



C123 – Intermediate Shafts

Fisher Street Shaft Site-Specific Archaeological Written Scheme of Investigation

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Definitions, Abbreviations and Acronyms

The following is a list of the most commonly used definitions, abbreviations and acronyms within this report:

ADS	Archaeology Data Service
AOD	Above Ordnance Datum
ATD	Above Tunnel Datum. (Tunnel Datum = Ordnance Datum plus 100m)
BP	Before Present
c.	Circa
CDI	Common Design Item
CDM	Construction (Design and Management) Regulations
CICP	Crossrail Integrated Construction Programme
CRL	Crossrail Ltd
CLRL	Cross London Rail Links Ltd (now Crossrail Ltd)
CPFR	Crossrail Project Functional Requirements
dB	Decibel
dB(A)	Decibel (ambient)
DDA	Disability Discrimination Act
DDBA	Detailed Desk Based Assessment
DfT	Department for Transport
DLR	Docklands Light Railway
Dom Doc	Lotus Domino Document Manager (software programme)
EMP	Environmental Management Plan
EMR	Environmental Minimum Requirements
ES	Environmental Statement
EWMA	Enabling Works Managing Agent
GLAAS	Greater London Archaeological Advisory Service
GLHER	Greater London Historic Environment Record
HER	Historic Environment Record
HF	Human Factors
HMRI	Her Majesty's Railway Inspectorate
IDC	Inter-Discipline Design Check
IDR	Inter-Discipline Design Review
IRD	Initial Reference Design
km	kilometre
km/h	kilometres per hour



LB	London Borough
LBC	London Borough of Camden
LFEPA	London Fire and Emergency Planning Authority
LLAU	Limit of Land to be Acquired or Used
LMP	Lorry Management Plans
LoD	Limit of Deviation
LU	London Underground Ltd
m	Metre
M&E	Mechanical and Electrical
MDC	Multi-Disciplinary Consultant
MDC2	Multi-Disciplinary Consultant 4, Arup/Atkins
MOLA	Museum of London Archaeology
NLL	North London Line
NR	Network Rail
O&M	Operations and Maintenance
OHLE	Overhead Line Equipment
OSD	Over Site Development
RM	Requirements Management
RMP	Requirements Management Plan
RSPG	Railway Safety Principles and Guidance
SI	Systems Integration/Site Investigation
SRA	Strategic Rail Authority
SRC	Systems and Rolling Stock Consultants
SRS	Systems Requirements Specification
TBM	Tunnel Boring Machine
TfL	Transport for London
TOC	Train Operating Company
VE	Value Engineering
VM	Value Management
WSI	Written Scheme of Investigation

1 Introduction

This Site-Specific Written Scheme of Investigation has been updated on completion of the Non-Listed Built Heritage Survey of No. 2 Fisher Street and following an assessment of the Fisher Street geotechnical design summary report (C123-JUL-C2-RGN-CR086_SH003_Z-00001 Revision 2).

The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail (3rd draft November 2007). The requirements being progressed follow the principles of Planning Policy Guidance Note 16 on archaeology and planning (1990). Accordingly, the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction work begins.

The strategy for archaeological works has been set out in the Crossrail Generic Written Scheme of Investigation (WSI) (CR-PN-LWS-EN-SY-00001); it presents the strategy for archaeology design, evaluation, mitigation, analysis, dissemination and archive deposition that will be adopted for the design and construction of Crossrail. The Generic WSI provides a general statement of objectives, standards and structure for the planning and implementation of archaeological works (July 10, version 2.0 section 3).

This Site-Specific WSI, informed by research carried out in a Detailed Desk-Based Assessment (DDBA) (Document Reference CR-SD-FIS-EN-SR-00001) sets out the proposed mitigation for the impact of Fisher Street Shaft and associated works on the potential archaeological resources which have been identified at Fisher Street Shaft (FSS). The FSS provides an emergency intervention point to the running tunnels and comprises a 15.0m (internal diameter) circular shaft. This FSS was redesigned in late 2010 – early 2011 following the removal of the requirement for the shaft to act as a ventilation facility for the Crossrail tunnel network. The overall size of this design is therefore considerably smaller than the previous design as it does not include a box-shaped secant piled double-basement.

A compensation grout shaft is also proposed through part of the Kingsway Tram Subway adjacent to the FSS to protect existing buildings from ground movement induced by the construction of the shaft and tunnel at Fisher Street. Only the grout shaft through the Kingsway Tram Subway would be subject to a Targeted Watching Brief during construction.

2 Project Background

2.1 Summary of previous Crossrail Studies

Previous studies of specific relevance to the archaeological works relate to the work undertaken by the Museum of London Archaeology (MoLA) as technical advisors to CRL during the Crossrail Bill process.

The impact of the Crossrail Bill scheme on archaeological remains and deposits has been assessed in the Specialist Technical Reports (STR): Assessment of Archaeology Impacts (Parts 1-6) prepared in support of the Environmental Statement 2005.

Although further assessment was carried out and reported in the Archaeology Programming Assessment by MoLA (November 2006, Document Reference 1E0318-G0E00-00006 Rev B), the FSS was not included in that assessment, and no archaeological monitoring of the geotechnical ground investigation works carried out for CRL has been carried out at Fisher Street.

MoLA, commissioned by CRL, have provided a range of information to MDC2 in support of the production of this WSI. MoLA provided and updated baseline, historic map information and data relating to the survival of deposits in the vicinity of the works. This baseline formed the basis for the DDBA (Document reference CR-SD-FIS-EN-SR-00001).

Further details of the potential survival of archaeological deposits around the FSS site are provided in Section 2.4 and Table 3.

2.1.1 Non-Listed Built Heritage Survey

The Early Works Management Agents (now referred to as the Early Works Contractors) have undertaken surveys of street furniture around the central stations to identify non-listed built heritage that may be affected by the works. CRL commissioned the survey and subsequent inventory of those assets to be retained as part of the scheme, or salvaged and stored as they relate to the central stations. A heritage expert has undertaken an assessment of these locations to assess the items of street furniture on site. However, it is recommended that all drain, electric and other utility covers, as well as all bollards, be retained and restored to site when site works are finished. Whilst the majority are not considered to be historic at present they have the potential to become heritage features in the future. The saving of these items indicates a sustainable approach to preserving these features. Similarly, several lamp posts, whilst not of historic interest, were noted to fit in with the historic character of the area. All post boxes and telephone boxes are noted to have historic significance and should be preserved and restored to site once construction is complete. All railings and kerb stones in these areas should also be retained and restored. Areas with brick lights indicate coal and other stores located under the footpath and are of archaeological significance (i.e. Proctor Street).

No further Non-Listed Built Heritage Work is required.

2.2 Geological and Topographical Setting

The FSS scheme design report (Document Reference CR-SD-FIS-CE-RT-00002) summarises the geological design sequence as follows:

Table 2: Summary of Geological Profile

Stratum	Level top of stratum (mATD)	Description	Thickness (m)	Design top of stratum level (mATD)
Made Ground	+124.56 to +124.94	Very loose to medium dense silty SAND and GRAVEL including mainly brick fragments, locally slightly clayey.	1.9 to 3.1	+124.9
River Terrace Deposits	+121.83 to +122.83	Medium dense to very dense sandy to very sandy fine to coarse sub-angular to rounded flint GRAVEL with rare cobbles of flint and locally slightly clayey.	3.1 to 4.5	+121.8
London Clay	+118.73 to +118.33	Stiff becoming very stiff fissured silty CLAY locally slightly sandy to sandy with some silt/sand partings and pockets, rare claystones and pyrite nodules.	16.9 to 17.4	+118.5

The Made Ground may contain deposits of interest of the more recent past relating to the post medieval urbanisation of the locality, for example deposits and collection of artefacts relating to the function and occupations of households and businesses in the area. The Thames (Lynch Hill) River Terrace Deposits have the potential to contain material of archaeological interest. No brickearth is shown on the British Geological Survey (BGS) mapping, but it has been found to survive with varying levels of truncation on a number of sites which have been subject to archaeological investigation (GLHER KWH96, STY96, HHN99), all of which are more than 200m from the FSS site. Such deposits are of potential archaeological interest, particularly for prehistoric remains. The detailed desk-based assessment (DDBA) for Fisher Street (CR-SD-FIS-EN-SR-00001) contains further background information about the locality and includes a plan showing the location of the sites.

