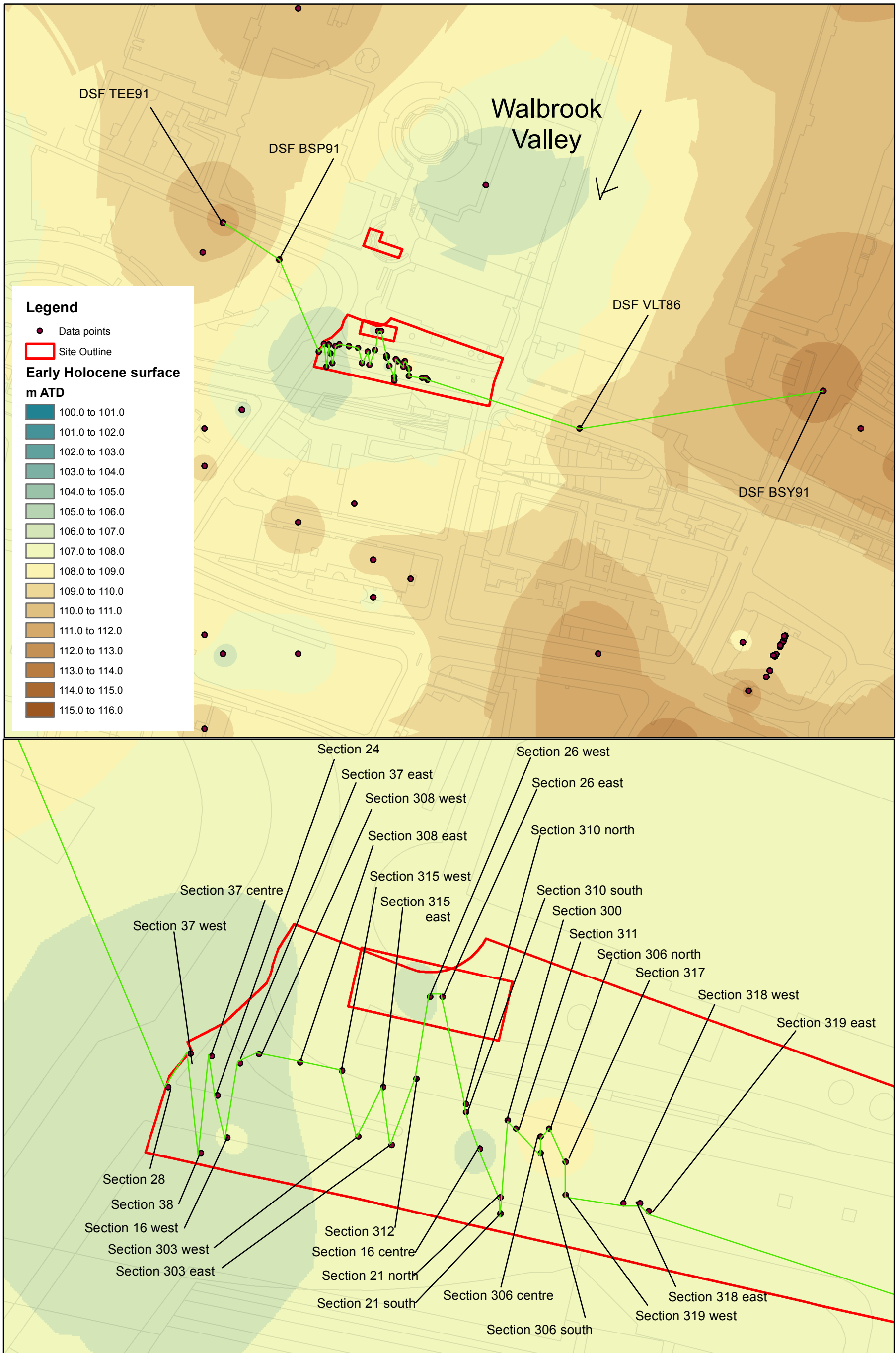


Fig 4 The early Holocene surface



Fig 6 The extent of surviving natural brickearth with projected line of Walbrook tributary to the west



