



**C360 - Eleanor Street and Mile End Park Shafts -
Archaeology**

**Site Specific Written Scheme of Investigation for the
Eleanor Street Ventilation Shaft**

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Contents

1	Executive Summary	4
2	Project Background	5
2.1	Introduction	5
2.2	Site Description.....	5
2.3	Summary of Previous Crossrail Studies.....	5
2.4	Previous Crossrail Archaeological Investigation	6
2.5	Geology and Topography.....	7
2.6	Ground Investigation	7
2.7	Archaeological and Historical Background of the Site	7
2.8	Previous Ground Disturbance	8
3	Construction Impacts and Mitigation	9
3.2	Main Ventilation Shaft Works.....	9
3.3	Outline Mitigation Design.....	10
4	Aims and Objectives	11
4.2	Site Specific Aims	11
4.3	Relevant Research Aims	11
5	Scope of the Investigation	13
5.1	Specific Requirements for the C360 Principal Contractor	13
5.2	Site Accommodation and Facilities.....	14
5.3	Specific Requirements for the C261 Archaeological Contractor	15
5.4	Non-Listed Built Heritage Assessment and Recording.....	15
6	Programme for the Investigation	18
7	Specification for archaeological evaluation and mitigation	19
7.1	Generic Standards	19
7.2	Potentially nationally important remains.....	19
7.3	Human Remains	20
7.4	Treasure Act	21
7.5	Health and safety	21
7.6	Location and ground elevation of interventions and survey grids	22
7.7	Specification for watching brief.....	23
7.8	Specification for archaeological investigation.....	27
7.9	Archaeological science	31
8	Deliverables	35

8.1	C261 Archaeology Contractors Deliverables	35
8.2	Archaeological Contractors Method Statement.....	35
8.3	Site Archives	37
8.4	Digital Data	37
8.5	Interim Statement.....	38
8.6	Survey Report.....	39
8.7	Fieldwork Report.....	39
8.8	GLSMR Summary Sheet.....	41
8.9	Summary Report	41
8.10	Post excavation assessment	41
9	Site Monitoring & Progress Reports	42
10	Personnel Requirements.....	43
11	References and Glossary of Terms.....	44
12	Annexes	46
	Annex 1 Archaeological Research Agenda	46
	Annex 2 Site Information.....	46
	Annex 3 Plans and other Illustrations	47
	Annex 4 Health and Safety Requirements	48
	Annex 7 Enabling and Temporary Works Design Requirements, Attendances and Implementation.....	49
	Annex 8 Security Requirements	49
	Annex 9 Need for Screening or Other Protective Works.....	49
	Annex 10 Procedure for Notification of the Discovery of Human Remains	49
	Annex 11 Procedure for the Notification of the Discovery of Material Falling Under The Treasure Act 1996	50
	Annex 12 Procedure for Notification of Major Unexpected Discoveries	50

Figures

Figure 1: Location of the Eleanor Street Shaft Site	6
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Tables

Table 1: Historic Street Furniture Identified within the Eleanor Street Shaft	17
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1 Executive Summary

- 1.1.1 This document forms a Site-Specific Written Scheme of Investigation (SS-WSI), for the Eleanor Street Ventilation Shaft, in the London Borough of Tower Hamlets (LBTH) as part of the Crossrail development. This SS-WSI supersedes those versions previously prepared for the Multidisciplinary Design Consultancy Package 3 (MDC 3) (Crossrail 2008, Document No. CR-SD-PRWX-IS-00002).
- 1.1.2 The site had until recently been partially utilised as a Traveller's community with the remainder being waste ground. Analysis of historic maps shows that the site was once occupied by terraced housing and bisected by a railway line.
- 1.1.3 Detailed Desk-Based Assessment (DDBA) identified the archaeological potential of the site and assessed the construction elements and associated worksite outlined in the Scheme Design for Running Tunnels and Shafts, developed in 2007.
- 1.1.4 The potential for archaeology within the site lies in the nature of its geology and topography rather than from any known archaeological remains in the area. In areas to the east and west of London that have similar topography and geology a landscape of Bronze Age and Iron Age field systems and farmsteads have been uncovered during archaeological investigations. It is possible that a similar landscape to exist in the area around the Eleanor Street Ventilation Shaft site. Archaeological field investigations carried out in the vicinity of Eleanor Street have identified evidence of Post-medieval features and agricultural soils which are possibly associated with widespread market gardening across the site and surrounding area.
- 1.1.5 Archaeological trial trench evaluation of the Temporary Shaft was completed in March 2013. The evaluation confirmed evidence for post-medieval horticultural activity noted on historic mapping in the form of an 18th century cultivation soil which had reworked the surface of natural brickearth deposits, which had destroyed any evidence of earlier archaeological remains. The remains of a 19th century building likely one of the terraced houses occupying Rounton Road were also recorded comprising the floors and wall foundations of the building.
- 1.1.6 The Crossrail works with the potential to affect archaeological remains are the construction of the main ventilation shaft and piling and foundation works relating to the head house structure. Enabling Works, including the establishment of the worksite, are unlikely to have an impact on buried archaeological deposits. Further archaeological investigation in the form of a Targeted Watching Brief is required during the excavation of the main ventilation shaft and construction of the head house.
- 1.1.7 A survey of Non-Listed Built Heritage (NLBH) identified street furniture worthy of protection. The Eleanor Street Bollard and three Dodgson Bollards should be carefully removed, stored and replaced in their original positions should Contractor C360 require their temporary removal.

2 Project Background

2.1 Introduction

- 2.1.1 The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail. Accordingly the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction work begins.
- 2.1.2 The strategy for archaeological works is set out in the Crossrail Generic Written Scheme of Investigation (WSI) (Document No. CR-PN-LWS-EN-SY-00001). The Generic WSI presents the strategy for archaeology design, evaluation, mitigation, analysis, dissemination and archive deposition that will be adopted for the design and construction of Crossrail and provides a general statement of objectives, standards, and structure for the planning and implementation of archaeological works.
- 2.1.3 This Site Specific Written Scheme of Investigation (SS-WSI) addresses the works required for the C360 Eleanor Street Ventilation Shaft and has been revised to specifically address the updated construction programme and targeted watching brief methodology required to deliver the C360 contract. Consequently this document supersedes the previous Rev 1.0 SS-WSI relating to trial trench evaluation of the Main Ventilation Shaft site.

2.2 Site Description

- 2.2.1 The Eleanor Street Shaft site is located within the Bow Triangle Area, situated within the London Borough of Tower Hamlets (LBTH). The site is bounded by three railway viaducts; the London to Tilbury Service (LTS) viaduct to the south; the District Line to the north and the Gas Factory Curve viaduct to the west.
- 2.2.2 The Bow Triangle today largely comprises a business park within its northern area, with a Traveller's site occupying the eastern part of the site. The southeast corner of the site is formed by an area of currently vacant hardstanding which will comprise the Rounton Road early access temporary shaft site. The shaft site is located within the eastern extent of the existing Traveller's site between Eleanor Street and Rounton Road (see Figure 1 below). Access to the Bow Triangle is currently via Eleanor Street (Crossrail 2008); however, a site access will also be made from Rounton Road.
- 2.2.3 The location of the Crossrail works for the Eleanor Street Shaft are shown on Drawing No. P30103-C1M61-E00-D-50001 (Annex 3) and Figure 1 below.

2.3 Summary of Previous Crossrail Studies

- 2.3.1 The general archaeological potential in the area of the Crossrail worksite for Eleanor Street Shaft is described in the Crossrail Archaeological Impact Assessment and the Specialist Technical Reports: Assessment of Archaeological impacts (Part 1-6), published in February 2005, which form supporting documents of the Crossrail ES, and the subsequent Updated Baseline Assessment. In 2006 an Archaeology Programming Assessment outlined the scope and approximate timings of potential archaeological works across the entire Crossrail route. This has been superseded by a Detailed Desk Based Assessment (DDBA) of the site, which informed this WSI (Document No. CR-SD-ELS-EN-SR-00001).

2.4 Previous Crossrail Archaeological Investigation

2.4.1 In March 2013 an archaeological trial trench (Trench 1) measuring 10m in length and 2m wide was excavated across the site of the temporary shaft. Natural terrace gravels were encountered at a height of 108.73m – 108.28m ATD, approximately 2.0m below the existing ground level and were overlain by a reworked brickearth deposit dating to the 18th century and a buried soil horizon consistent with horticultural activity noted on historic mapping. The reworking of the brickearth had destroyed any evidence of earlier archaeological remains. The remains of a 19th century building likely one of the terraced houses occupying Rounton Road were also recorded. The floors and wall foundations of the building lay at a height of c.109.45m ATD and overlay the reworked brickearth and soil. The sequence of archaeological deposits was sealed by 0.50m of recent made ground.

2.4.2 The results of Trench 1 are reported in C261 Archaeology Early East Interim Statement Archaeological Evaluation Eleanor Street Shaft XTJ13 (Document No. C261-MLA-X-RGN-CRG03-50040).

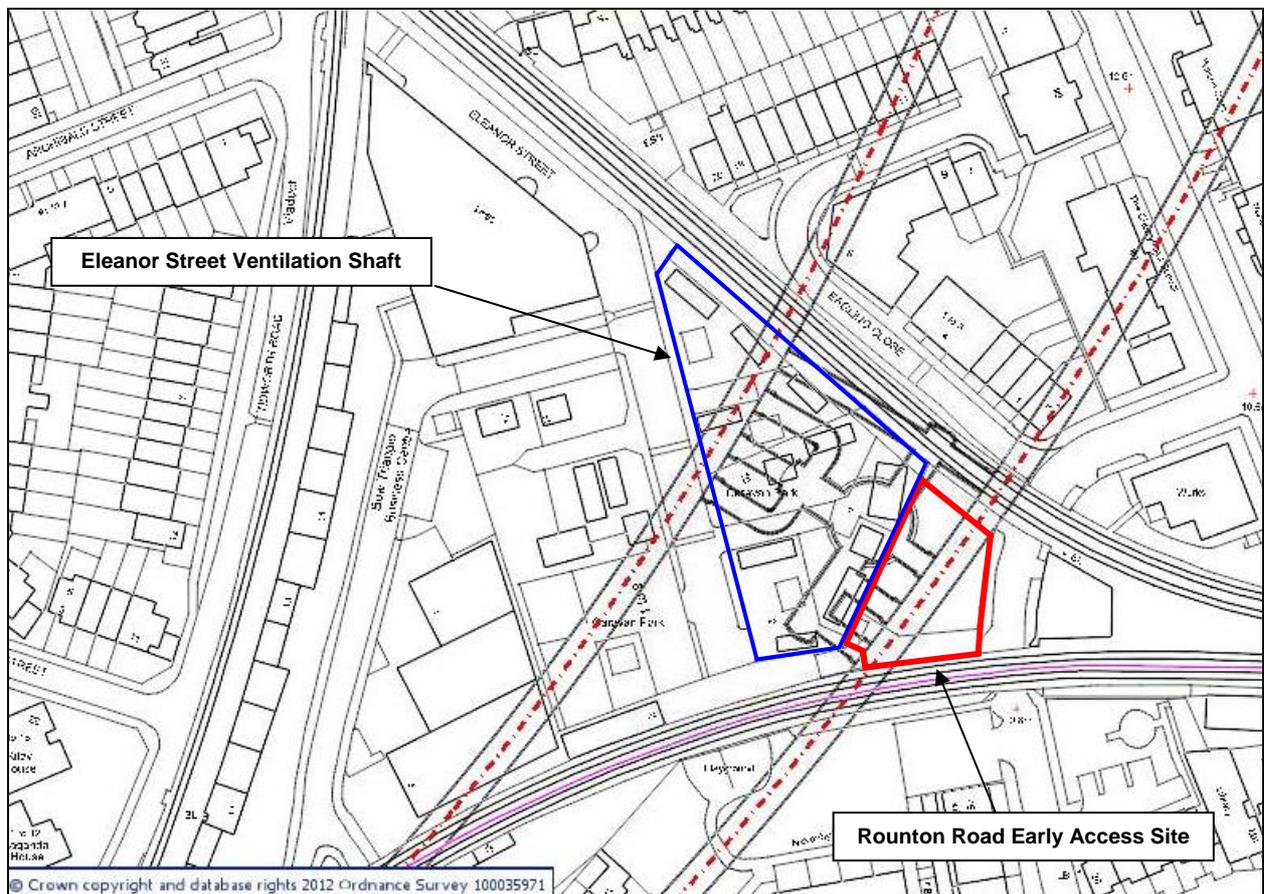


Figure 1: Location of the Eleanor Street Shaft Site

2.5 Geology and Topography

- 2.5.1 The geology of the area comprises Made Ground and River Terrace Deposits (Taplow Thames Terrace Gravels) overlying London Clay. At this location the London Clay is expected to be approximately 16m thick above a 1 to 2m layer of the Harwich Formation, typically stiff gravelly clay. Beneath the Harwich Formations lie the Lambeth Group and Thanet Sands (Crossrail 2008). For a more detailed description of the geology of the site, refer to section 10.2.4 of the Civil, Structural & Tunnel Engineering Report for MDC3 Running Tunnels & Shafts, Vol. 3 of 7, CR-SD-CT1-CE-RT-00008. Refer to drawing number P30103-C1M61-G00-D-50001 (Appendix 3) for a geological cross-section and the locations of the boreholes mentioned in the text.
- 2.5.2 The topography of the site is relatively flat with a slight incline to the north-west. The site lies at between 109 and 110.5m ATD and is enclosed by three railway lines, each of which is raised on a viaduct.