The ground in Southampton Row and Kingsway slopes down from north to the south, towards Aldwych. There is also a gentle decline in ground level from west to east.

The entire site is within the urban heart of London and is constrained by Fisher Street, Southampton Row and Catton Street. Of interest archaeologically and geo-archaeologically are the River Terrace Deposits recorded in several boreholes, notably RT70, RT35 and RT36 which were recorded close to the Fisher Street site.

2.3 Archaeological and historical development

The FSS site falls within the Archaeological Priority Area (London Borough of Camden), designated for the medieval and later village of St. Giles. For further information on sites refer to the DDBA report (CR-SD-FIS-SR-OT-00001), with previous archaeological intervention located within the DDBA.

The Specialist Technical Reports prepared in support of the Environmental Statement summarise the interest as having a high potential, but of moderate importance for post medieval urbanisation – foundations cellars, floor, drains, rubbish and cess pits have been found in a series of archaeological investigations (site codes HHN99, KGY99, KWH96, PKC01, STY96, SUW95, TEO98) and occupation dumps (HHN99, KGY99, QNS94, STY96) and highlight their presence throughout the locality.

The STR determined that there was a moderate potential and moderate importance for activity associated with the Roman (and later) road which lies some 50m to the south of the FFS site, including burials. Ditches and surfaces were found at Kingsway 160m south west of FSS site (KGY99), a cremation in Southampton Row is located on the GLHER no. 081782) 170m to the north west and part of a tombstone from Barter Street (170m to the south west, GLHER no. 081774). Medieval agricultural features such as plough soils and drainage ditches have been found within approximately 200m of the FSS site (HHN99, KGY99, KWH96).

There is a low potential for the discovery of remains relating to the Saxon trading settlement of *Lundenwic*. Current understanding suggests that it does not extend north of High Holborn. Evidence has been found in the form of stakeholes, beams slots, wells and pits in Kingsway approximately 270m to the south of the FSS site. To the south west at Macklin Street (MAC89) Saxon pottery was recovered.

The area appears to have remained in field until the mid 1600s when the area began to develop following an increase in population, improved transport and other services. Development seems to move upwards from the Thames along High Holborn. High Holborn was infamous for being the road that led from Newgate and the Tower to the gallows at Tyburn. In the 18th century it was not uncommon to see Holborn lined with onlookers as thieves were led away to be hanged (Victoria County History (VCH) 1878, 529).

Southampton Row, formerly known as King Street and Kingsgate, was redeveloped in 1903. It was described in 1878 as being broad and well built, extending from High Holborn to the fields to the north, although it was later widened (VCH 1878:543). Also sitting between High Holborn and the fields to the north was Red Lion Square, from which Fisher Street runs to Southampton Row. In 1786 it had stone watch houses at each corner, with streets entering it on three sides (one of which became Fisher Street). The stone watch houses did not survive to the 20th century. Red Lion Square takes its name from the 'Red Lyon' Inn, which was one of the most important inns in Holborn at one time, as did the adjoining road (VCH 1878:545).

The DDBA contains a map regression demonstrating the key stages through the development of the area. The highlights are:

- The Hogenberg 1572 map which shows the site within fields with the road that becomes known as High Holborn running horizontally across the map;
- The Faithorne Newcourt map of 1658 which shows that urbanisation is beginning to encroach on the fields from the south with land plots becoming more formalised;
- The Morgan 1682 map which shows the site located mainly within the western portion of Red Lion Fields, which is named after the inn mentioned above;
- Rocque's map of 1746 which shows that Red Lion Fields has been renamed Red Lion Square and Fisher Street had been created from an access path;
- The Greenwood 1824 map which shows that the area has become extensively developed in the Holborn area, with the site appearing to have been built upon by this date;
- The 1st edition Ordnance Survey map (1873) which shows long narrow plots with a high density of houses; and,
- The 1914 Ordnance Survey map (just fifty years later) which shows significant change with the narrow house plots having been demolished to give way to a larger development, and a building on the corner (2-6 Catton Street).

The DDBA for Fisher Street (Document Reference CR-SD-FIS-EN-SR-00001) contains further background information about the locality.

2.4 Potential archaeological deposit survival

MoLAS has reviewed the archaeological records of investigations undertaken in the area surrounding the Fisher Street works, including the location of the compensation grout shafts, and has provided an indication of the heights for the surrounding area in Above Tunnel Datum (ATD). Four of the sites (TEO98, SUW95, KGY99 and HHN99) lie closest to the worksites, but none are especially close, being in excess of 150m away from construction activity. They do however highlight the presence of Brickearth and Lynch Hill Terrace Deposits which are known to be of archaeological interest. Figure 4 in the Fisher Street Shaft DDBA (Document Reference CR-SD-FIS-EN-SR-00001) shows the location of the archaeological investigations below.

Table 3: Deposit Survival from previous archaeological investigations

Site Code	Easting	Northing	Location	Natural Surface mATD	Description	Ground Level mATD	Comment



Site Code	Easting	Northing	Location	Natural Surface mATD	Description	Ground Level mATD	Comment
TEO98	530650	181850	Lacon & Adastral House, Theobald's Road	122.0	Lynch Hill terrace gravels	124.7	Post-medieval deposits and features overlay truncated natural geology.
SUW95	530340	181800	67-73 Southampton Row	122.0	Lynch Hill terrace gravels	125.0	Post-medieval deposits overlay natural geology, where it was not truncated by basements down to 21.42-21.96m OD.
KGY99	530450	181450	Aviation House, Kingsway	120.5	Lynch Hill terrace gravels	123.4	Roman ditch cut natural geology; Roman, medieval and post-medieval deposits up to 20.45-21.01m OD. Natural geology truncated by Holy Trinity Church basement down to 19.75-20.28m OD.
STY96	530380	181420	Holborn Town Hall 'Site C', Stukeley Street	121.1	Brickearth overlaying Lynch Hill terrace gravels	123.1	Terrace gravels at 20.36-20.67m OD. Brickearth at 20.59-21.08m OD, partially truncated by post-medieval deposits
HHN99	530355	181415	Holborn Town Hall	121.1	Brickearth overlaying Lynch Hill terrace gravels	123.0	Terrace gravels at 21.05-21.08m OD, truncated by an undated ditch. Brickearth at 21.08-21.14m OD, overlain by medieval feature and post-medieval deposits and structures.
HOK07	530490	181355	Holbrook House, Great Queen Street	117.6	London Clay	122.1	Natural geology truncated by basement down to 17.13m OD, removing terrace gravels.
KIW98	530550	181350	77-97 Kingsway	118.5	Lynch Hill terrace gravels	121.5	Natural geology truncated down to 18.35-18.55m OD.
KWH96	530550	181330	66-68 Great Queen Street, Kingsway House	1118.8	Brickearth overlaying Lynch Hill terrace gravels	121.5	Archaeology consisted of Saxon wells, pits and ditch, and Post-medieval pits and ditches. On NE side Lynch Hill terrace gravels appeared at 19.4m OD without overlying brickearth due to possible truncation. On SW side brickearth appeared

Site Code	Easting	Northing	Location	Natural Surface mATD	Description	Ground Level mATD	Comment
							at 18.59-18.8m OD.
LCF05	530734	181350	Lincoln's Inn Fields	119.2	Lynch Hill terrace gravels	119.9	Highest survival of archaeology at 19.6m OD (17th-century quarry pit).