Fig 7 Surviving extent of layer containing Late Iron Age pottery

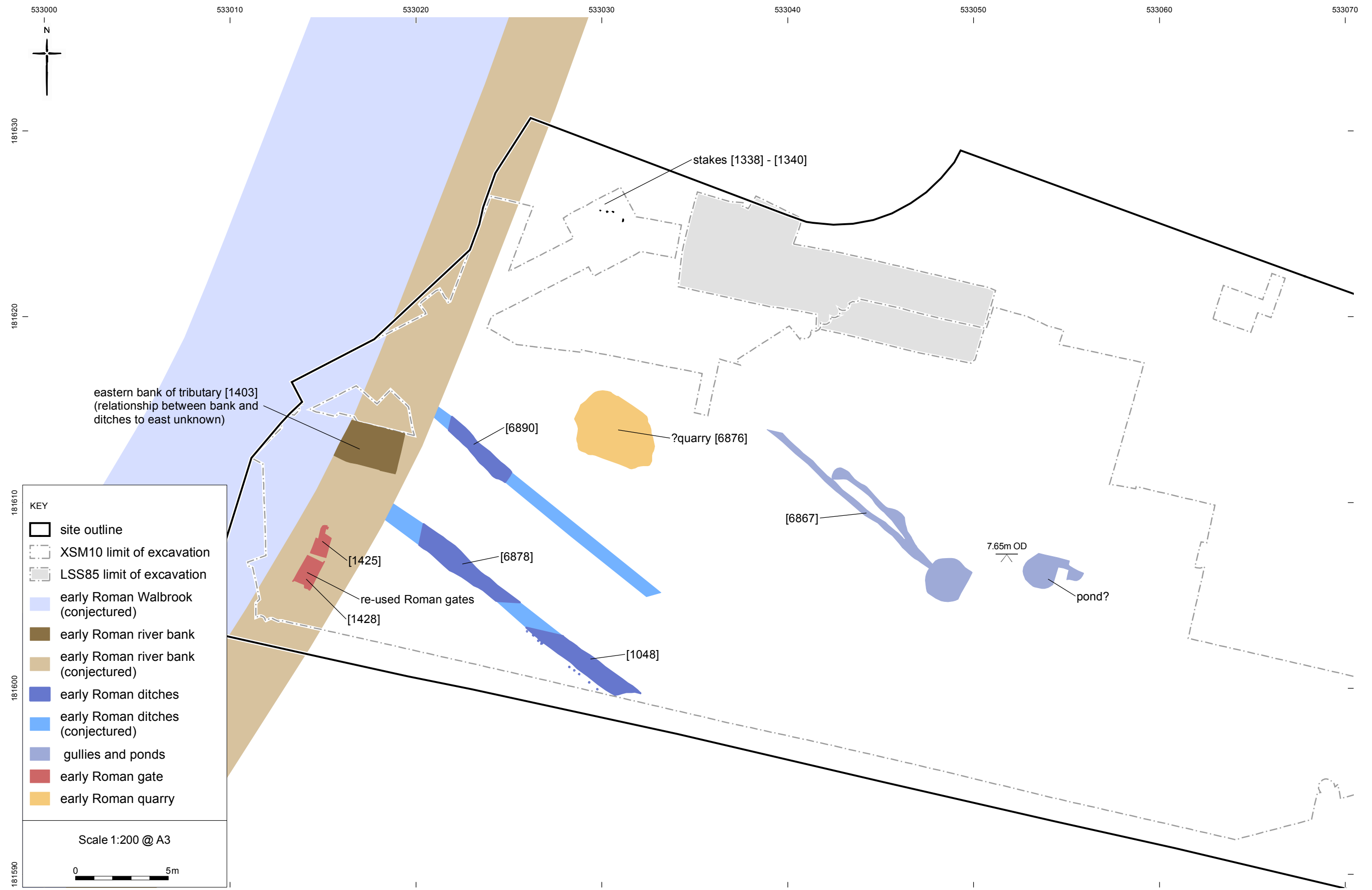


Fig 8 primary phase of Roman use of the site: water management

Fig 9 *One of two timber gates at the edge of the Walbrook stream; looking south-west*



Fig 10 *Remains of the first phase of Roman road, with sequence of roadside ditches; looking WNW*



Fig 12 *Series of roadside ditches (6782 with human bones) with charnel pit [6823] in foreground; looking north*



Fig 13 *Decapitated burial [6840]; looking east*



Fig 14 *Decapitated Roman burial; looking down to south-east*



Fig 15 *Roman features at break in the southern roadside ditches; looking ENE*





Fig 16 Resurfacing of Roman road and recuts of side ditches