2.6 Ground Investigation

- 2.6.1 A number of boreholes were drilled in the area surrounding the Eleanor Street Shaft site as part of Ground investigation Package 12. Two of these boreholes (BT36R and BT42) were located in close proximity to the proposed Eleanor Street ventilation and temporary shafts. Borehole BT42 in particular was located immediately between the two proposed shaft locations.
- 2.6.2 Borehole BT42 revealed a sequence of deposits comprising River Terrace Deposits described as dense brown, clayey sand with some gravel at a height of 108.71m ATD (c.1.30m below ground level (BGL)). Overlying the River Terrace Deposits was 500mm thickness of firm brown sandy clay, the surface of which was recorded at 109.21m ATD (c. 0.80m BGL). This deposit may represent Brick Earth or a former subsoil horizon. The deposit sequence was sealed by recent made ground comprising dense brick and stone in a black/grey sandy soil fill.
- 2.6.3 Borehole BT36R was drilled 5.50m to the southwest of BT42 and recorded very dense, dark brown, slightly clayey sandy gravel, river terrace deposits at 108.53m ATD (1.50m BGL). The River Terrace Deposits were sealed by two layers of made ground which contained fragments of brick, flint, clinker, wood and large boulder sized fragments of concrete. The depth of the made ground deposits and lack of surviving Brick Earth suggest that the River Terrace Deposits have been truncated by modern activity at this location.
- 2.6.4 For further information refer to the Package 12 Ground Investigation Factual Report: Stepney Green to Pudding Mill Lane (Document No.CRL1-GCG-C2-RGN-CRG03-50021).

2.7 Archaeological and Historical Background of the Site

- 2.7.1 The archaeological and historical development of the Eleanor Street Shaft site has been presented in the Eleanor Street Ventilation Shaft DDBA (Document No. CR-SD-ELS-EN-SR-00001). A summary of the key information used to inform the preparation of this SS-WSI is set out below. Drawings showing the locations of boreholes (P30103-C1M61-G00-D-50001) and archaeological sites (P30103-C1M61-E00-D-50001) mentioned in this section are included at Annex 3 of this document.

- 2.7.2 There is limited evidence for prehistoric settlement activity in the area surrounding the Eleanor Street shaft site, however, the light, free draining soils of the Thames gravel terraces are known to have been settled from an early date. Extensive evidence for agricultural field systems and rural settlements of Bronze Age and Iron Age date has been recorded from the gravel terraces to the east and west of London and it is certain that these late prehistoric agricultural landscapes extended across the area now covered by the City and suburbs of Greater London.
- 2.7.3 During the Romano-British period the Eleanor Street shaft site would have been situated approximately 4km to the northeast of the Roman city of Londinium, within the agricultural hinterland that served the city.
- 2.7.4 St Paul's Cathedral was consecrated in AD604 and the Bishopric of London established. The manor of Stepney (whose name is derived its name from the Anglo-Saxon Stebunhithe, meaning Stebb's landing place) is likely to have been part of the original foundation endowment of the Bishopric of London and covered most of modern Tower Hamlets. Throughout the Saxon and medieval periods the site would have comprised open land with marshes to the south and forest to the north. The closest medieval settlements to the Eleanor Street site were located in the vicinity of Bromley Street to the northeast and at Bow.
- 2.7.5 Historic mapping illustrates that the site remained undeveloped through the post-medieval period until the mid-19th century, when urban development around the site accelerated and construction of railways in this part of London began. Stanford's map of 1862 depicts the area surrounding Eleanor Street comprised market gardens with the area of the site itself bisected by a railway line. By the late 19th century historic Ordnance Survey mapping shows that the site was located within the major railway intersection known and Bow Junction (now the Bow Triangle) and that large parts of the site were occupied by terraced housing which fronted onto Eleanor Street and Rounton Road as evidence in Trench 1 within the footprint of the temporary shaft
- 2.7.6 The potential for made ground associated with both the railway line that bisected the site and the terraced housing indicates that the only surviving archaeological deposits on the site are likely to be deep cut features such as pits, wells or stream channels. There has been limited recovery of archaeological remains from the vicinity of the site; although post-medieval agricultural soils have been recorded within the footprint of the temporary shaft and near-by supporting the historic map evidence. It has also been suggested that the lack of archaeological evidence is due to the small number of archaeological investigations that have been carried out in this area. Archaeological investigations carried out in similar landscapes with a comparable geology of River Terrace Gravels have identified field systems and agricultural settlements dating from the Bronze Age and Iron Age.

2.8 Previous Ground Disturbance

- 2.8.1 Ground level varies around the site from 109m to 110m ATD. It is unknown if these levels represent the natural topography or are a result of levelling works associated with the construction of then multiple railway lines that have crossed or surround the site or after the demolition of the terraced housing once present on the site.
- 2.8.2 Information from the Package 12 geotechnical boreholes within the site (BTG36R and BT42) demonstrate that made ground exists on the site to depths of between 0.80 and

1.60m below ground level. Underlying this, River Terrace Deposits up to 5.30m thick are present on the site.

- 2.8.3 The site is currently occupied by a business park in the northern part of the site and a Travellers' site located to the east. The nature and extent of foundations, basements or utilities present within the site footprint in relation to existing buildings is currently unknown, although Visual Site Appraisal identified no existing structures likely to have deep foundations.

3 Construction Impacts and Mitigation

- 3.1.1 The general construction methodology and scope of the C360 shaft works are set out in the C123 Intermediate Shafts, Construction Planning Report – Eleanor Street Shaft (Crossrail 2011; Document No. C123-JUL-N2-RGN-CR094_SH007_Z-00004)

3.2 Main Ventilation Shaft Works

Enabling Works

- 3.2.1 In advance of the main ventilation shaft construction the following enabling works have been identified as being required:
- Topographical survey;
 - Utility survey;
 - Asbestos survey of buildings to be demolished;
 - Condition survey and building inventory for the structures on the Travellers site;
 - Traffic management including signage;
 - Removal of parking bays in Mornington Grove and Rounton Road;
 - Construction of new access roads;
 - Utility diversions in association with the Travellers site and temporary supplies to the shaft site; and
 - Travellers site move which includes demolition of a laundry and 3No. industrial units, the construction of a new access road, new caravan pitches, utility blocks and perimeter wall (Crossrail 2011).
- 3.2.2 No archaeological works are required during the enabling works.

Ventilation Shaft Works

- 3.2.3 The main Eleanor Street Shaft works comprise the excavation of a 36.5m deep ventilation shaft with an internal diameter of 16.4m. The shaft will be constructed using a top down method and will be connect to the Crossrail running tunnels by a series of ventilation and emergency access adits. The shaft itself will house vertically mounted fans, emergency service intervention stairs and a lift (Crossrail 2011, p.9; Document No. C123-JUL-N2-RGN-CR094_SH007_Z-00004).

- 3.2.4 The shaft will be constructed in two stages; the upper section of the shaft will be constructed within a sheet piled box to a depth of 9m below ground level designed to prevent the ingress of water from a perched water table identified at a depth of approximately 3.0m below ground level. Within the sheet piles the shaft will be excavated to a depth of c. 108.4m ATD (2m below ground level) where 2No. precast concrete rings will be installed and concreted into position. The shaft will then be excavated and underpinned with a further 16No. 1m concrete rings. The lower section of the shaft will be constructed using a spray concrete lining.
- 3.2.5 A gantry crane will be used to service the shaft works and will be used to remove spoil, materials and plant.

Head House

- 3.2.6 A two storey steel framed head house structure with barrel roof and “green” roof covering will be constructed over the shaft. This will house the ventilation plant, equipment rooms and a separate entrance for the emergency services. The head house will be constructed from a steel frame founded partly on 900mm diameter piles and partly on the shaft itself. The head house will be clad in block work and steel panelling with the ventilation plant discharging through a series of louvres at first floor level (Crossrail 2011, p12). Conventional foundations c. 1.5m below ground level (BGL) will be constructed between the piles.

3.3 Outline Mitigation Design

- 3.3.1 The DDBA (Document No. CR-SD-ELS-EN-SR-00001) has identified that the Eleanor Street and Rounton Road shaft sites have an unknown potential for the survival of archaeological remains of prehistoric to medieval date and a moderate potential for the survival of archaeological remains of post-medieval and modern date associated with the development of the Bow Junction railway infrastructure, agricultural soils and terraced housing that occupied formerly occupied the site.
- 3.3.2 Trench 1 excavated on the site of the temporary shaft confirmed the presence of 19th century building remains and 18th century horticultural soil horizons. Further buried archaeological remains are likely to survive within the area of the main ventilation and temporary shafts and area of the head house.
- 3.3.3 In a change to the previous version of this SS-WSI the updated construction programme has necessitated a change from trial trench evaluation in advance of construction to archaeological targeted watching brief during excavation of the Main Ventilation Shaft and construction of the head house.
- 3.3.4 The Non-Listed Built Heritage and Street Furniture survey undertaken as part of the DDBA identified four Non-Listed Built Heritage assets present on the site (the Eleanor Street Bollard and 3 No. Dodgson Bollards). These bollards will be carefully removed, stored and replaced in their original positions should C360 require their temporary removal.

4 Aims and Objectives

- 4.1.1 The overall objective of the archaeological targeted watching brief is to mitigate the impact of constructing the new Main Ventilation Shaft on the archaeological resource through a programme of archaeological investigation, recording, analysis and dissemination in accordance with the Crossrail Generic WSI (document number CR-PN-LWS-EN-SY-00001) and the standards listed therein.
- 4.1.2 Archaeological investigations within the footprint of the shaft have the potential to recover evidence of 19th century railway remains, agricultural activity from the post-medieval period and to determine whether the site has the potential for prehistoric remains, such as field systems that could be present due to the nature of the topography and geology of the site.

4.2 Site Specific Aims

- 4.2.1 The specific aims of the archaeological targeted watching brief are:
- to record the landscape development through assessment of the soil stratigraphy, including the definition of any surviving post-medieval soil horizons associated with market gardening or Brickearth deposits;
 - to identify the location, extent and depth of post-medieval and modern truncation of archaeological and natural deposits, particularly in relation to the construction of the Bow Junction and the North London Railway which crossed the Eleanor Street site; and
 - to identify and record any surviving elements of the 19th Century houses that formerly occupied the site.

4.3 Relevant Research Aims

- 4.3.1 Selected research themes derived from *A Research Framework for London Archaeology 2002* (Nixon et al, 2003) are included in the Assessment of Archaeology Impacts Technical Report (Crossrail 2005).
- 4.3.2 The Eleanor Street Ventilation Shaft site was located outside of London until extensive urban development in the mid 19th century incorporated it into the city. Previous archaeological investigations and examination of historic maps have shown that the area was agricultural land until the post-medieval period. Archaeological investigations at the Eleanor Street Shaft have the potential to contribute to the major themes set out below:
- understanding Prehistoric activity in London, in relation to the Terrace Gravels;
 - examining the concept of core/periphery for different periods in London's past, as a means of understanding how evolving settlement patterns reflect the need for sustainable, beneficial relationships between a settlement and its environs, a city and its hinterland;
 - contributing to our understanding of the creation of the London suburbs; Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change; and



- identifying the consequences of infrastructure development at a local level.

5 Scope of the Investigation

5.1 Specific Requirements for the C360 Principal Contractor

Targeted Watching Brief

- 5.1.1 Targeted Watching Brief will be required during excavation works for the Eleanor Street Main Ventilation Shaft and construction of the head house where there is the potential to remove archaeological remains of prehistoric to medieval date, surviving 18th century agricultural/horticultural soils and 19th century railway infrastructure relating to Bow Junction and terraced housing that occupied formerly occupied the site.
- 5.1.2 Archaeological investigation by Targeted Watching Brief is defined in the Generic WSI (CR-PN-LWS-EN-SY-00001) and Section 7.7.4 below.
- 5.1.3 Construction activities requiring a Targeted Watching Brief will include:
- the excavation starter pits;
 - excavation for the caisson collar or sheet piled box to the surface of the terrace gravels anticipated between c. 108.70 and 108.30m ATD; and
 - excavation of conventional foundations for the head house to a depth of c.1.5m below ground level (BGL) between the piled foundations.
- 5.1.4 Trench 1 excavated to the south of the Main Ventilation Shaft encountered 19th century building remains at depth of c.0.50m below the existing ground surface and a sequence of soil horizons and reworked brickearth to a depth of 2.0m below ground level. Consequently the Targeted Watching Brief will be limited in depth to the deposits between the current ground surface (at c.110.5m ATD) and the surface of the terrace gravels at approximately 108.73m – 108.28m ATD.
- 5.1.5 Under the Targeted Watching Brief modern overburden will be removed in stages by the C360 Main Contractor using a 360° tracked excavator or similar with a toothless grading bucket. Excavation will proceed in level spits of a maximum thickness of 500mm at the discretion of and supervised by the C261 archaeologist. Machine excavation will proceed until the surface of the terrace gravel or the first archaeological horizon whichever is encountered first.
- 5.1.6 Any archaeological horizons encountered will be hand cleaned as necessary to achieve clear definition including any archaeological features which will then be rapidly investigated, sampled and recorded by the C261 archaeologists. Sections through the stratigraphic sequence will also be cleaned, recorded and sampled as appropriate.
- 5.1.7 Excavation in this manner will allow the full sequence of deposits to be examined and recorded.