The historic map research undertaken has demonstrated that there is considerable disturbance from services, building foundations and basements across the site. 2-6 Catton Street and 1-2 Fisher Street are 4 to 5 storeys high buildings with single level basements. This will have resulted in the removal of archaeological deposits although pockets may still remain.

Boreholes RT70 (north) and RT33 (south) indicate that the River Terrace Deposits are at 122.83 m ATD (north side) and 121.83 m ATD (south side). The internal height of the floor surface in the basement is 122.23m ATD (north side) and 122.29m ATD (south side). These heights do not include the depth of the concrete slab as the original designs for the building do not show the thickness of the floor surface. The concrete floor is estimated to be 250mm in depth, which give a level of 121.98 m ATD (north side) and 122.04m ATD (south side). This means that the cellaring would have removed up to 1m of River Terrace Deposits on the north side and 0.21m on the south side of the building (Figure 1). The archaeological remains in this area would have been largely removed by the process.

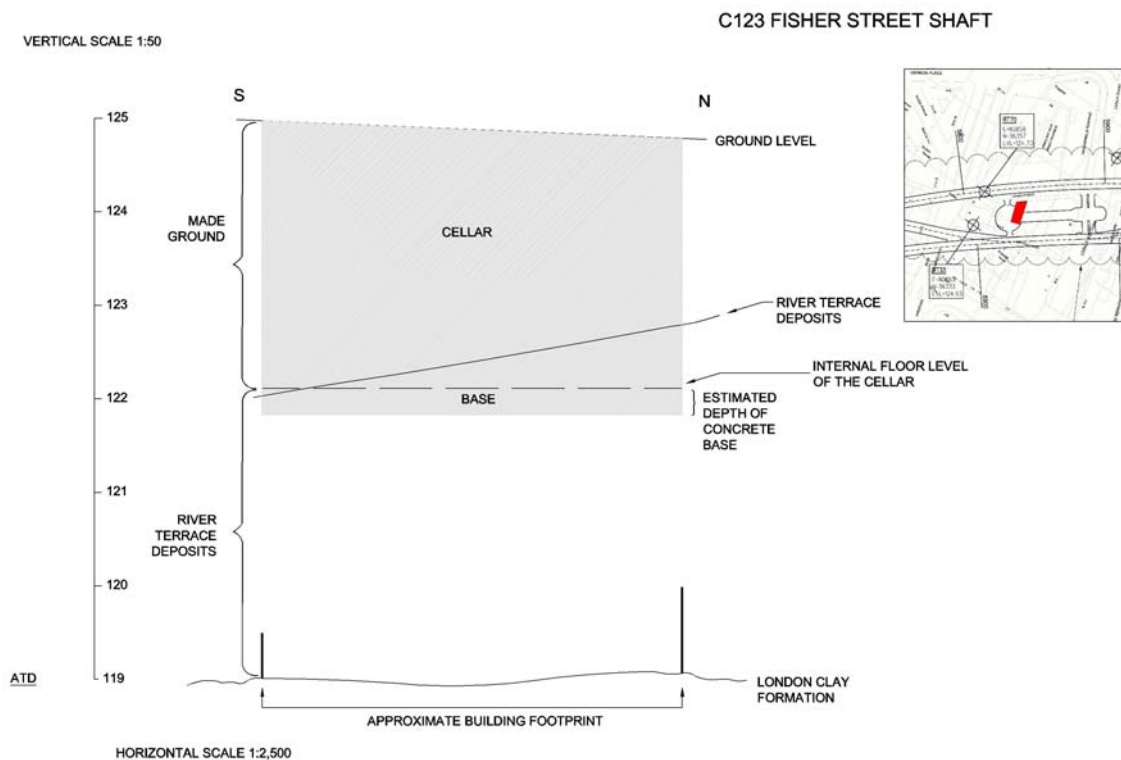


Figure 1 North-south cross section through Fisher Street

3 Construction Impact Summary and Outline Mitigation Design

As part of the construction of Crossrail, the FSS is being used to construct an emergency shaft and a number of associated compensation grout shafts. The shaft will provide an emergency intervention point with stairs and a lift to the running tunnels. Since the shaft has been redesigned, space provision for forced ventilation for the running tunnels is no longer required. The compensation grout shafts are proposed in the area to alleviate potential settlement. No major utility diversions will be undertaken at Fisher Street as the shaft will be constructed within the footprint of an existing basement. The only utility issue is the existing EDF substation next door which will remain and will need to be protected.

Construction activities will take place in four principal locations:

The FSS will be constructed at:

- 2-6 Catton Street;
- 8-10 Southampton Row; and,
- 1-2 Fisher Street.

A compensation grout shaft (proposed location) will be undertaken at:

- The Kingsway Tram Tunnel.

General construction sequence:

- Building demolition; and,
- Site establishment.

Ground level slab and associated basements of the buildings are to be retained to form a working platform.

3.1 Advanced works

No major utility diversions will be undertaken at the FSS work site as the shaft will be constructed within the footprint of an existing basement. The only utility issue is the existing EDF substation next door which, as indicated above, will need to be protected.

Table 4 below lists the buildings which are to be demolished as part of the advanced works.

Table 4. Demolition works for the FSS



Location	Description	Reason Required
2-6 Catton Street	Existing buildings	Construction of Fisher Street Shaft
1-2 Fisher Street	Existing buildings	Construction of Fisher Street Shaft
8-10 Southampton Row	Existing rear extension	Creation a usable and safe worksite for construction of the shaft after the demolition of 1-2 Fisher Street and 2-6 Catton Street

The following description of the engineering and construction has largely been derived from the C123 Fisher Street Shaft C300 Gate Submission Report C123-JUL-Z-RGN-CR086_SH003-00001, except where the design has been updated. The shaft structure is located on a very constrained site contained by Fisher Street, Southampton Row and Catton Street. The proposed land take for the site will include 2 to 6 Catton Street, currently used by Westminster College, and 1 to 2 Fisher Street.

The existing structures at 2-6 Catton Street and 1-2 Fisher Street are to be demolished to existing ground level to facilitate the construction of the shaft and its associated basements. The ground level slab and associated basements are to be retained until the shaft construction commences. These non-listed built heritage features have undergone a visual survey in order to establish their significance. There is no requirement to undertake further recording actions on these buildings.

Numbers 8 to 10 Southampton Row are a grade II Listed Building, the façade of which will be retained and redeveloped; the single storey rear extension to the building is also listed and it is proposed that this is demolished for the shaft. The works at Southampton Row are covered by a separate Heritage Deed (CAM/3/3/H1) and Supplementary Heritage Method Statements CAM/3/3/H3 and CAM/3/3/HX (In prep). As these buildings are listed, mitigation is outside the scope of this WSI.

Fronting both Catton Street and Fisher Street is an EDF substation forming the sole party wall to the east of the site. A key utility issue for design is the protection of the strategic EDF substation from differential settlement.