Archaeological Targeted Watching Brief Procedure

5.1.8 During construction of the Eleanor Street main ventilation shaft and head house the following procedure is to be incorporated into the C360 Main Contractor's method of working:

- All known live services and utilities to be diverted prior to the start of excavation activities. The Main Contractor should confirm that there are no live services within the excavated area and brief the C261 archaeologist;
- Machine excavate in level spits, under supervision of C261 Archaeologist modern overburden and post-medieval made ground to the surface of the archaeological horizon or natural terrace gravels whichever is encountered first;
- Allow adequate time for any surviving archaeological remains to be investigated and recorded. The duration of any archaeological investigation and recording required may vary dependant on the density and complexity of archaeological remains present. This will be instructed by the Project Archaeologist following discussion with the C360 Main Contractor, and C261 Archaeologist;
- Allow suitable secure access, shoring and edge protection where required from ground level to bottom of excavated areas for the archaeologists to work;
- Remove, as directed by the C261 archaeologist, materials once they have been recorded by the C261 archaeologists until the required depth of excavation is reached;
- Use of excavators or other plant within the excavation area shall only be undertaken with the agreement of the Project Manager and under the supervision of C261 Archaeologist;
- Allow for up to 2 No. archaeologists to be on site during groundworks; and
- Provide further technical advice to C261 as maybe required to safely complete the work.

5.2 Site Accommodation and Facilities

5.2.1 The C360 Principal Contractor shall provide the following site accommodation facilities for the use of the C261 archaeological operatives (No. to be determined in C261 Method Statement), inclusive of any hard standing and services required:

- Welfare and mess facilities;
- Male and Female toilets, with drying and washing facilities;
- First Aid;
- Storage for small plant and tools; and
- Temporary office including 1 No. desk space for the use of the C261 lead archaeologist complete with furniture, telephone and internet access.

5.3 Specific Requirements for the C261 Archaeological Contractor

5.3.1 To deliver the archaeological targeted watching brief the C261 Archaeology Contractor shall:

- Provide a revised Archaeological Method Statement inclusive of risk assessment and safe method of working;
- Provide a suitably qualified and competent staff who have valid CSCS cards;
- Provide a suitably qualified archaeologist, experienced in archaeological investigation, recording and the nature of archaeological deposits which are expected on this site; and
- Ensure that during the archaeological targeted watching brief the extent of the any surviving archaeological deposits are mapped and that any surviving archaeological remains are hand cleaned, defined and sample excavated, sufficient to determine type, plan form and relationships and that these are recorded.

5.4 Non-Listed Built Heritage Assessment and Recording

5.4.1 Non-listed built heritage assessment and recording forms part of the archaeological mitigation strategy for Crossrail. The definition of non-listed built heritage adopted follows Information Paper D22 Archaeology and encompasses above ground historic features and structural elements of historical interest.

5.4.2 Two main groups are:

- Non-listed buildings proposed for demolition in conservation areas; and
- Historic street furniture and materials falling within a worksite and being temporarily or permanently impacted upon by the works.

5.4.3 The detailed scope for this element of works includes:

- Important non-listed buildings of historic interest proposed for demolition in conservation areas (as set out in Information paper D18, Listed Buildings and Conservation Areas);
- Important non-listed historic street furniture and materials;
- Other important non-listed buildings and structures of historic interest outside conservation areas (i.e. the standing walls at Stepney Green), locally listed station buildings and railway structures and any industrial and defence archaeology of significance.

5.4.4 The Crossrail Environmental Statement and supporting Specialist Technical Reports define the baseline built heritage resources (both statutorily protected and non-listed) across the route, the potential significant impacts, mitigation and any residual impacts after that mitigation is employed (Crossrail 2009).

5.4.5 An archaeological (non-listed built heritage) assessment has been carried out to determine the need for, and/or level of, mitigation works in advance of demolition. This survey determined that no NLBH recording is required at the Eleanor Street Shaft.

5.4.6 Street furniture surveys have been carried out by the MDC3 Heritage Specialist to identify all elements of street furniture at the Eleanor Street Shaft. The results of the



survey have been reviewed in order to identify street furniture of historic significance (Table 1 and Drawing No. P30103-C1M61-E00-D-50004, Annex 3).

Table 1: Historic Street Furniture Identified within the Eleanor Street Shaft

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
Eleanor Street Bollard		<p>Cast iron bollard with decorative head. Painted in black and white stripe.</p>	<p>Not listed or within a conservation area; however, the bollard represents an interesting example of an unusual bollard type.</p>	<p>The bollard may be required to be removed during the works</p>	<p>If any works necessitate the removal of the bollard, it should be replaced in its original position upon completion.</p>
Dodgson Bollard x 3No.		<p>Group of three bollards arranged along Eleanor Street. Square in profile, rising to a hexagon. All are painted with black and white stripes. Inscription reads 'DODGSON Fecit Shadwell, London' and dated 1821. However, they are likely to have been relocated to their present position as this area of London remained undeveloped until the late 19th century.</p>	<p>Not listed or within a conservation area; however, the bollard has some historic interest associated with its Dodgson insignia and early date.</p>	<p>The bollards may be required to be removed during the works</p>	<p>If any works necessitate the removal of the bollards, they should be replaced in their original position upon completion.</p>

6 Programme for the Investigation

- 6.1.1 It is currently estimated that the C360 Eleanor Street Main Ventilation works will take place during June 2014. The construction programme will be confirmed by the C360 Principal Contractor prior to the start of works.
- 6.1.2 If significant archaeological remains are discovered during the targeted watching brief additional time will be required for further archaeological investigation and recording to fully mitigate the shaft impact. The *C360 ES & MEP Shafts – Period 11 Revised Programme for Acceptance Version 007* allowed two weeks during the main shaft works for these additional works identified as Activity S2190.
- 6.1.3 In the event that nationally important remains the procedures for Potentially Nationally Important Remains and the Notification of Major Unexpected Discoveries set out in Section 7 below and Managing Unexpected Discoveries in Section 6.5 of the Archaeology Generic Written Scheme of Investigation (Document No. CR-PN-LWS-EN-SY-00001) will be followed

7 Specification for archaeological evaluation and mitigation

7.1 Generic Standards

7.1.1 The archaeological evaluation and mitigation works and scope of any archaeological scientific methods shall be designed and undertaken in accordance with the Generic WSI and relevant best practise guidance (and any subsequent revisions) i.e.:

- Crossrail standards and specifications;
- Institute for Archaeologists – Standard and Guidance for archaeological field evaluation, 2013a;
- Institute for Archaeologists – Standard and Guidance for archaeological excavation, 2013b;
- Institute for Archaeologists – Standard and Guidance for an archaeological watching brief, 2013c;
- Museum of London collections and archive policies and guidance;
- English Heritage – Geoarchaeology, 2007;
- English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003;
- GLAAS Archaeological Guidance Papers 2009 (Consultation Draft);
- Corporation of London archaeology guidance – Planning Advice Note 3, 2004;
- Museum of London Archaeology Service site recording manual (MOLAS 1994); and
- English Heritage – Understanding Historic Buildings – A guide to good recording practice, 2006

7.2 Potentially nationally important remains

7.2.1 Where unexpected, potentially nationally important archaeological remains (as defined in the Crossrail Environmental Minimum Requirements and Generic WSI) are identified during the works, the Archaeology Contractor shall undertake works in accordance with the Environmental Requirements (archaeology) section of the relevant package Works Information and shall adhere to procedures as set out in the SS-WSI.

7.2.2 The Archaeology Contractor shall submit details of their procedure for excavating and recording potentially nationally important remains in the Archaeology Contractor's Method Statement.

7.2.3 In the event that archaeological remains of potentially national importance are encountered the C261 Archaeology Contractor will immediately inform the Project Archaeologist and not recommence work at the location until further instruction has been received from the Project Archaeologist. The discovery of archaeological remains of potentially national importance will be confirmed in writing within 24hours of discovery.

7.2.4 The Project Archaeologist will be responsible for informing the relevant statutory consultees (EH GLAAS) and co-ordinate any meetings required between Crossrail

Central, the C360 Principal Contractor, the C261 Archaeology Contractor and the relevant statutory consultees.

- 7.2.5 The C360 Principal Contractor will be responsible for supplying any material required to protect archaeological remains of potentially national importance from possible damage by ongoing construction activities in the vicinity. This may include the provision of barrier fencing, terram and sand.
- 7.2.6 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Project Archaeologist to incorporate any additional specific primary fieldwork event aims.

7.3 Human Remains

- 7.3.1 Certain aspects of the normal legal procedure for the removal of human remains (and associated monuments) from burial grounds has been modified by Schedule 15 to the Crossrail Act 2008. However for other aspects, normal legislation applies.
- 7.3.2 Where human remains are identified, all subsequent works must be undertaken in accordance with relevant legislative and environmental health requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.
- 7.3.3 In the event that human remains are encountered the C261 Archaeology Contractor will immediately inform the Project Archaeologist and not recommence work at the location until further instruction has been received from the Project Archaeologist. The discovery of human remains will be confirmed in writing within 24 hours of discovery during which time C261 will apply for the relevant Ministry of Justice (Coroner's Division) licence.
- 7.3.4 The Project Archaeologist will be responsible for informing the relevant statutory consultees (EH GLAAS) and co-ordinate any meetings required between PDP, the Principal Contractor, the C261 Archaeology Contractor and the relevant statutory consultees.
- 7.3.5 The Archaeology Contractor shall confirm how the requirements set out in the SS-WSI will be implemented as part of their procedure for excavating and recording human remains in the Archaeology Contractor's Method Statement. This should incorporate best practice guidance e.g. Council for the Care of Churches (1999) and English Heritage (2002 and 2002a).
- 7.3.6 At sites known in advance to have a high risk of encountering human remains, provision shall be made by the Archaeology Contractor for site inspection by a recognised specialist.
- 7.3.7 Should human remains be discovered, the Archaeology Contractor shall notify the Project Archaeologist immediately so that these procedures can be implemented. This notification may be initially made personally or by telephone but shall be confirmed in writing within 24 hours of discovery.
- 7.3.8 The Principal Contractor will be required to cease all works at that location until further instruction is provided by the Project Archaeologist. The Archaeology Contractor shall undertake an initial in situ observation and assessment of the remains and shall advise the Project Archaeologist of the course of action required.
- 7.3.9 Lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation or excavation. Notwithstanding this, the Archaeological

Contractor shall ensure that all burials are planned/photographed in-situ and that appropriate samples have been recovered prior to any lifting.

7.3.10 Visible grave goods and other obvious artefacts, shall be recorded and lifted before the end of the working day to avoid the risk of vandalism and theft. Where this is not feasible or appropriate, the Archaeology Contractor shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor. As a minimum, this will require a 24 hour comprehensive security regime until sensitive remains have been recorded and lifted.

7.3.11 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Project Archaeologist to incorporate any additional specific primary fieldwork event aims.

7.4 Treasure Act

7.4.1 The Treasure Act 1996 defines 'Treasure' as:

- Any object at least 300 years old when found which is: not a coin, but has metallic content of which at least 10% is precious metal; or
- One of at least two coins with at least 10% precious metal content;
- One of at least 10 coins;
- Any object at least 200 years old designated as treasure by the Secretary of State;
- Any object which would have been 'Treasure Trove';
- Any object found with any of the above.
- The Treasure (Designation) Order 2002 extends the definition of treasure to include:
 - Finds of at least two base metal objects (other than coins) of prehistoric date; and
 - Any object (other than a coin) of prehistoric date with any precious metal content.

7.4.2 All finds falling within the definitions of treasure shall be reported immediately to the Project Archaeologist and all subsequent works must be undertaken in accordance with the relevant legislative requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.

7.4.3 To protect the finds from theft, the Archaeology Contractor shall record the finds and remove them to a safe place. Where recording and removal is not feasible or appropriate on the day of discovery, the Archaeology Contractor shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor.

7.4.4 Subject to the Provisions of the Treasure Act 1996, all material that is defined as Treasure is vested in the franchisee or, if none, the Crown.

7.4.5 With respect to Treasure finds, a reward may be payable to the finder, the landowner and/or the occupier. The Crown usually offers finds to a museum.

7.5 Health and safety

7.5.1 The Archaeology Contractor shall undertake the works in accordance with the Employer's Health and Safety requirements and the Principal Contractor's Health and

Safety Plan. Where specific health and safety constraints or requirements for the Archaeology Contractor's method of work are required, these shall be set out in this section and detailed in the Archaeology Contractor's Method Statement (in the Health and Safety Plan).

- 7.5.2 No ground intervention or other survey shall be made without approval of the Archaeology Contractor's Health and Safety Plan, Method Statement and Risk Assessment by the CDM co-ordinator.
- 7.5.3 Hand excavation or other remote sensing method may be required prior to any mechanical excavation in the first instance to locate any known or suspected below ground hazards. The Archaeology Contractor's Method Statement and Risk Assessment shall take account of any design information (including the Designer's and Principal Contractor's Risk Assessment) pertaining to above ground hazards such as buildings and other structures or public rights of way and below ground hazards such as services, utilities and infrastructure and shall contain a site specific Risk Assessment for unknown below ground hazards such as contaminants including unexploded ordnance. All appropriate mitigation measures shall be in place prior to commencement of any ground intervention or other survey.
- 7.5.4 Trial trench excavation method and earthworks support design, shall conform to Health and Safety legislation and safety standards as well as incorporating current engineering best practice, where appropriate.

7.6 Location and ground elevation of interventions and survey grids

- 7.6.1 The spatial extent of the investigation(s) shall be set out in accordance with the setting out co-ordinates supplied by the Project Archaeologist. All spatial setting out and recording shall be in accordance with The London Survey Grid Standard (formerly Crossrail Survey Grid). See Crossrail standard CR-STD-010.
- 7.6.2 Interventions shall be located to a horizontal accuracy of +/-500mm in relation to the detail illustrated in the contract drawing(s). The corner points of each excavation or the centre point of each soil core location shall be set out with a Total Station Theodolite or other suitable automated equipment referenced from approved Permanent Ground Marker (PGM) data supplied to the Archaeology Contractor by the Project Archaeologist. The positions of the trenches and survey points shall be verified by the Archaeology Contractor taking additional check measurements to additional known-location points of detail.
- 7.6.3 Surface heights shall be recorded and related to PGMs or approved Ordnance Survey Bench Marks (OSBM) .The full descriptions and locations of PGMs and OSBMs known to the Employer will be supplied to the Archaeology Contractor by the Project Archaeologist. Levelling accuracy between OSBMs/PGMs and site TBMs shall be within $10 \text{ mm} \sqrt{k}$: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved OSBMs or Crossrail PGMs. Where more than one TBM is required per site the Archaeology Contractor shall establish the TBMs as part of the same closed loop.
- 7.6.4 The Archaeology Contractor shall include details of their surveying methodology within their Method Statement (see Section 8), including the setting out of the grid and how they intend to provide the project grid co-ordinates to the Project Archaeologist with the Survey Report.

7.6.5 The Archaeology Contractor shall ensure that all trench or excavation limits, and significant archaeology detail are surveyed 'as dug' in relation to the project grid before leaving the site. Ground level height data shall be recorded for each intervention. Survey methodology and a detailed survey record shall be provided to the Project Archaeologist within the Survey Report.

7.7 Specification for watching brief

Scope of Watching Brief

- 7.7.1 Watching brief, as defined in the Generic WSI, is a programme of archaeological monitoring (i.e. observation, investigation and recording) which is carried out by a suitably qualified archaeologist during site investigations (e.g. geotechnical test pits, boreholes and utilities trial trenches) and construction works. The purpose of a watching brief is to identify the potential of any archaeological remains that are uncovered in the course of the works and record them appropriately (as far as is reasonably practicable). The watching brief shall result in the preparation of an ordered archive which will be incorporated into the post-excavation works and into publication of the project results.
- 7.7.2 The Archaeology Contractor shall undertake the watching brief for all areas of ground disturbance which may potentially contain archaeological remains as set out in the SS-WSI. This shall include any activities (including those associated with site set-up and demolition) undertaken by the Principal Contractor that involve the removal of modern material, made ground and topsoil, subsoils, and superficial geological deposits such as alluvium and colluvium.
- 7.7.3 Areas that have been previously subject to archaeological excavation and which are known not to contain significant deposits (for example tunnels, cuttings, and areas of known large-scale modern disturbance) shall be excluded from the scope of the watching brief, unless stated otherwise in the SS-WSI. Areas that have been subject to previous assessment and evaluation (e.g. geophysical survey, surface artefact collection, geotechnical survey, trial trenching etc.) shall be included within the watching brief, as appropriate.
- 7.7.4 Two classes of watching brief are set out in the Generic WSI:
- A General Watching Brief shall comprise observation and recording of the Principal Contractor's works without constraint on their working methods.
 - A Targeted Watching Brief shall comprise observation and recording of the Principal Contractor's works with specific operations carried out under the supervision of the Archaeology Contractor. Under Targeted Watching Brief, the Archaeology Contractor may impose constraints on, or require changes to, the Principal Contractors' or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works.

- 7.7.5 Targeted Watching Brief shall be used for areas of known occasional, dispersed features which are either not considered to be of sufficient significance to warrant archaeological investigation in advance of construction, or where access prior to construction has not been possible and where, as a result, there is a possibility of unexpected discoveries
- 7.7.6 Except in cases where unexpected, potentially nationally important, archaeological remains are discovered, the Targeted Watching Brief shall be designed and implemented so as to avoid adverse impact on the construction programme, wherever practicable.
- 7.7.7 The Principal Contractor shall make allowance in their activity programme for the completion of any targeted or General Watching Briefs as set out in the SS-WSIs.
- 7.7.8 The specification for watching briefs (general and targeted) are set out below:

Scope of Targeted Watching Brief - Constraints on Principal Contractor's Methodology

- 7.7.9 In archaeologically sensitive areas, where the need for a Targeted Watching Brief has been identified in the SS-WSI, the Principal Contractor will strip soils (which may include modern made ground, topsoil, subsoil, alluvium and colluvium) using a 360 degree excavator and toothless ditching bucket under the supervision of the Archaeology Contractor. The Principal Contractor will limit their tracking of vehicles and plant within areas specified in the SS-WSI and/or as instructed by the Project Archaeologist. The Principal Contractor will facilitate mapping and sampling of deposits by the Archaeology Contractor through use of agreed plant, a site share agreement and careful liaison between the Archaeology Contractor's supervising archaeologist and the Principal Contractor's site supervisor.

Specification for watching brief

- 7.7.10 The requirement for the Archaeology Contractor to undertake a Targeted Watching Brief during advanced works during utilities diversions or the excavation of the temporary and main ventilation shafts will be informed by the results of the trial trench evaluation.
- 7.7.11 The Works to be carried out by the Archaeology Contractor shall consist of two parts:
- a) Watching brief ('observation') following, and without interruption to, the progress of the Principal Contractor by a core team of archaeologists.
 - b) Investigation of archaeology and remains of quaternary geological importance undertaken either:
 - by the core team, following the progress of the Principal Contractor; or
 - by additional archaeologists (the 'support team'), to be deployed to investigate unanticipated archaeological remains, where appropriate.

- 7.7.12 The Archaeology Contractor's core team shall consist of the Archaeology Contractor's key person (the field director) and other appropriately experienced archaeologists commensurate with the scale and nature of the Principal Contractor's works.
- 7.7.13 The core team shall undertake the observation and any required investigation such as they may reasonably be able to undertake.
- 7.7.14 The Archaeology Contractor's support team shall consist of additional experienced archaeologist. The size of the support team shall be commensurate with the scale and programme of the Principal Contractor's works. The Archaeology Contractor shall be required to supply teams of 5 and 10 persons within 24 and 48 hours notice respectively.
- 7.7.15 The Archaeology Contractor's core and support teams shall be advised where necessary by specialists, as appropriate and as agreed with the Project Archaeologist.
- 7.7.16 The Archaeology Contractor shall record the following observations on a daily basis. The record shall consist of, as a minimum:
- The Event Code and chainage/location of the area observed;
 - The date(s) of the observation;
 - Personnel employed on site;
 - A description of the construction works observed;
 - The works (sub) contractor and personnel undertaking and supervising the construction activity;
 - Depths and extents of excavation works observed;
 - Measure of confidence that any archaeological remains would have been observed and reasons;
 - The areas and horizons (both those containing archaeological or remains of quaternary geological importance and those which do not) unaffected by construction activity (with special reference to archaeological sites identified for preservation in situ);
 - The reasons why any particular area of the works was not observed, and noting those areas not subject to disturbance from construction;
 - Location and description of any archaeological remains; and
 - Location and description of any modern remains.

Investigation undertaken during watching brief

- 7.7.17 An appropriate sample shall be excavated from cut features and other archaeological remains of importance. Sampling of cut features shall include feature inter-sections to establish relative chronologies. The extent of sampling shall be determined by the Archaeology Contractor in liaison with the Project Archaeologist (and as discussed with the relevant local authority and English Heritage, and a quaternary specialist, if necessary) but may, for instance, include the sample excavation of a selected number of deposits (both layers and negative, cut features), recording of structural remains, drawn sections and profiles, and/or be aimed at recovering sufficient information to determine function, form, and date. Any specific variations from this specification shall be indicated in The Archaeology Contractor's Method Statement.
- 7.7.18 Heights for all deposits shall be related to approved Permanent Ground Markers (PGMs) or approved Ordnance Survey Bench Marks (OSBM), where reasonably accessible. Levelling accuracy between OSBMs/PGMs and site Temporary Bench Marks (TBMs) shall be within 10 mm ± k: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved OSBMs or URL PGMs. Where more than one TBM is required per site, the Archaeology Contractor shall establish the TBMs as part of the same closed loop. The Archaeology Contractor shall prepare a record of their surveying methodology for inclusion in the archive.
- 7.7.19 It may not be possible to clean and record the archaeological profile of geotechnical test pits, due to health and safety or access constraints. Every effort shall be made to establish the presence or absence of archaeological deposits by establishing the absolute ordnance datum (AOD) for the height of significant deposits, including the depth of modern intrusions, key stratigraphic components and natural deposits.

Recording standards

- 7.7.20 The archaeological remains shall be recorded to best practice standards, recognising the special circumstances of a watching brief which demand flexibility in order to achieve archaeological objectives and requirements within the construction environment.
- 7.7.21 The recording is to include as a minimum:
- The written record of individual context descriptions on appropriate pro-forma.
 - The drawn record shall normally include, plans and section drawings of appropriate features, structures and individual contexts (1:50 1:20 or 1:10). Isolated archaeological remains (artefacts) may be spot located in plan and a height provided where possible. Deposits which are regular in plan (pits and ditches) may be located though co-ordinates, annotated with dimensions, and may be recorded digitally.
 - Other appropriate drawn and written records shall also be produced (for environmental sampling etc.).

- The photographic record shall consist of monochrome prints/negatives and colour transparencies. A 35mm format (film or digital) SLR camera is acceptable for all site photography. The Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, structures, and quaternary deposits. Each photograph and transparency shall clearly show details of the above. Each photograph and transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the event code and context/feature number. In addition, the Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.

7.8 Specification for archaeological investigation

- 7.8.1 A sufficient sample of the archaeological features and deposits revealed must be sampled/or fully excavated to allow the resolution of the aims and objectives of the work. Structures, features, or finds which might reasonably be considered to merit preservation in-situ shall not be unduly damaged.
- 7.8.2 Where modern foundations are likely to be present, the SS-WSI shall identify whether they should be left in-situ for the purposes of the evaluation or removed. Where it is clear that modern foundations have truncated certain archaeological levels they should be removed to assess lower archaeological levels. The Archaeology Contractor shall take all reasonable care to ensure that any damage is limited as far as practicable. If significant damage is likely to occur the work shall be suspended and the Project Archaeologist informed so that a technical solution can be agreed with the Project Manager.
- 7.8.3 The location and objectives of the trial excavations set out in Sections 5 and 4 of this SS-WSI have been established in consultation with the projects' statutory consultees.
- 7.8.4 Each trial excavation has been assigned a unique ID number by the Project Archaeologist. The Archaeology Contractor shall not vary this number unless agreed by the Project Archaeologist in writing.
- 7.8.5 The dimensions of each trial excavation in plan, inclusive of the trench support system employed (if required) to secure personnel entry to the excavation, shall be set out in the SS-WSI. Trial excavations shall be excavated to the base of the alluvial sequence or to a depth specified in the SS-WSI (Section 5). This shall be dependent on the agreed objectives of the excavation.
- 7.8.6 Temporary works and any required hand investigation to address below ground hazards shall be carried out by the Principal Contractor under supervision by the Archaeology Contractor in accordance with their approved Method Statement and Risk Assessment. All subsequent trial excavations shall be excavated by the Principal Contractor under supervision by the Archaeology Contractor using a mechanical excavator with toothless ditching bucket, except where the nature of the made ground or surface of the pits is such that an alternative bucket or means of breaking out prior to excavation is required (and the Project Archaeologist has agreed an alternative method).
- 7.8.7 All machine work and demolition of below-ground obstructions (e.g. removal of basement slabs) shall be carried out by the Principal Contractor under supervision by the Archaeology Contractor. The Principal Contractor shall cease work when archaeological evidence is revealed and allow the Archaeology Contractor to undertake

investigation, as appropriate. An excavator shall not be used to cut arbitrary trial trenches down to natural deposits without regard to the archaeological stratification.

- 7.8.8 All undifferentiated topsoil, or overburden of recent origin, shall be removed down to the first archaeological layer. An exception to this would be where a focused soil-sampling strategy is proposed to record and collect data from reworked soil contexts above recognisable stratified archaeological contexts. If a mechanical excavator is to be used to remove modern overburden, such as floor slabs or recent levelling layers, this shall be undertaken in spits of 0.20m-0.5m depth (dependant on specific site conditions), moving along the length of the trench or area. The Archaeology Contractor's supervising archaeologist shall use their professional judgement to determine the appropriate depth of each spit and will advise the Principal Contractor accordingly. Any variations to the excavation methodology shall be at the discretion of the supervising archaeologist and recorded in writing for inclusion in the final report to the Project Archaeologist.
- 7.8.9 Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machining.
- 7.8.10 The archaeological level shall be cleaned in plan by the Principal Contractor using a wide blade, ditching bucket or similar, with no teeth. If the machine has to re-enter the trench care will need to be taken to ensure that it does not damage underlying remains.
- 7.8.11 The Archaeology Contractor shall undertake hand excavation and cleaning of any archaeologically significant horizons, to fulfil the aims of the work. Within alluvial sequences the Archaeology Contractor shall pay particular attention to establishing the vertical extent of layers of archaeological potential and shall be aware that horizons of cultural activity may be interdigitated with horizons of sterile alluvium. The Archaeology Contractor shall supervise the excavation of each test pit in such a manner so as to allow a cumulative or continuous section to be recorded.
- 7.8.12 The Archaeology Contractor's excavation, sampling and recording policy shall be included in the Archaeology Contractor's Method Statement. This is to include, as a minimum:
- The recording of individual contexts on appropriate pro-formas;
 - Excavation plans at 1:50 scale; planning and section drawing of appropriate single contexts and features (usually at 1:20 scale for plans and 1:10 scale for inhumations and sections);
 - Photographs; and other appropriate drawn and written records; and
 - Permanent Ground Markers (PGM's), any temporary benchmarks and approved OS benchmarks shall be indicated on the relevant plans.
- 7.8.13 The Archaeology Contractor's survey and recording policy shall meet the following requirements:
- All levels shall be recorded to London Grid standards and reduced to OS datum;
 - All trial pit locations shall be electronically surveyed with reference to the London Grid and Crossrail PGM's upon the completion of fieldwork by the Archaeology Contractor;
 - The locations of trial pits shall be plotted on appropriate scale plans related to the London Grid and labelled with six figure eastings and northings; and
 - The electronic survey record shall be retained with the project archive.