The latest design of the FSS, at RIBA Stage C/D, comprises a 15.0m internal diameter shaft using 8.0m long 600mm diameter secant piles for the upper levels, with the lower portion of the shaft constructed using Sprayed Concrete Lining (SCL). The overall size of this design is slightly smaller than the previous design at this stage and does not include a secant piled double-basement.

Previously a double-basement structure had been incorporated to allow the shaft head house to be brought back within the limits of deviation whilst accommodating the ventilation facility. The double-basement design was a change from SD3 design.

The internal structure of the shaft is all in situ reinforced concrete. M&E plant rooms,

inline with the latest Systems and Rolling Stock Consultant (SRC) requirements, are located within the head house and lower shaft levels. Construction of the FSS shaft will directly affect potential archaeological deposits. The basement structure will be excavated to c.6.5m below ground level (c.118.60m ATM). A secant piled wall will be installed around the perimeter of the existing basement.

3.2 Compensation Grout Shafts

One compensation grout shaft is proposed in the area to alleviate settlement. The grout shaft is likely to measure approximately 4.5m to 5m in internal diameter (c.5m to 5.5m externally). The methodology for the grout shafts has yet to be confirmed, however, the basic premise is excavation of the shaft to the top of the London Clay Formation. The grouter is then dropped onto this level. The physical grouting will not adversely impact upon buried archaeological remains. A TWB will be required during the excavation of the grout shaft though the Kingsway Tram Tunnel to understand the tunnel floor construction and its major alterations in c.1929 and to record survival of earlier buried setts or other original elements of the structure.

4 Research Design Objectives and Research Aims

The research objectives for Zone A between Royal Oak and Hatton Gardens (ES route Window C1-C5) are set out in Annex 1. Of particular relevance to the FSS site are the following (the full list is set out in Annex 1):

- Examining the concept of core/periphery for different periods in London's past, as a means of understanding a settlement and its environs, a city and its hinterland. (81);
- Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change. (82);

The following preliminary site-specific aims have been developed:

- To determine the significance of the non-listed built heritage; and
- To understand the construction technique of Kingsway Tram Subway and its major alterations in c.1929 and to record survival of earlier elements of the structure.

These will be augmented as the project progresses.

5 Scope of the Investigation

5.1 Archaeology

5.1.1 Targeted Watching Brief

A TWB is proposed for the compensation grout shaft on Kingsway Tram Subway (Figure 2). The TWB will be adopted as part of a programme of observation, investigation and recording of archaeological remains during construction. A TWB is utilised in specific cases where the likely extent of the remains has been demonstrated but where detailed investigation prior to the main construction programme is unfeasible (due to safety or logistical considerations) or undesirable (due to environmental or engineering constraints). A TWB is a controlled methodology which will be adopted as part of the construction works to allow archaeological recording to take place to the required standard.

This will include archaeological supervision during the initial removal of the tramway fabric followed, if necessary, by localised hand inspection, and assessment by archaeologists. If no significant remains are discovered, the site will return to 'general' watching brief status, as defined in the Crossrail Archaeology Generic WSI (Document Reference CR-PN-LWS-EN-SY-00001, 07 July 2009).

Consultation has been undertaken with Greater London Archaeological Advisory Service who is in agreement with the proposed mitigation strategy.

The following site has been defined as requiring TWB:

- The excavation of the compensation shaft on Kingsway Tram Subway.

The sequence of archaeological activity will be guided by the construction programme.

5.2 Non-Listed Built Heritage

No further Non-Listed Built Heritage surveys are required.

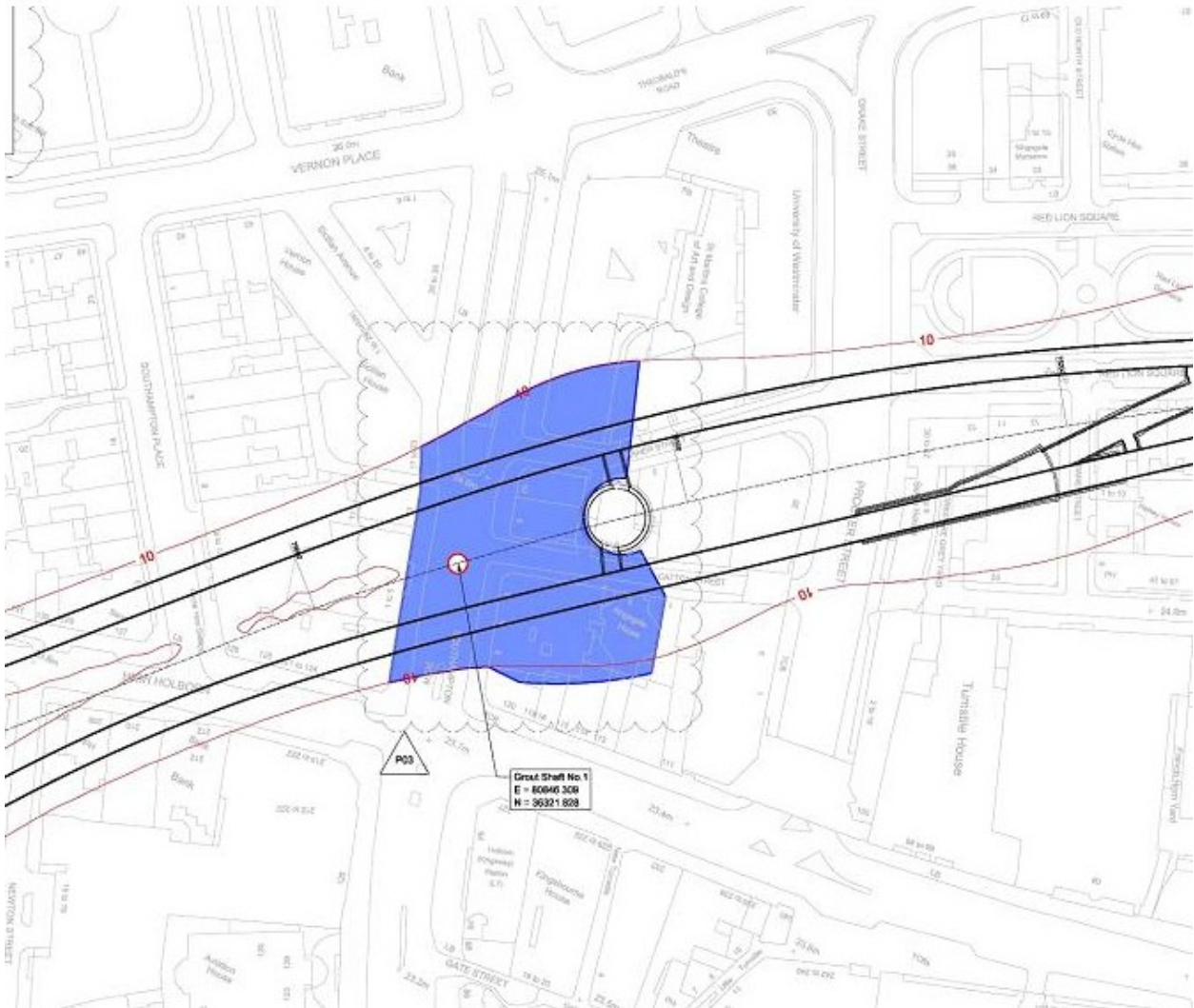


Figure 2 Location of Grout Shaft in Kingsway Tram Subway

5.3 Specific Requirements for the Principal Contractor (C300)

5.3.1 Archaeological Watching Brief

As part of the overall scheme works are being undertaken on services within the scheme footprint. A TWB will be undertaken on the grout shaft through Kingsway Tram Subway. Refer to generic WSI (CR-LWS-EN-SY-00001) for definitions of General and Targeted Watching Briefs.