- 7.8.14 In alluvial sequences, each trial excavation shall be excavated to the base of the alluvial sequence, and shall be appropriately shored and kept free of water by the Principal Contractor to allow 'person entry' to the excavations i.e. to allow the Archaeology Contractor to undertake investigation and recording to fulfil the aims of the work.
- 7.8.15 The Archaeology Contractor shall identify any temporary works and dewatering requirements associated with the archaeological investigation in the Archaeology Contractor's Method Statement and shall agree the detailed arrangements for such with the Principal Contractor. The Archaeology Contractor will be required to undertake works in accordance with the Principal Contractor's arrangements for matters such as off site-spoil disposal or storage, on-site facilities and services. Relevant requirements shall be incorporated in the Archaeology Contractor's Method Statement.
- 7.8.16 Where areas of extensive archaeological stratification are encountered, trial trenches shall not be fully excavated. However, the horizontal and vertical extent of archaeological stratification shall be assessed by the Archaeology Contractor through implementation of an appropriate strategy including, either the excavation of features cut into horizontal stratification, limited test pitting or auguring. The aim shall be to recover suitable stratigraphic, finds and environmental samples from the full, intended depth of the trench, as far as is practicable. The exact methodology may need to be determined by the Archaeology Contractor during the excavation of individual trenches and agreed with the Project Archaeologist.
- 7.8.17 A sufficient sample shall be excavated from cut features and other archaeological deposits to fulfil the aims of the work. Sampling of cut features shall include feature intersections to establish relative chronologies.

Recording systems

- 7.8.18 The trial excavations shall be recorded by the Archaeological Contractor to the standards of current best practice. The recording systems adopted during the investigations must be fully compatible with those published by the Museum of London Archaeology Service (MoLAS 1994 3rd ED) and Museum of London (MoL 1998).
- 7.8.19 The recording is to include, as a minimum:
- At least one representative section at (1:10 or 1:20 scale) of each trial excavation from ground level to the base of the excavation;
 - The written record of individual context descriptions on appropriate pro-forma;
 - Plans at appropriate scales (1:10 or 1:20);
 - Single context planning if appropriate; and
 - Photographs and other appropriate drawn and written records.
 - Other sections, including the half-sections of individual layers or features shall be drawn as appropriate to 1:10 or 1:20.

- 7.8.20 Site plans shall identify both London Grid and OS co-ordinates. A 'site location plan', indicating site north shall be prepared at 1:1250. Individual 'trench plans' or 'excavation area plans' at 1:200 (or 1:100) shall be prepared which show the location of archaeology investigated in relation to the investigation area.
- 7.8.21 Section drawings shall be located on the relevant plan and both London Grid and OS co-ordinates recorded. The locations of the OSBM or PGM bench markers used and any site TBM shall also be indicated.
- 7.8.22 A record of the full extent in plan of all archaeological deposits as revealed in the investigation shall be made; these plans shall be on polyester based drawing film, and be at a scale of 1:10 or 1:20 unless otherwise agreed with the Project Archaeologist. 'Single context planning' shall be used on deeply stratified sites. Drawing information shall be digitised for eventual CAD applications. The GLSMR will accept Autocad DXF or .DWG format of extent of site and location of major features with the completed Sites and Monuments Report Form.
- 7.8.23 A 'Harris matrix' stratification diagram shall be employed to record stratigraphic relationships (Harris 1993). This record shall be compiled and fully checked by the Archaeological Contractor during the course of the excavations. Spot dating shall be incorporated onto this diagram during the course of excavations.
- 7.8.24 Recording of structural evidence revealed below ground level will vary according to the level of special interest of the structure and its relationship to below-ground archaeology. Structures of little or no significance shall be noted on a site plan. Detailed element detail drawings of important features revealed in investigations may be required in accordance with the aims and objectives of the investigation.
- 7.8.25 The Archaeology Contractor shall agree the appropriate level of recording and analysis for discovered standing structures with the Project Archaeologist, in accordance with the Crossrail procedure for non-listed built heritage recording (Document CR-PN-PRW-EN-PD-00010). The Archaeology Contractor shall revise the Archaeological Contractor's Method Statement to reflect any additional requirements for built heritage recording.
- 7.8.26 The photographic record shall consist of monochrome prints/negatives and colour transparencies. A 35mm format SLR camera (film or digital) is acceptable for all site photography. The Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, and structures. Each photograph and transparency shall clearly show details of the above, and may require the use of artificial lighting to achieve suitable definition. Each photograph and transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the project event code and context/feature number. In addition, the Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.
- 7.8.27 The transparencies shall be mounted in suitable frames for long-term curation in preparation for deposition with the archive. Digital photography and video recording may be appropriate in some circumstances and the Archaeology Contractor shall set out proposals for such recording in the Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 7.8.28 Where appropriate a photogrammetric record or laser scan record shall be made of complex structures, features and horizons, liable to be damaged in the course of the investigation, such as buildings or parts of buildings. Appropriate technical specification

and scales shall be specified in the SS-WSI and addressed in the Archaeology Contractor's Method Statement.

7.9 Archaeological science

- 7.9.1 The strategy for sampling archaeological and palaeo-environmental deposits and structures (which can include soils, timbers, pollen, diatoms, animal bone, human bone etc.) will be developed by the Project Archaeologist in consultation with English Heritage Science Advisor and the Archaeology Consultant. On-site work and off-site analysis of the processed samples and remains will be undertaken by the Archaeology Contractor's environmental archaeologist as specified in the Archaeology Contractor's Method Statement.
- 7.9.2 The finds retrieval policies of the appropriate recipient museum will be adopted. In accordance with the collection and retention strategy set out in SS-WSI, all finds (artefacts and ecofacts) visible during excavation shall be collected and processed by the Archaeology Contractor. In some cases, sampling may be the most appropriate strategy. Finds shall be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication First Aid for Finds (Watkinson and Neal 1998).
- 7.9.3 Where there is evidence for industrial activity, macroscopic technological residues (or a sample of them) shall be collected by hand. Separate samples (c. 10ml) shall be collected for micro-slugs (hammer-scale and spherical droplets). Reference should be made to the Centre for Archaeology Guideline on Archaeometallurgy (English Heritage 2001). Assessment of any technological residues shall be undertaken.
- 7.9.4 Where appropriate, samples shall be taken for scientific dating (for example radiocarbon dating, OSL, thermoluminescence at the evaluation stage). This may apply where dating by artefacts is insecure or absent, and where dating is necessary for development of the SS-WSI for subsequent mitigation strategies. Procedures and specifications shall follow English Heritage guidance (English Heritage 2008b).
- 7.9.5 Buried soils and sediment sequences shall be inspected and recorded on site by the Archaeology Contractor's geoarchaeologist, since field inspection may provide sufficient data for understanding site formation processes. Procedures and techniques presented in the English Heritage documents Environmental Archaeology (English Heritage 2002) and Geoarchaeology (English Heritage 2007) shall be followed. Samples for laboratory assessment shall be collected where appropriate, following agreement with the Project Archaeologist.
- 7.9.6 Deposits shall be sampled for retrieval and assessment of the preservation conditions and potential for analysis of biological remains following English Heritage guidance (English Heritage 2002). The sampling strategy shall include a reasoned justification for selection of deposits for sampling, and shall be developed by the Archaeology Contractor's environmental archaeologist or recognised bioarchaeologist in liaison with the Project Archaeologist. Flotation samples and samples taken for coarse-mesh sieving from dry deposits shall be processed at the time of the fieldwork wherever possible, to permit variation of sampling strategies if necessary. Sampling strategies for wooden structures shall follow the methodologies presented in Brunning (1996).
- 7.9.7 Artefacts, biological samples and soils shall be assessed for evidence of site and deposit formation processes and taphonomy and especially for evidence of recent changes that may have been caused by alterations in the site environment.

- 7.9.8 Assessment of finds assemblages shall include x-radiography of all iron objects (after initial screening to exclude obviously recent debris) and, where appropriate, non-ferrous artefacts (including all coins). Where necessary, active stabilisation /consolidation shall be carried out to ensure long-term survival of the material, but with due consideration to possible future investigations.
- 7.9.9 Once assessed, all material shall be packed and stored in optimum conditions, as described in First Aid for Finds (Watkinson and Neal 1998). Waterlogged organic materials shall be processed in accordance with: Guidelines for the care of waterlogged archaeological leather (English Heritage/Archaeology Leather Group 1995) and Waterlogged wood: the recording, sampling, conservation and curation of structural wood (Brunning 1996).
- 7.9.10 Samples for absolute dating shall be submitted promptly to the supply laboratory proposed by the Archaeology Contractor or other supplier as instructed by the Project Archaeologist. Delivery times shall be agreed to ensure that the results are available to aid development of specifications for subsequent mitigation strategies in the SS-WSI. Where it is proposed to date human remains, the time limits for reburial imposed by Schedule 15 of the Crossrail Act (for remains removed from burial grounds) or set out in the relevant burial licence under the Burial Act 1857 (in all other cases) shall be adhered to.
- 7.9.11 Processing of all soil samples collected for biological assessment, or sub-samples of them, shall be completed as soon as reasonably practicable. The preservation state, density and significance of material retrieved shall be assessed by the Archaeology Contractor's recognised specialist. Special consideration shall be given to any evidence for recent changes in preservation conditions that may have been caused by alterations in the site environment. Unprocessed sub-samples shall be stored in appropriate conditions in accordance with the Archaeology Contractor's Method Statement.
- 7.9.12 Samples collected for geo-archaeological assessment shall be processed promptly by the Archaeology Contractor's specialist, particularly where storage of unprocessed samples is thought likely to result in deterioration. Appropriate assessment shall be undertaken as agreed with the Project Archaeologist. Where preservation in situ is a viable option, consideration shall be given to minimising the possible effects of compression and loading on the physical integrity of the site and any hydrological or chemical impacts of the proposed construction works (English Heritage 2002).
- 7.9.13 Animal bone assemblages, or sub-samples of them, shall be assessed by the Archaeology Contractor's specialist with reference to English Heritage guidance (English Heritage 2002).
- 7.9.14 The results from any specific investigations in Archaeological Science shall be included in the Site Archive and presented in the evaluation report or final fieldwork report. Reports shall include sufficient detail to permit assessment of potential for analysis. They shall include tabulations of data in relation to site phasing and contexts, and include non-technical summaries. The objective presentation of data shall be clearly separated from interpretation i.e. recommendations for further investigations, (both on samples already collected, and at future excavations), shall be clearly separated from the results and interpretation.

Generic specification for Environmental Sampling

- 7.9.15 Appropriate features and deposits shall be sampled to retrieve palaeo-environmental and economic indicators. The Archaeology Contractor shall make provision for the

sampling of a wide range of contexts for potential assessment and analysis for plant and animal micro/macro fossils and soils/sediments in order to fulfil the aims set out in the SS-WSI.

- 7.9.16 The Archaeology Contractor shall use ten litre plastic buckets (with lids and handles), or as a temporary measure strong polythene bags (double bagged) secured at the neck, for the recovery of bulk 'disturbed' environmental samples. An adhesive label recording the project event code, context number and sample information shall be securely fixed to a vertical face of the bucket only or attached to the neck of the bag. Labels shall be completed with an indelible ink pen. A duplicate non-adhesive label shall be inserted within the bucket or between the polythene bags.
- 7.9.17 The selection, preparation for and methods of taking samples together with their size, presentation and processing shall be in accordance with current best practice (e.g. IFA Standard and Guidance for Artefact and Environmental Study, Collection, Research and Conservation 2008d; English Heritage –Geoarchaeology, 2007; English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003).
- 7.9.18 The Archaeology Contractor shall be responsible for the protection of all samples and finds and for their transport (including loading and unloading) to the Archaeology Contractor's facilities or other location as agreed with the Project Archaeologist. Samples shall be protected at all times from temperatures below 5 and above 25 degrees Celsius and from wetting and drying out due to weather exposure.
- 7.9.19 Bulk samples shall normally be in the range of 10-60 litres. The size selected will depend on the likely density of macrofossils in the soil. The lower end of the range (10-20 litres) will be suitable for the recovery of macrofossils from waterlogged deposits. For non-waterlogged deposits the sample volume is likely to be in the middle to higher range (20-40 or 40-60 litres) dependant upon site activity, conditions and preservation. The residue of soil left in the bottom of any inhumations after the removal of human remains shall be retrieved for bulk processing. Vessel or pit fills containing human remains shall be processed as bulk samples to ensure the maximum retrieval of cremated bone. Cremation vessels and deposits of placed human bone within cut features may require excavation in spits. The fill residues from the excavation of these features shall be bulk sampled to ensure maximum retrieval of cremated bone, associated small finds and floral and faunal remains. All work shall be undertaken in compliance with the generic Crossrail standards for Human Remains (see Section 7A) which may require the reburial of human remains within a specific timeframe.
- 7.9.20 For 'bulk disturbed' samples the limits of the sample zone shall be recorded and identified on plan.
- 7.9.21 The Archaeology Contractor shall use appropriately sized monolith or kubiena boxes for the recovery of 'undisturbed' monolith samples for geo-archaeological study (pollen, other microfossil and micromorphological studies etc). Care shall be taken to ensure that wherever possible only newly exposed sections are sampled to avoid contamination, desiccation and decalcification. This sampling shall be undertaken under supervision of the Archaeology Contractor's environmental specialist. Boxes shall be wrapped neatly and tightly in bin-liners or plastic sacks and secured with rubber bands. A label shall be attached to the outside (in duplicate) with site name and code, feature/context number and depths of sample.
- 7.9.22 The Archaeology Contractor shall record the depth of the 'undisturbed' monolith at the top and the bottom of the sample. There shall be a 50mm overlap between each

monolith. This information shall be plotted onto a section drawing at an appropriate scale, with all levels reduced to heights relative to Ordnance Datum. Where the sample crosses archaeological context boundaries these shall be noted on the sample recording pro-forma.