Archaeological General/Targeted Watching Brief Procedure

During the removal of the Made Ground/overburden, the following procedure is to be incorporated into the *Principal Contractor (C300)* methods of work:

- Allow for archaeological deposits to be excavated and recorded;
- Allow safe access to the working area;
- Make allowance for one to two archaeologists on site to monitor and record;
- Use of plant in the working area is only to be undertaken with the agreement, and under the constant supervision of the *Archaeology Contractor (C254)*; and
- Provide technical advice to the *Archaeology Contractor (C254)* as may be required to safely complete the work.

Site Accommodation and Facilities

The *Principal Contractor (C300)* will provide the following site accommodation facilities for the use of archaeological personnel, inclusive of hardstanding and services required:

- Secure storage for tools and equipment for a team of three archaeologists;
- Toilets with washing and drying facilities;
- Temporary office facilities for use by *C254* (one Senior Archaeologist) complete with suitable furniture and provision of drying areas for work clothing; and
- First Aid facilities and fire stations.

5.4 Instructions to Archaeology Contractor (C254) and Specification

5.4.1 Archaeological Excavation and Watching Brief

It is proposed that a programme of archaeological investigation comprising a Targeted Watching Brief be undertaken on the grouting shaft at the Kingsway Tram Subway. Where there are multiple phases of archaeological remains, the full sequence of remains will be recorded. If post-medieval structures are present they will be hand cleaned, excavated and recorded before being removed to identify if earlier archaeological remains survive below them. If present, these archaeological remains will be hand cleaned and recorded.

The Archaeology Contractor shall:

- Provide a team of suitably qualified and experienced archaeologists to cover the range of archaeological investigation to be undertaken;
- Provide a method statement, risk assessment and safe method of working for carrying out the works;
- During excavation, all archaeological features will be hand cleaned and defined to allow determination of their plan form, type, function, phasing and relationship with any other archaeological features. Each feature will be recorded as defined in Section 9 of this document; and
- On completion of the recording of wall structures, provide a suitably qualified and experienced archaeologist to supervise the removal of walls and other solid material within the excavation area. If earlier archaeological remains are identified beneath these they will be hand cleaned and recorded.

The Principal Contractor (C300) will hold a Construction Design and Management Risk Register for the main works.

6 Programme for Further Investigations

6.1 Archaeology

The limited survival of archaeological deposits has been noted above. Detail on construction design is included above in Sections 3 and 5.1.

At present, it is understood that the main works for the grout shafts will be undertaken prior to construction of the FSS. The TWB is to monitor the initial excavation of the grout shaft.

Targeted Watching Brief

Tasks of significance to the TWB include the excavation of the grout shaft which is due to be undertaken in 2012.

The shaft is programmed to be excavated in the 3rd quarter of 2012.

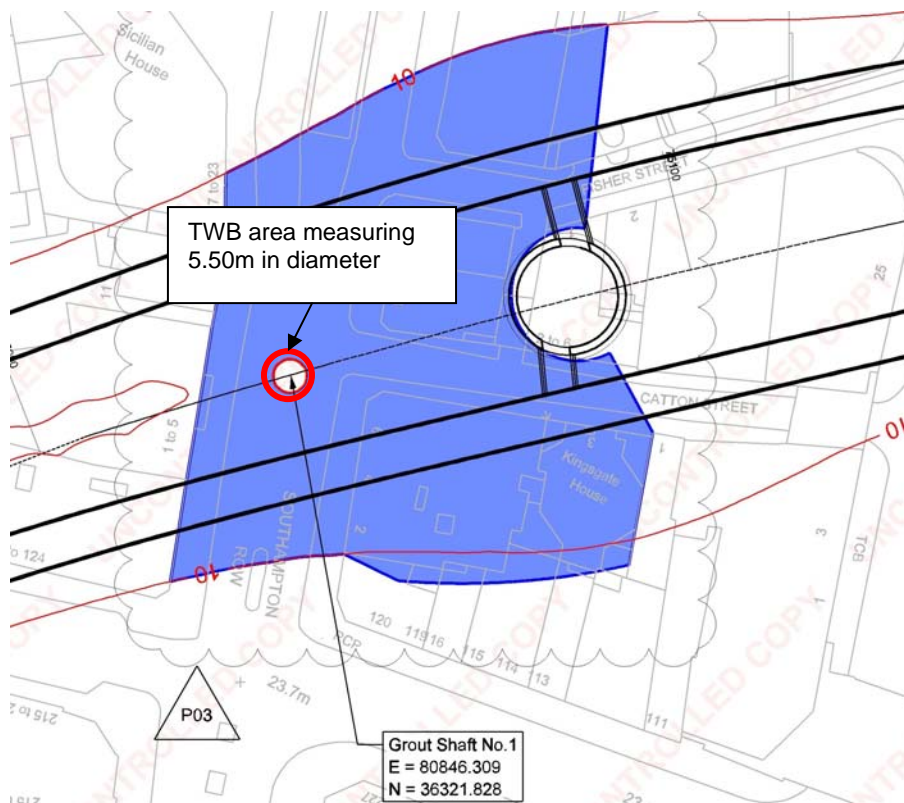


Figure 6 TWB area (identified in red circle)

7 Specification for Evaluation & Mitigation (including Watching Brief)

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 excavation, 2008 (revised);
- Institute for Archaeologists - Standard and Guidance for an archaeological watching brief, 2008 (revised);
- 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 1999;
- 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 this SSWSI.

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

7.2.3 Details shall be in accordance with Crossrail procedures and include how relevant parties are to be informed of such discoveries, the criteria to be utilised by the Archaeology Contractor in the assessment of the significance of such discoveries and the timescales to be adhered to.

7.2.4 As a result of the discovery of unexpected, potentially nationally important archaeological remains, this SSWSI will be updated by the Design Archaeologist and reissued 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 Crossrail procedures for dealing with discoveries of human remains identify specific individual roles or actions that are relevant to the works. Details include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries, the application process for licences, and the timescales to be adhered to.
- 7.3.4 The Archaeology Contractor shall confirm how the requirements set out in the SSWSI will be implemented as part of their procedure for excavating and recording human remains in the Archaeological 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).
- 7.3.5 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.
- 7.3.6 Should human remains be discovered, the Archaeology Contractor shall notify the Project Archaeologist immediately so that these procedures can be implemented. Initially this notification may be made personally or by telephone but shall be confirmed in writing within 24 hours of discovery.
- 7.3.7 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.
- 7.3.8 Lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation or excavation. Notwithstanding this, the Archaeology Contractor shall ensure that all burials are planned/photographed in situ and that appropriate samples have been recovered prior to any lifting.

7.3.9 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.

7.3.10 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SSWSI 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.

7.4.2 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.

7.4.3 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.

7.4.4 Crossrail procedures for dealing with Treasure finds shall identify any specific individual roles or actions that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries and the timescales to be adhered to.

7.4.5 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.

7.4.6 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.

7.4.7 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. Specific health and safety constraints or requirements for the Archaeology Contractor's method of work are set out below and shall be addressed in the Archaeology Contractor's Method Statement (provided as part of the Health and Safety Plan).
- 7.5.2 No ground intervention or other survey shall be made prior to approval of the Archaeology Contractor's Health and Safety Plan, Method Statement and Risk Assessment by the CDM co-ordinator and/or Principal Contractor responsible for the works.
- 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.