7.9.23 Where it is not possible to insert monolith boxes, the Archaeology Contractor shall take a vertical series of small 'spot' samples. Samples shall be at 20mm vertical intervals with no more than 10mm depth being sampled. In the case of deposits with a low organic content it may be necessary to take as much as 5g or even 20g per sample. If so, sampling shall be extended laterally at a given depth in 10mm deep spits.

7.9.24 Where appropriate, the Archaeology Contractor shall take contiguous column samples for the retrieval of macrofossils. The individual sub-samples will be of 1-10kg, depending on the nature of the deposit and the category of material to be retrieved. Where several specialists are involved it may be necessary to take separate sub-samples for a range of palaeo-environmental evidence, for example, insects, molluscs and seeds, to ensure that adequate sub-samples are available for specialist assessment.

8 Deliverables

8.1 C261 Archaeology Contractors Deliverables

- 8.1.1 The Archaeology Contractor shall provide a detailed Archaeological Method Statement for the archaeological targeted watching brief.
- 8.1.2 During the execution of each fieldwork event the Archaeology Contractor shall submit a weekly progress report to the Project Archaeologist.
- 8.1.3 On completion of each archaeological fieldwork event the Archaeology Contractor shall provide the post-excavation deliverables summarised below:
- an Interim Report within 7 days of completion;
 - a Survey Report within 2 weeks of completion;
 - a Fieldwork Report within 6 weeks of the completion; and
 - a Summary Report within 8 weeks of the completion.
- 8.1.4 The requirement for production of a formal Post-excavation Assessment will be dependant on the significance of the results of the archaeological evaluation and targeted watching brief undertaken during the C360 Main Works package.
- 8.1.5 Details of each deliverable are provided below.

8.2 Archaeological Contractors Method Statement

- 8.2.1 The Archaeology Contractor shall provide a detailed Method Statement for the works for the Project Archaeologist's approval. The Method Statement shall be prepared in association with the Principal Contractor, taking account of their Environmental Management Plan and other relevant site information provided by them and requirements for the works set out in the Works Information (e.g. relating to health and safety, security, engineering design requirements and attendances). The Method Statement shall include, as appropriate:
- a) A resource plan and programme and CV's;
 - b) The Archaeology Contractor's IT capability and proposed IT plan (including specific survey methods for on-site recording of stratigraphic profiles and sub-surface topographic modelling;
 - c) The Archaeology Contractor's approach to Archaeological Science;
 - d) The methods for survey and setting out works;
 - e) The methods to address the specific event types required (trial trench, area excavation etc);
 - f) The safe method of working whilst excavating trenches or pits including any temporary works required;
 - g) The method for disposing of water from trenches and test pits in waterlogged ground;
 - h) Site management plan to include details of the method for preparing safe access route to the working areas, the proposed site accommodation, services and welfare;
 - i) The retention and disposal policies for samples and artefacts recovered during the work;

- j) The method for excavating and recording inhumations and cremations in compliance with the generic Crossrail standards for Human Remains (see Section 7.1);
- k) The method for preparation of the required reports, archive and all associated deliverables;
- l) The procedures for assessment of potential for analysis (post excavation assessment);analysis and publication proposals;
- m) The method for preparation of the digital dataset, digital drawings, and digital report deliverables;
- n) The Archaeology Contractor's methods and approach for undertaking the site based works and off site processes to completion.
- o) The Health and Safety Plan and Site-Specific Risk Assessment (including unexploded ordnance);
- p) The Quality Assurance Plan;
- q) The procedures for on- and off- site security and emergency response plan (including environmental incidents);
- r) The method for complying with project generic and site specific environmental and consent requirements; and
- s) The Archaeology Contractor's requirements and specification for services and facilities and attendances required to be supplied by the Principal Contractor or the Employer.

8.3 Site Archives

- 8.3.1 The site archive shall be organised to be compatible with other archaeological archives in London, or where outside the greater London area, any specific requirements of the receiving museum. This requirement for archival compatibility includes computerised databases.
- 8.3.2 For London archives, individual descriptions of all archaeological strata and features excavated or exposed shall be entered onto prepared pro-forma recording sheets which include the same fields of entry on the recording sheets of Museum of London Archaeology. Sample recording sheets, sample registers, finds recording sheets, registered finds catalogues and photographic record cards shall also follow the Museum of London Archaeology equivalents.
- 8.3.3 Archives shall be prepared to conform with current best practise (e.g. Brown and Duncan 2007; Institute of Field Archaeologists 2008f) The archive shall cover all finds, samples and records (drawn, written, photographic and electronic) collected and produced during the works. The archive shall be indexed and internally consistent. The Archaeology Contractor shall complete the site archive and submit to the Project Archaeologist within 8 weeks of completion of a fieldwork event.
- 8.3.4 The site archive shall be deposited by at a museum to be confirmed by the Project Archaeologist.

8.4 Digital Data

- 8.4.1 The Archaeology Contractor shall produce a digital data archive of all primary field data produced during the works in accordance with ADS guidelines (Richards and Robinson 2001).
- 8.4.2 The Archaeology Contractor shall prepare and provide field and laboratory data, evaluation or excavation trench and phasing plans showing archaeological features recorded, and report text in digital form, as well as in paper form. Consideration should be given to recording electronic plans during fieldwork.
- 8.4.3 The digital archive for each fieldwork event shall be copied to CD-R or DVD (recordable laser disc) and submitted to the Project Archaeologist for archiving in the Employer's document management system.
- 8.4.4 Final reports, site plans and other illustrations shall be prepared in accordance with the Employer's Information Management standards and procedures.
- 8.4.5 All data files submitted shall be scanned by a virus detection programme updated to the most current version. The disk label shall clearly indicate:
- Confirmation that this check has been carried out (including details of the virus checking programme name and version used) and that the submission is virus free.
 - Fieldwork event name and code.
- 8.4.6 Supplier company name, date and QA details (as a minimum, the name, position and signature of the approver).
- 8.4.7 Prior to commencing the works, the Archaeology Contractor shall submit an example hard copy and data output of each of the data formats required (i.e. data, graphic, CAD and text) produced by their current software, for approval by the Project Archaeologist. The Archaeology Contractor shall inform the Project Archaeologist of any changes or

upgrades made to approved software prior to processing any works data. The sample disk shall include data from a previous real job or jobs.

- 8.4.8 A sequential numbering of data issues shall be rigorously adhered to so that no data versions are submitted out of sequence. The organisation of the data prior to submission shall be the responsibility of the Archaeology Contractor. The Archaeology Contractor shall ensure that data originating from different sources within the Archaeology Contractor's organisation is compatible with the project requirements. The Archaeology Contractor shall nominate one person to the Project Archaeologist who is the main point of contact for matters relating to the digital data submissions.
- 8.4.9 Where errors or inconsistencies are noted in the data, by either the Project Archaeologist or Archaeological Contractor they shall be corrected by the Archaeology Contractor and a corrected data file issued to the Project Archaeologist. When a change or addition is made to the data within an issue, a complete data group shall be re-issued, not just the changed fields. This may not require complete replacement of the whole data set which includes other previous issues.
- 8.4.10 Where any changes are made to a data record between digital data submissions, the Archaeology Contractor shall record the date of the change and the name of the person carrying out the change. The Archaeology Contractor shall ensure that each data amendment is carried out correctly.
- 8.4.11 The Archaeology Contractor shall make two identical copies of the digital archive. The first copy shall be retained by the Archaeology Contractor until the expiry of the Contract maintenance period. The second copy shall be issued to the Project Archaeologist.
- 8.4.12 A digital archive for each Crossrail site (incorporating individual event archives) shall be submitted to a regional or national data archive as agreed with the service provider by the Employer.

8.5 Interim Statement

- 8.5.1 Within 7 days of completion of a fieldwork event the Archaeology Contractor shall submit an Interim Statement to the Project Archaeologist.
- 8.5.2 The Interim Statement shall be brief, and the information contained commensurate with the timescale for production. The report shall not duplicate effort to be utilised at a later date and shall draw on the data gathered during the initial assessment undertaken during fieldwork.
- 8.5.3 A site plan indicating all as-dug investigations shall be provided. Key stratigraphic profiles and topographic templates of the major stratigraphic units shall be provided.
- 8.5.4 The Interim Statement including illustrations shall be submitted as a single PDF file to the Project Archaeologist. CAD drawing files shall also be submitted.
- 8.5.5 The Interim Statement text shall be submitted in hard copy and as an MS Word *.document in accordance with the Employer's information management standards and procedures.
- 8.5.6 The Interim Statement shall include an approved report title sheet and QA page (to be supplied by the Employer).
- 8.5.7 The following shall appear in the footer or header of each Interim Statement:

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8.5.8 Copies of the Interim Statement shall be provided by the Project Archaeologist to the LB Tower Hamlets and GLAAS for comment.

8.6 Survey Report

8.6.1 The Archaeology Contractor shall provide a written and graphic survey report for the works upon completion of fieldwork. Evidence shall be provided for check measurements and results of levelling for establishment of TBM's. The survey report shall be submitted by the Archaeology Contractor to the Project Archaeologist within 2 weeks of the completion of fieldwork.

8.6.2 The Archaeology Contractor shall prepare and submit 'as excavated' site area outlines and levels in accordance with Crossrail standard CRS-SDT-05. Each drawing shall identify the relevant event code and sub-site division, if applicable.

8.7 Fieldwork Report

8.7.1 The evaluation report and watching brief reports shall be prepared by the Archaeology Contractor within 6 weeks of the completion of the fieldwork (unless this is varied by the Project Archaeologist). The Fieldwork Report shall follow the standard structure set out in City of London Planning Advice Note 3 and IFA standards i.e.:

Contents list

Non technical summary

1. Introduction

2. Planning background

3. Previous work(s) relevant to archaeology of site (DBA, DDBA, surveys etc)

4. Geology and topography of site

5. Research objectives and aims

6. Methodology of site-based and off-site work

7. Results and observations including quantitative report, stratigraphic report (including any constraints on site).

8. Assessment of results against original expectations (using criteria for assessing national importance i.e. period, relative completeness, condition, rarity, and group value) and review of evaluation strategy

9. Statement of potential of archaeology

10. Conclusions and recommendations for appropriate mitigation strategy

11. Publication and dissemination proposals (in addition to fieldwork report)

12. Archive deposition

13. Bibliography

14. Acknowledgements

15. Sites & Monuments Record form

16. A3 plans

- 8.7.2 The Fieldwork Report shall provide an illustrated factual statement and statement of importance with associated assessment of potential for further fieldwork and/or analysis of the archive. The Fieldwork Report shall utilise information collected during archaeological fieldwork and from any other appropriate sources agreed with the Project Archaeologist.
- 8.7.3 The Fieldwork Report shall include sections detailing the background to the project, any previous relevant research and investigation, location and topography/geology, a description of the methodology employed and the techniques adopted. Where relevant, these sections shall include location plans with scale and grid co-ordinates.
- 8.7.4 Each component of the works (e.g. stratigraphic/structural, artefactual and environmental/economic) shall be supported by a statement setting out:
- A quantification of the resource (tabulated and cross referenced as appropriate);
 - Provisional dating and evidence for residuality and intrusiveness;
 - The range of material, including sampling and/or taphonomic biases; and
 - The condition of the material, including preservation bias.
- 8.7.5 The stratigraphic statement shall include: a description of the geomorphology and sedimentation record of the survey area; a description of the fieldwork results (brief context descriptions supported by plans and sections as necessary, with levels related to Ordnance Datum); a trench summary table indicating depths of all major stratigraphic units, and their boundaries. Photographs shall be included where appropriate.
- 8.7.6 The Archaeology Contractor shall produce a subsurface model(s) and profiles to illustrate the extent, character and depth of the major stratigraphic topology identified. The model shall be correlated with previous works within the survey area in order to inform the mitigation design. The processing software and presentation format of the data shall be included in the Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 8.7.7 The assessment of results and statement of potential shall include the Archaeology Contractor's conclusions based on the recorded data, e.g. the monument/site class represented, site/feature function and relevant parallels. The statement shall also comment on the potential of the data to address the projects' research themes. As appropriate, comment shall be made on the site as a whole and the individual components (e.g. artefactual, palaeo-environmental, economic). The statement shall utilise the criteria laid down by the Secretary of State for Culture, Media and Sport Criteria for Scheduling, to establish importance.
- 8.7.8 In reporting the results of the works, the accuracy of the original expectations and the appropriateness of the methods adopted shall be assessed by the Archaeology Contractor in order to illustrate what level of confidence can be placed on the information. The Project Archaeologist will use that information as the basis for developing any further mitigation strategy and/or further analysis and publication.
- 8.7.9 The report shall be illustrated with a site location plan, survey location plans as appropriate (to include archaeological interpretation of results), and individual trench and area plans identifying archaeological features exposed and investigated.
- 8.7.10 When submitted at evaluation stage, the report shall set out an outline recommendation for mitigation. This may include preservation in situ and/or further investigation and recording of the remains and/or watching brief. The development of a detailed mitigation

strategy shall be progressed by the Project Archaeologist in liaison with the Project Manager's engineering design team, the Archaeology Contractor, and the English Heritage Science Advisor (and other statutory authority), as appropriate.