7.6 Location and ground elevation of interventions and survey grids

- 7.6.1 The spatial extent of the investigation(s) shall be set out by the Principal Contractor or Archaeology Contractor (as required by works information) 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 and elevations of all deposits encountered shall be recorded and related to Permanent Ground Markers (PGM)s 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 Archaeology Contractor by the Project Archaeologist. Levelling accuracy between OSBMs/PGMs and site temporary bench marks shall be within 10 mm k: where 'k' is the total distance levelled in kilometres. Each temporary bench mark shall be levelled as part of a closed loop starting and finishing on approved OSBMs or Crossrail PGMs. Where more than one temporary bench mark is required per site the Archaeology Contractor Archaeology Contractor shall establish the temporary bench marks 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 SSWSI. 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 SSWSI. 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:

- i) A general watching brief which comprises observation and recording of the Principal Contractor's works without constraint on their working methods.
- ii) A Targeted Watching Brief (TWB). As described in detail above this comprises observation and recording of the Principal Contractor's works with specific operations carried out under the supervision of the Archaeological Contractor. Under a TWB, 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 As described above, a TWB will 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 TWB 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 SSWSIs.
- 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 SSWSI, 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 Archaeological Contractor. The Principal Contractor will limit their tracking of vehicles and plant within areas specified in the SSWSI 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 Archaeological Contractor's supervising archaeologist and the Principal Contractor's site supervisor.

Specification for watching brief

- 7.7.10 The Works to be carried out by the Archaeological Contractor shall consist of two parts:
- i) Watching brief ('observation') following, and without interruption to, the progress of the Principal Contractor by a core team of archaeologists.
 - ii) 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. The Archaeological Contractor's core team shall consist of the Archaeological Contractor's key person (the Field Director) and other appropriately experienced archaeologists commensurate with the scale and nature of the Principal Contractor's works.
- 7.7.11 The core team shall undertake the observation and any required investigation such as they may reasonably be able to undertake.
- 7.7.12 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.
- 7.7.13 The Archaeology Contractor's core and support teams shall be advised where necessary by specialists, as appropriate and as agreed with the Project Archaeologist.

7.7.14 The Archaeology Contractor shall record the following observations on a daily basis. As a minimum the record shall consist of,:

- 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

7.7.15 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 Greater London Archaeological Advisory Service/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 Archaeological Contractor's Method Statement.

7.7.16 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 shall be within 10 mm?k: where 'k' is the total distance levelled in kilometres. Each temporary bench mark shall be levelled as part of a closed loop starting and finishing on approved OSBMs or URL PGMs. Where more than one temporary bench mark is required per site, the Archaeology Contractor shall establish the temporary bench mark as part of the same closed loop. The Archaeological Contractor shall prepare a record of their surveying methodology for inclusion in the archive.

7.7.17 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 above ordnance datum (AOD) for the height of significant deposits, including the depth of modern intrusions, key stratigraphic components and natural deposits.

7.8 Recording standards

7.8.1 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.

7.8.2 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.); and
- 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.

7.9 Specification for archaeological investigation

- 7.9.1 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.
- 7.9.2 Where modern foundations are likely to be present, the SSWSI 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.
- 7.9.3 The location and objectives of the trial excavations set out in Section 5 of the SSWSIs have been established in consultation with the projects' statutory consultees.
- 7.9.4 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.
- 7.9.5 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 Archaeology Design Consultant's Method Statement. Trial excavations shall be excavated to the first archaeological horizon or natural/undisturbed geology; the requirement to excavate to natural if archaeological horizons are identified will be established during site work. This shall be dependent on the agreed objectives of the excavation.
- 7.9.6 Temporary works and any required hand investigation to address belowground 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).
- 7.9.7 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 Archaeological 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.
- 7.9.8 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-0.50m 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.

7.9.9 Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machine excavation.

7.9.10 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 shall need to be taken to ensure that damage does not occur to underlying remains.

7.9.11 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.

7.9.12 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.

7.9.13 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.



- 7.9.14 In Alluvial sequences, each trial excavation shall be excavated to the base of the Alluvial sequence, and shall be shored appropriately 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.
- 7.9.15 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 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.
- 7.9.16 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.
- 7.9.17 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.

7.10 Recording systems

- 7.10.1 The archaeological remains shall be recorded by the Archaeology 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).
- 7.10.2 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;
 - Photographs and other appropriate drawn and written records; and
 - Other sections, including the half-sections of individual layers or features shall be drawn as appropriate to 1:10 or 1:20.
- 7.10.3 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.

- 7.10.4 Section drawings shall be located on the relevant plan and both London Grid and OS coordinates recorded. The locations of the OSBM or PGM bench markers used and any site temporary bench mark shall also be indicated.
- 7.10.5 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 GLHER will accept Autocad DXF or .DWG format of extent of site and location of major features with the completed Sites and Monuments Report Form.
- 7.10.6 A 'Harris matrix' stratification diagram shall be employed to record stratigraphic relationships (Harris 1993). This record shall be compiled and fully checked by the Archaeology Contractor during the course of the excavations. Spot dating shall be incorporated onto this diagram during the course of excavations.
- 7.10.7 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.
- 7.10.8 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 Reference 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.
- 7.10.9 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.
- 7.10.10 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.
- 7.10.11 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 SSWSI and addressed in the Archaeology



Contractor's Method Statement.

7.11 Archaeological science

- 7.11.1 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 Regional Science Advisor and the Design Archaeologist. 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.
- 7.11.2 The finds retrieval policies of the appropriate recipient museum will be adopted. In accordance with the collection and retention strategy set out in SSWSI, 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).
- 7.11.3 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.
- 7.11.4 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 SSWSI for subsequent mitigation strategies. Procedures and specifications shall follow English Heritage guidance (English Heritage 2008b).
- 7.11.5 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.
- 7.11.6 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).
- 7.11.7 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.

- 7.11.8 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.
- 7.11.9 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).
- 7.11.10 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 SWSI. 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.
- 7.11.11 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.
- 7.11.12 Samples collected for geoarchaeological 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).
- 7.11.13 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).
- 7.11.14 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.

7.12 Generic specification for Environmental Sampling

- 7.12.1 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 SSWSI.
- 7.12.2 The Archaeology Contractor shall use ten litre plastic buckets (with lids and handles), or 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.
- 7.12.3 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).
- 7.12.4 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.
- 7.12.5 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 7.3) which may require the reburial of human remains within a specific timeframe.
- 7.12.6 For 'bulk disturbed' samples the limits of the sample zone shall be recorded and identified on plan.
- 7.12.7 The Archaeology Contractor shall use appropriately sized monolith or kubiena boxes for the recovery of 'undisturbed' monolith samples for geoarchaeological 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.

- 7.12.8 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 ATD. Where the sample crosses archaeological context boundaries these shall be noted on the sample recording proforma.
- 7.12.9 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.
- 7.12.10 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 Archaeological Contractors Method Statement

8.1.1 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 8.3);
- 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.

Site Archives

8.1.2 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.

8.1.3 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 MOLA. Sample recording sheets, sample registers, finds recording sheets, registered finds catalogues and photographic record cards shall also follow the MOLA equivalents.

8.1.4 Archives shall be prepared to conform with current best practice (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.

8.1.5 The site archive shall be deposited by at a museum to be confirmed by the Project Archaeologist.

Digital Data

8.1.6 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).

8.1.7 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.

8.1.8 The digital archive for each fieldwork event shall be copied to CD-R or DVD and submitted to the Project Archaeologist for archiving in the Employer's document management system.

8.1.9 Final reports, site plans and other illustrations shall be prepared in accordance with the Employer's Information Management standards and procedures.

8.1.10 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.
- Supplier company name, date and QA details (as a minimum, the name, position and signature of the approver).

8.1.11 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.

8.1.12 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.

8.1.13 Where errors or inconsistencies are noted in the data, by either the Project Archaeologist or Archaeology 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.

8.1.14 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.

8.1.15 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.

8.1.16 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.

Interim Statement

8.1.17 Within 7 days of completion of a Critical Phase or Phase 1 fieldwork event, or as otherwise instructed to do so, the Archaeology Contractor shall submit an Interim Statement to the Project Archaeologist.

8.1.18 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.

- 8.1.19 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.
- 8.1.20 The Interim Statement including illustrations shall be submitted as a single PDF file to the Project Archaeologist. CAD drawing files shall also be submitted.
- 8.1.21 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.
- 8.1.22 The Interim Statement shall include an approved report title sheet and QA page (to be supplied by the Employer).
- 8.1.23 The following shall appear in the footer or header of each Interim Statement:
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- 8.1.24 Copies of the Interim Statement shall be provided by the Project Archaeologist to GLAAS (English Heritage) and the London Borough of Camden.

Survey Report

- 8.1.25 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 temporary bench marks. The survey report shall be submitted by the Archaeology Contractor to the Project Archaeologist within 2 weeks of the completion of fieldwork.
- 8.1.26 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.

Fieldwork Report

- 8.1.27 The 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

8.1.28 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.

8.1.29 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.

8.1.30 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.

8.1.31 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.

8.1.32 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.



- 8.1.33 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.
- 8.1.34 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.
- 8.1.35 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.
- 8.1.36 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 Regional Science Advisor (and other statutory authority), as appropriate.
- 8.1.37 Copies of the Fieldwork Report shall be provided by the Project Archaeologist to GLAAS (English Heritage) and the London Borough of Camden.
- 8.1.38 The following shall appear in the footer or header of each Fieldwork Report:
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HER Summary Sheet

- 8.1.39 The Archaeology Contractor shall complete a GLHER Summary Sheet for the works (i.e. one per fieldwork event). The Summary Sheet shall be included in the Fieldwork Reports.

Summary Report

- 8.1.40 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.
- 8.1.41 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.

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

Post excavation assessment

8.1.43 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.

8.1.44 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 London Borough of Camden, GLAAS officer and, if required the English Heritage Inspector for works affecting a Scheduled Monument (collectively the 'external consultees') 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 external consultees 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 external consultees, 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 SSWSI. 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 or tender process.
- 10.1.3 The works shall be managed, directed and staffed by appropriately qualified and experienced personnel. The Archaeology Contractor's Project Manager shall possess at least ten years directly relevant experience of similar projects.
- 10.1.4 The excavation, sampling and recording of the works shall be directed in the field by a Fieldwork Director (Supervising Archaeologist) who is a Member of the Institute of Field Archaeologists (MIFA) The Supervising Archaeologist shall be on site throughout the fieldwork stages.
- 10.1.5 The Archaeology Contractor's project team shall include a historic buildings specialist and 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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Appendix 1 Results of Non-Listed Built Heritage Survey

11.1.1 Introduction

A Non-Listed Built Heritage Survey (NLBH) survey of No. 2 Fisher Street, Camden was undertaken by Jacobs C123 on 1st April 2010. The reason for the survey was that the previous SSWSI (CR-SD-FIS-EN-PT-00001) had identified Fisher Street as possibly being 'of interest with it having an appearance of possibly earlier than the late Victorian/early Edwardian façade indicates'. The survey was undertaken to establish if any of the internal elements of the building pre-dated the façade.

11.1.2 Results

No. 2 Fisher Street was originally built in the early 1900s as offices and stores for the substation at Fisher Street. A series of architects plans dating to 1903 show the location of Fisher Street including the substation, a section through, and plans of, No. 2 Fisher Street and an elevation (Figures 3 to 5).

The building was constructed by The Metropolitan Electric Supply Company Ltd. The ground plan and section show that the ground floor would have been used for offices and the first and second floors would have been used as stores (Figure 4).

The façade of the building is Queen Anne Style (Figure 5). The fenestration (windows) is classically inspired, however, no attempt has been made at achieving a harmonious sense of proportion (Plate 1). The windows themselves are typical examples of Queen Anne Style; tall, white-painted small paned sash windows (Curl 2006, 615-616). The brick work is a Flemish bond.

The building itself is three stories high, with a basement. The roof is a mansard roof with double dormer windows, which would have been built to create a further room. Each room was examined as part of the survey with the exception of the first floor that was inaccessible due to asbestos. The interior of the building has been badly damaged through the insertion of partition walls and suspended ceilings that have been attached to the fabric of the building. Plate 2 shows part of the second floor suspended ceiling obscuring part of the windows. The suspended ceiling is also anchored into the fabric of the building.

The staircase is constructed of ornate cast iron balusters and a moulded wooden handrail (Plate 3). This has also been damaged by the addition of plain balusters where original ones have been damaged. The base of the balustrade in some places has been covered with concrete (Plate 3).

11.1.3 Conclusion

The original aim of the survey was to establish if the building pre-dated the late Victorian/early Edwardian period.

The results of the survey and background research have identified that the building was constructed between the design in 1903 and the publication of the revised Ordnance Survey map dated 1914. The building served as offices and stores for the Metropolitan Electric Supply Company Ltd until being later converted into offices.

The building is of minor architectural significance. Later work to convert it into office space has affected the fabric of the structure, with many of the period features, specifically coving and the balustrade, having been damaged as a result. No further work is recommended.

11.1.4 Plates



Plate 1 General view of the façade



Plate 2 General view of 2nd Floor showing suspended ceiling



Plate 3 Staircase on ground floor



Figure 3 Plan showing location of Fisher Street Substation (shown in red circle)