8.7.11 Copies of the Fieldwork Report shall be provided by the Project Archaeologist to the LB Tower Hamlets and GLAAS for comment.

8.7.12 The following shall appear in the footer or header of each Fieldwork Report:

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8.8 GLSMR Summary Sheet

8.8.1 The Archaeology Contractor shall complete a GLSMR Summary Sheet for the works (i.e. one per fieldwork event). The Summary Sheet shall be included in the Fieldwork Report.

8.9 Summary Report

8.9.1 A short summary report of no more than 500 words (the Summary Report) for the works shall be prepared by the Archaeology Contractor for submission to the Project Archaeologist for subsequent publication within London Archaeologist or another local (county) journal or publication outlet specified by the Project Archaeologist.

8.9.2 The Archaeology Contractor shall submit the draft Summary Report to the Project Archaeologist for approval within 8 weeks of the completion date of the fieldwork event. The Archaeology Contractor shall allow two weeks in the programme of works for the Project Archaeologist to provide comments. The Archaeology Contractor shall include any amendments required by the Project Archaeologist in the final Summary Report which shall be submitted within one week of receiving the Project Archaeologist's comments on the draft report.

8.9.3 The Summary Report shall be submitted as an MS Word *.document in accordance with the Employer's information management standards and procedures.

8.10 Post excavation assessment

8.10.1 If instructed by the Project Archaeologist, the Archaeology Contractor shall undertake a post-excavation assessment of the site archive and submit a report of their findings to the Project Archaeologist for approval. Assessment of potential for analysis shall be undertaken in accordance with English Heritage guidelines.

8.10.2 The Archaeology Contractor shall provide details of its current post excavation assessment procedures with their Method Statement.

9 Site Monitoring & Progress Reports

- 9.1.1 Prior to commencing the works the Archaeology Contractor shall agree a programme of weekly written progress reports and periodic progress meetings with the Project Archaeologist an/or Project Manager and shall be represented at such meetings to the satisfaction of the Project Archaeologist. The Archaeology Contractor shall provide information describing progress on-site to date, the processing of samples and artefacts and feedback from any initial assessment.
- 9.1.2 The LB Tower Hamlets and GLAAS shall be informed in writing at least one week in advance of commencement of fieldwork by the Project Archaeologist.
- 9.1.3 Periodic updates on the progress of the Crossrail archaeology programme shall be submitted to the LB Tower Hamlets and GLAAS by the Project Archaeologist. The Archaeology Contractor shall provide information to the Project Archaeologist as requested to inform this reporting.
- 9.1.4 The Project Archaeologist shall arrange and convene monitoring site visits by the LB Tower Hamlets and GLAAS, as appropriate. There shall be no unauthorised access to the works in any other circumstances. Any visits to the works shall be in accordance with the Principal Contractor's health and safety, site access and security requirements.
- 9.1.5 The Archaeology Contractor may propose that archaeological excavation be carried out as an extension to evaluation works, if the scope of such work is readily incorporated into the SS-WSI. The detailed method for this work shall be agreed between the Archaeology Contractor and the Project Archaeologist at a site meeting and subsequently in writing between the Project Archaeologist and the relevant external consultees.

10 Personnel Requirements

- 10.1.1 The Archaeology Contractor shall provide project personnel of experience as described below. The personnel shall be approved by the Project Archaeologist. Approval may be withdrawn by the Employer at their discretion and in accordance with the contract conditions.
- 10.1.2 The Archaeology Contractor shall submit CVs of all proposed personnel including any specialists, but excluding site technician grades, to the Project Archaeologist for approval if this has not already been done as part of the pre-qualification process.
- 10.1.3 The works shall be managed, directed and staffed by appropriately qualified and experienced personnel. The Archaeology Contractor's Key Person shall possess at least ten years relevant experience.
- 10.1.4 The excavation, sampling and recording of the works shall be directed in the field by a Fieldwork Director who is a Member of the Institute of Field Archaeologists (MIFA) The Fieldwork Director shall be on site throughout the fieldwork stages.
- 10.1.5 The Archaeology Contractor's project team shall include an environmental archaeologist suitably qualified in archaeological science and geo-archaeological sediment description methods, and on site sample processing and assessment techniques.
- 10.1.6 The Archaeology Contractor's project team shall be staffed by technician grades with minimum six months experience in appropriate aspects of excavation and recording.
- 10.1.7 Specialist staff employed on any aspect of the works, including post-excavation assessment or analysis of any kind including the writing of reports, shall be suitably qualified and shall be supervised by personnel with a minimum of ten years of relevant experience in their field (this may be inclusive of post-graduate studies).
- 10.1.8 Specialist staff shall be available, normally at 24 hours notice, for the duration of the works to provide advice on any specialist tasks to be undertaken.

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12 Annexes

Annex 1 Archaeological Research Agenda

The aims, objectives and relevant archaeological research agenda as set out in A Research Framework for London Archaeology 2002 (Nixon et al, 2003) are presented in Section 4 of this site specific WSI and major research themes summarised below:

- Understanding Prehistoric activity in London, in relation to the Terrace Gravels;
- Examining the concept of core/periphery for different periods in London's past, as a means of understanding how evolving settlement patterns reflect the need for sustainable, beneficial relationships between a settlement and its environs, a city and its hinterland;
- Contributing to our understanding of the creation of the London suburbs; Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change; and
- Identifying the consequences of infrastructural development at a local level.

Annex 2 Site Information

Services and Utilities

The C360 Principal Contractor will advise the C261 Archaeological Contractor of the latest works information regarding the location and depth of all known services and utilities prior to the start of the archaeological works.

Extinguishments of Rights of Way

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Surface Water Control

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Protective Fencing

Site security and protective fencing is the responsibility of the C360 Principal Contractor. The early access site will be hoarded by C360 prior to the start of the archaeological works.

Credit Boards

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Care in Executing the Site Operations

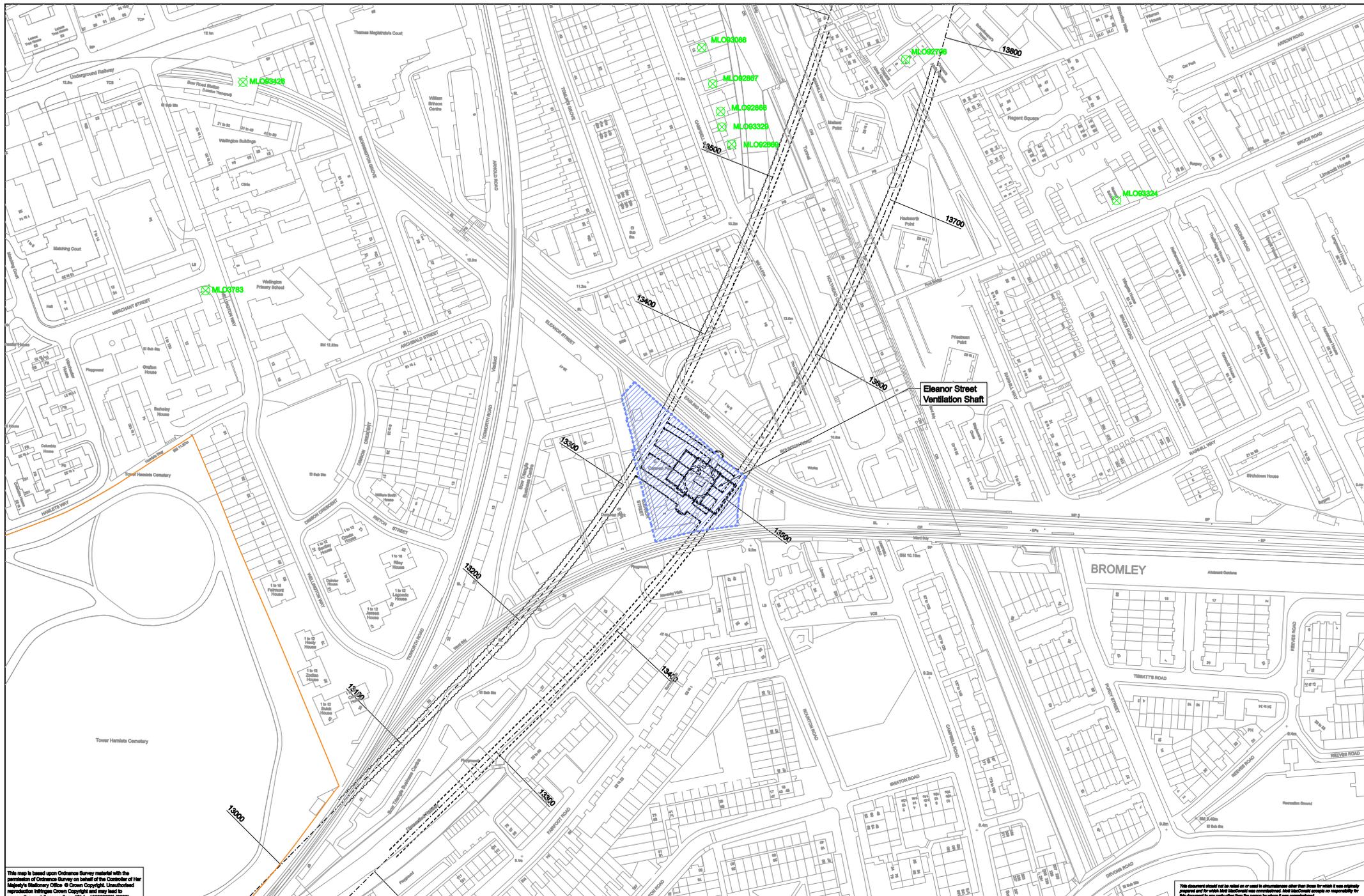
For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Parking of Vehicles

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Annex 3 Plans and other Illustrations

Drawing Number	Title	Scale
P30103-C1M61-E00-D-50001	Eleanor Street Shaft Archaeological Baseline	1:500@A3
P30103-C1M61-E00-D-50004	Eleanor Street Shaft Non-Listed Built Heritage Location Plan	1:500@A3
P30101-C1M61-G00-D-50001	Eleanor Street Shaft Central Alignment Geological Section	1:500@A3



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REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A02	20/06/2008	SCHEME DESIGN 3 ISSUE	PWC	MC	DRW		

LEGEND

- X MLO21941 Greater London Sites and Monuments Record
- X ATL89 Site Codes
- BQ205 Burial Ground
- BQ205 Burial Ground
- Registered Parks and Gardens
- Archaeological Priority Zone
- L036 Scheduled Ancient Monuments
- L036 Scheduled Ancient Monuments
- Crossrail Worksite

Scale 1:500

10m 0 10m 20m 30m 40m 50m

N

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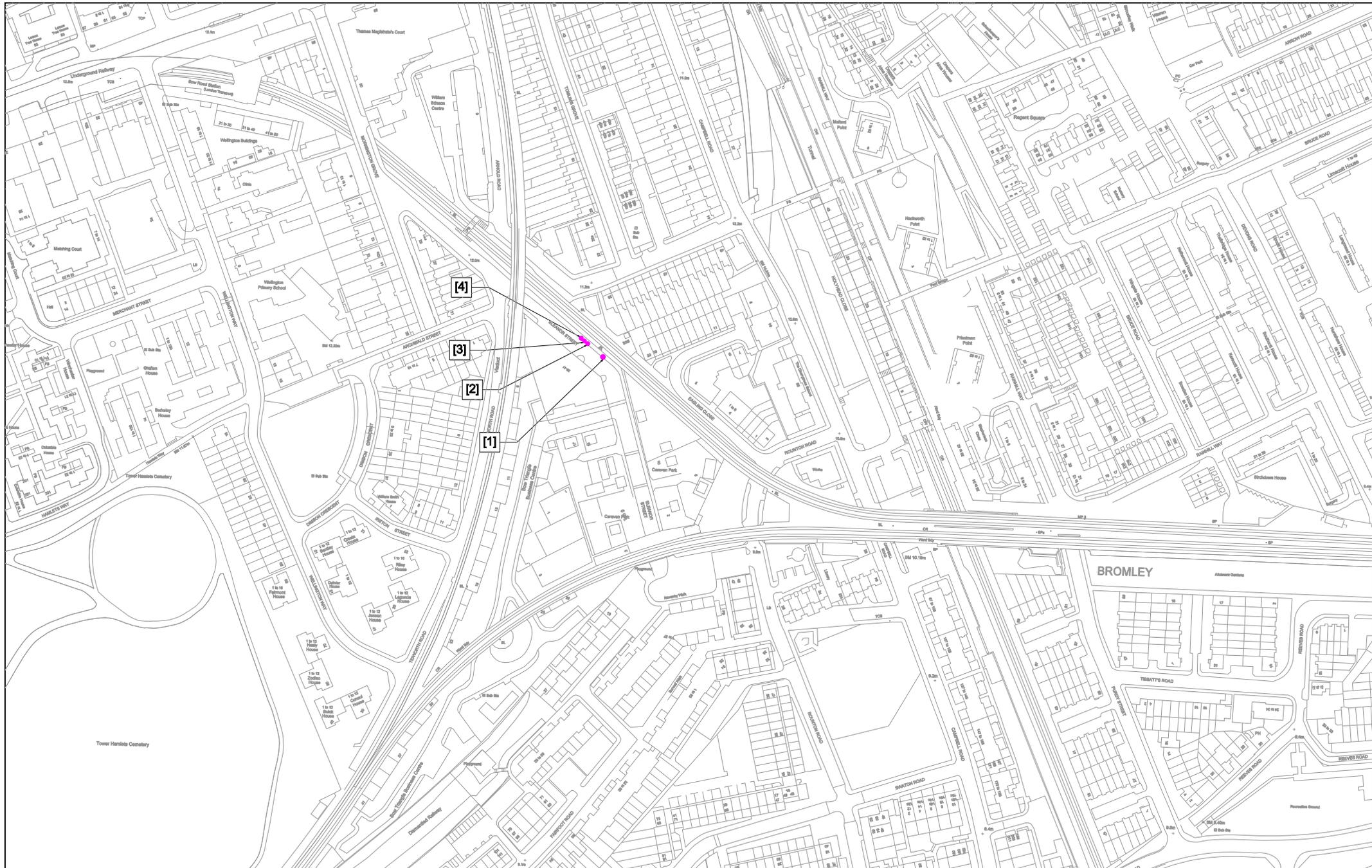
TITLE:
 ELEANOR STREET SHAFT
 ARCHAEOLOGICAL BASE LINE

SCALE: 1:500 @ A1

DRAWING AND CAD FILE NO:
 P30103-C1M81-E00-D-50001

REV: A02

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REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A02	20/06/2008	SCHEME DESIGN 3 ISSUE	PWC	MC	DRW		

 Historic street furniture



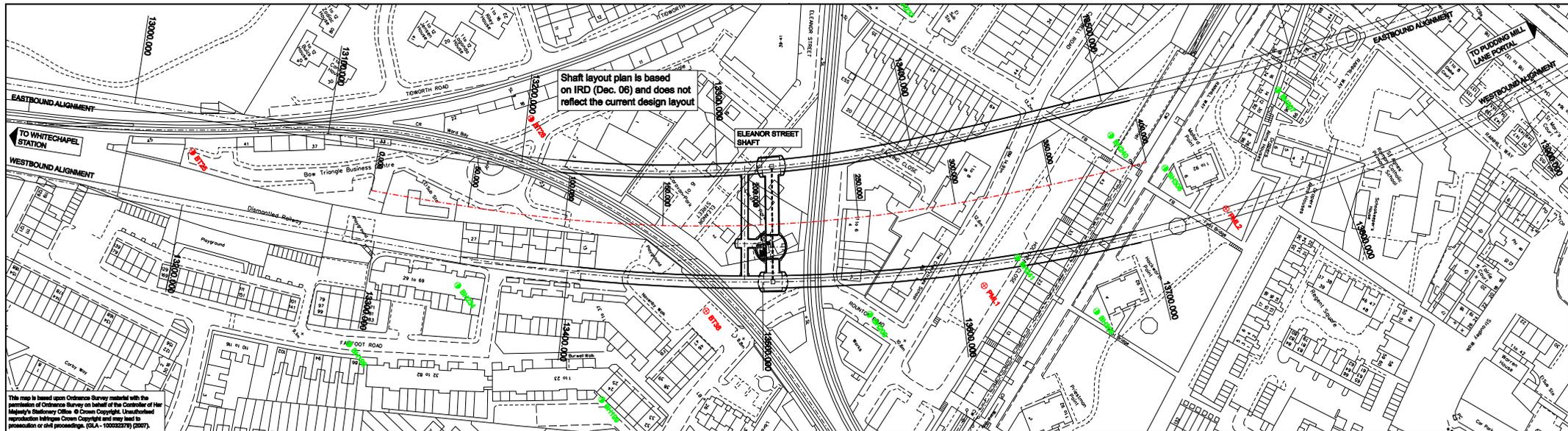
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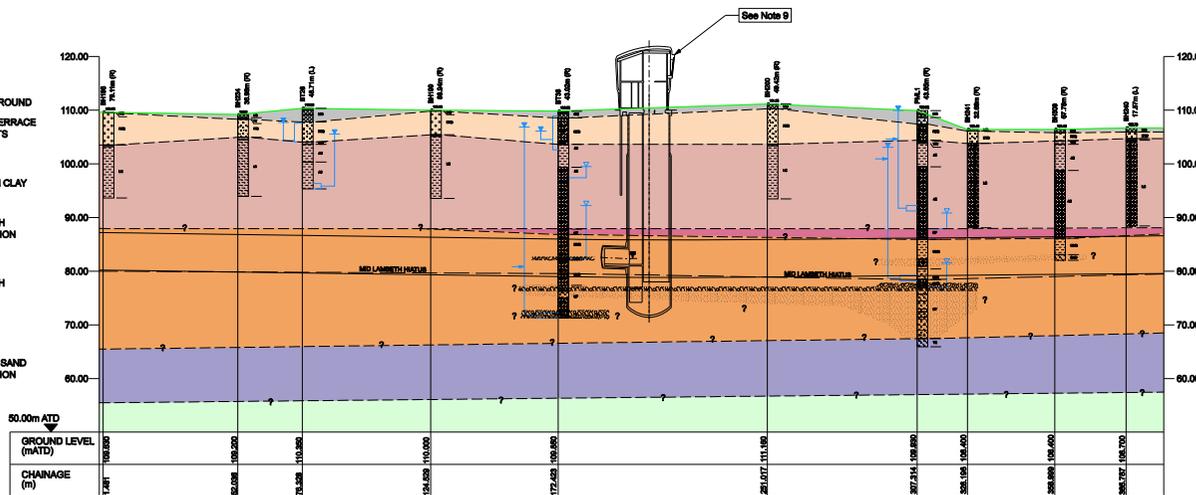
CONTRACT NO. / CONSULTANT:
 1199 / MOTT MACDONALD
 TITLE:
 ELEANOR STREET SHAFT
 NON-LISTED BUILT HERITAGE
 LOCATION PLAN
 SCALE:
 1:1000 @ A1
 DRAWING AND CAD FILE NO:
 P30103-C1M61-E00-D-60004
 REV: A02

1. Confirmation of all survey data must be obtained from the Crossrail survey team.
 2. Coordinates to the London Survey Grid, height to the London height datum which is 100 metres below Ordnance Datum Newlyn. See Crossrail standard CR-STD-010.

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This drawing is part of an interim submission. Further development is required prior to full submission in February 2008.

Longitudinal Section
Scale H=1:1000 V=1:500

- KEY**
- ⊕ Crossrail Boreholes Package 2 (FES) (2003)
 - ⊕ Crossrail Boreholes Package 6 (NH) (2005)
 - ⊕ Third Party Boreholes
 - 18.32m (L) Offset from centre line (Left or right)
 - Interpreted Geological Boundary
 - Existing Ground Level
 - Gravel layers potentially water bearing (Principal particle size gravel or cobbles) within LC and LG
 - Sand layers potentially water bearing (Principal particle size - sand or silt) within LC and LG

- Recorded water level during water strike
- Water strike level
- Maximum recorded groundwater level (Piezometer)
- Piezometer tip level and sand filter zone
- Arrow indicates maximum recorded groundwater Level (Piezometer) within reliable data set
- Piezometer tip level and sand filter zone of faulty Piezometer
- ? Indicates uncertainty in stratum boundary level and/or extent

NOTES

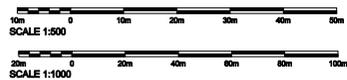
- The scheme plan and vertical alignment is revision L alignment. This drawing represents the existing geotechnical information provided by GCG and third party information gained from other sources. This includes Horwell Hoist reports 1D0101-CG000-00090 to 32 & 35; FES reports 1D0101-C1G-00010 to 12; GCG Interpretative report (1D0101 C1G00-00070 to 8).
- Where required Mott MacDonald have re-interpreted the existing data for the purposes of the ground model construction.
- The geotechnical long sections have been interpreted principally from the boreholes closest to the section line. However, the overall geological structure has been interpreted from all the data available. Where exploratory holes are offset from the section line, strata boundaries shown on the long section may not coincide with the strata boundaries within individual exploratory holes.
- For detailed information regarding stratigraphy and material type, reference should be made to the individual factual exploratory hole records for development of design sections.
- Most reliance has been placed on the crossrail ground investigation boreholes. The quality of the logging of BH 198, BH 204, BH 199, BH 200, BH 241, BH 309 and BH 240 is considered poor.
- Chattages shown on plan and sections are indicative only and subject to change. Central alignment chattages increase running west to east.
- Some boreholes are not shown on the section due to absence of detailed material descriptions.
- Where recorded piezometer readings appear erroneous or anomalous, the maximum recorded water levels within the 'reliable data' set are also indicated. Faulty piezometers that have not produced any reliable readings are not shown, although the location of the response zone is indicated.
- Indicative section profile through centre of shaft.
- Drawings based on available information up to April 07.

REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A01	17/12/2007	PILOT ISSUE - SCHEME DESIGN	DJC	B.L	DRW		

Stratigraphic Units	
MG	Made Ground
AL	Alluvium
LS	Langley Silt
RTD	River Terrace Deposits
WR	Weathered London Clay

A2, A3, B	London Clay Formation
LC	Unclassified London Clay
HF	Harwich Formation
USB	Upper Shelly Beds
UNB	Upper Mottled Beds
LTB	Laminated Beds
LSS	Lower Shelly Beds

LMB	Lower Mottled Beds
LG	Unclassified Lambeth Group
UF	Upnor Formation
TIS	Thanet Sand Formation
BUB	Bulhead Beds
CK	Chalk



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CONTRACT No. 7 CONSULTANT:
1199 / MOTT MACDONALD

TITLE:
**ELEANOR STREET SHAFT
 CENTRAL ALIGNMENT
 GEOLOGICAL SECTION**

SCALE: 1:1000 @ A1 DRAWING AND CAD FILE No: P30101-C1M81-G00-D-80001 REV: A01

Annex 4 Health and Safety Requirements

Designers Risk Assessment and CDM requirements

The archaeological works and trench locations have been designed to remove or reduce risk where possible. Residual hazards and risks will be identified by the C360 Principal Contractor and communicated to the C263 Archaeology Contractor in the Principal Contractor's Method Statement for the works.

Archaeological Contractors Risk Assessments and Health and Safety Plans

The C261 Archaeology Contractor will prepare method statements, site-specific risk assessments and a health and safety plan to be approved by the C360 Principal Contractor and Crossrail Central.

Archaeological Contractor's Safety Audits, Safety Inspections, Reporting of Accidents

The Archaeology Contractor's requirements for safety audits, inspections and the reporting of accidents are set out in the Works Package Information for the C261 Archaeological Contract.

Personal Protective Equipment (PPE)

Mandatory PPE to be worn by all C261 personnel will comprise:

- High Visibility Vest (of an appropriate colour for the nature for the Worksite);
- Hard Hat;
- Gloves;
- Light Eye Protection;
- Lace-up boots with ankle support, steel insoles and toe caps (rigger boots are not permitted on Crossrail Sites).

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Labelling of Hazardous Substances, Contaminated Land

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Crossrail Health and Safety Management System, Crossrail Drugs and Alcohol Policy

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Crossrail Policy for work on Network Rail Land

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Annex 5 Environmental Protection Requirements

For the environmental protection requirements refer to the Works Package Information for the C261 Archaeological Contract.

Annex 6 Programme and Order of Work for Implementation of Works and Integration with other Activities

The programme and construction sequence for each contract package and the associated archaeological works are set out Section 6 of this site specific WSI.

Annex 7 Enabling and Temporary Works Design Requirements, Attendances and Implementation

The C360 Principal Contractor will be responsible for the design of temporary works and they will establish a method of shaft excavation that incorporates the archaeological targeted watching brief in line with the requirements for site Health & Safety and for the archaeological works set out in this SS-WSI.

The C360 Principal Contractor is also responsible for the excavation activities within the C360 Rounton Road worksite under supervision of the C261 Archaeological Contractor. A clear, safe working area will be defined for use by C261. For construction activities requiring archaeological mitigation the C360 Principal Contractor will consult the C261 Archaeological Contractor prior to starting work.

For general and site specific security requirements at the Eleanor Street site please refer to the Works Package Information for the C261 Archaeological Contract.

Annex 8 Security Requirements

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Annex 9 Need for Screening or Other Protective Works

For further information please refer to the Works Package Information for the C261 Archaeological Contract.

Annex 10 Procedure for Notification of the Discovery of Human Remains

The procedure for notifying the discovery of human remains during the archaeological works are set out in Section 7 of this site specific WSI.

In the event that human remains are encountered the C261 Archaeology Contractor will immediately inform the Project Archaeologist and not recommence work at the location until further instruction has been received from the Project Archaeologist. The discovery of human remains will be confirmed in writing within 24 hours of discovery during which time C261 will apply for the relevant Ministry of Justice (Coroner's Division) licence.

Annex 11 Procedure for the Notification of the Discovery of Material Falling Under The Treasure Act 1996

The procedure for notifying the discovery of material falling under The Treasure Act 1996 during the archaeological works are set out in Section 7 of this site specific WSI.

All finds falling within the definitions of treasure under The Treasure Act 1996 shall be reported immediately to the Project Archaeologist and all subsequent works must be undertaken in accordance with the relevant legislative requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.

To protect the finds from theft, the Archaeology Contractor shall record the finds and remove them to a safe place. Where recording and removal is not feasible or appropriate on the day of discovery, the Archaeology Contractor shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor.

Annex 12 Procedure for Notification of Major Unexpected Discoveries

The procedure for notifying major unexpected discoveries during the course of the archaeological works are set out in Section 7 of this site specific WSI.

In the event that archaeological remains of potentially national importance are encountered the C261 Archaeology Contractor will immediately inform the Project Archaeologist and C360 Principal Contractor. Where the remains cannot be preserved in situ a suitable scheme of investigation and recording (preservation by record) will rapidly be agreed and implemented. The scope of the archaeological recording and sampling will comply with the standard Crossrail mitigation strategy and will be proportionate to the significance of the archaeological remains discovered. The C261 Archaeology Contractor will deploy appropriate resources in order to successfully undertake the archaeological recording and sampling with minimal delay to the C360 Principal Contractor's construction programme.