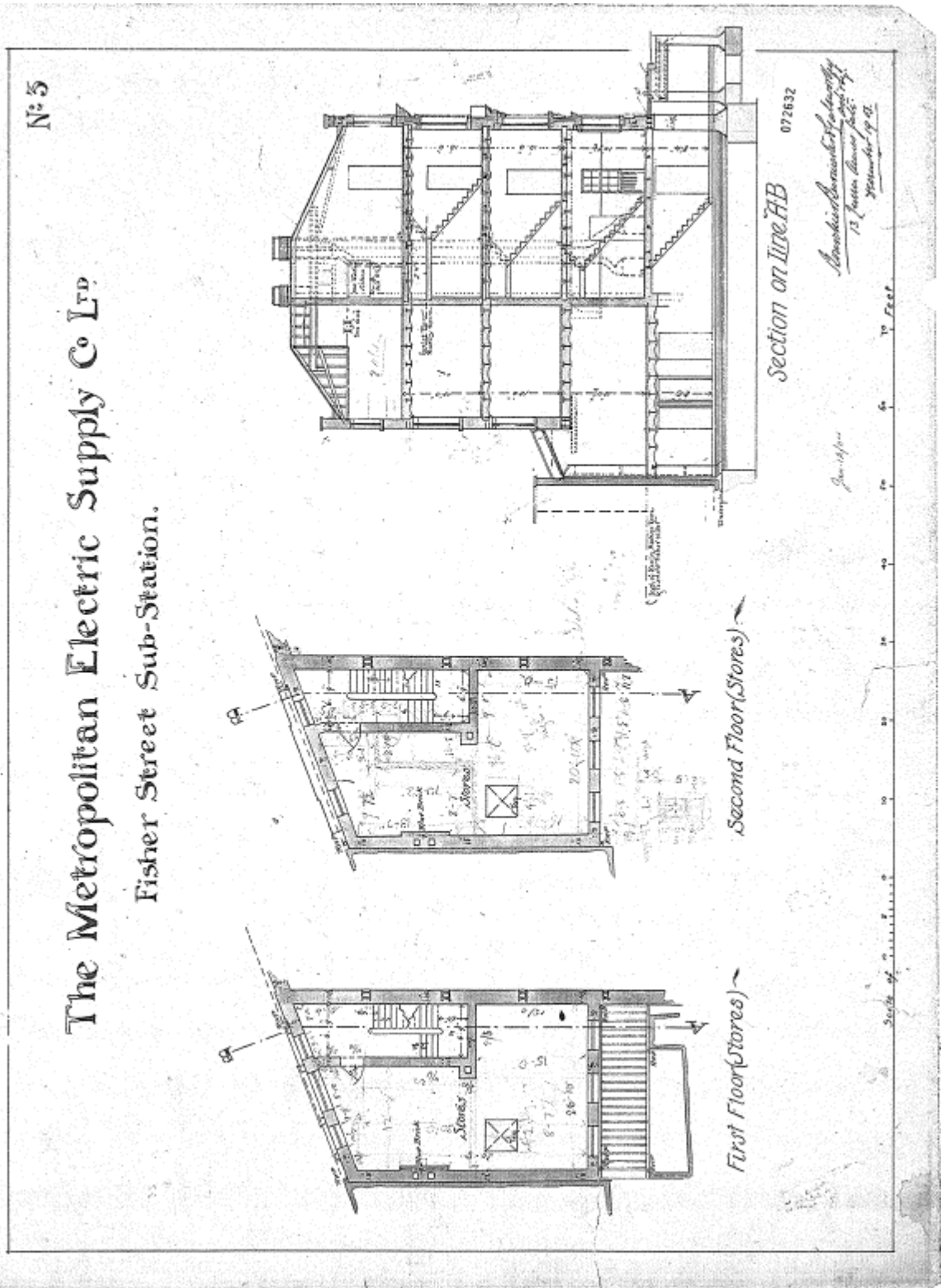


Figure 4 Section through, and plans of, no. 2 Fisher Street

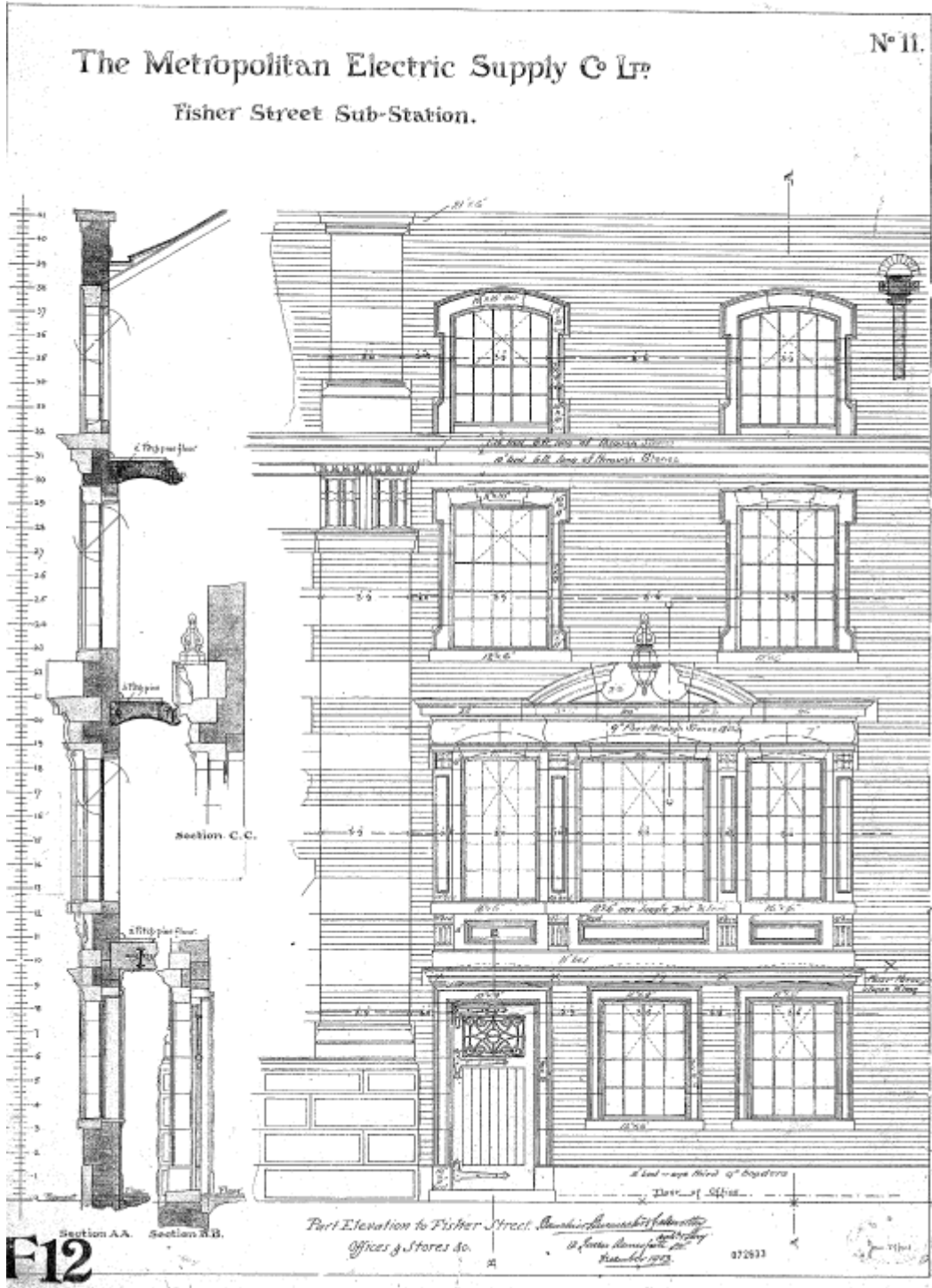


Figure 5 Elevation of no. 2 Fisher Street



ANNEXES

Annex 1 Archaeological Research Agenda

The research objectives for Zone A between Royal Oak and Hatton Gardens (ES route Window C1-C5) are set out in Annex 1. Of particular relevance to the FSS site are the following (the full list is set out in Annex 1):

- Examining the concept of core/periphery for different periods in London's past, as a means of understanding a settlement and its environs, a city and its hinterland. (81);
- Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change. (82);

The following site-specific research aims can be outlined for the investigations at Fisher Street shaft:

- Gain an understanding of the construction of the Kingsway Tramway Subway.



Annex 2 Site Information

Annex 2.1 Services and Utilities

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.2 Extinguishments of Rights of Way

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.3 Surface Water Control

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.4 Protective Fencing

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.5 Credit Boards

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.6 Care in Executing the Site Operations

Please refer to C254 Works Information Chapter 1 Worksite Information

Annex 2.7 Parking of Vehicles

Please refer to C254 Works Information Chapter 1 Worksite Information



Annex 3 Plans and Other Illustrations

Design drawing to be provided

Annex 4 Health and Safety Requirements

Annex 4.1 Designers Risk Assessment and CDM requirements

Please refer to Package Work Order C254 Works Information Chapter 3. Key construction risks relating to working constraints are provided in the RIBA F constructability report. Below is the Designers Risk Control Log Summary.

Activity	Health Risk	ERIC	Possible Control Measure	Responsibility
General Site Working	All following	E	Site Specific Induction, toolbox talks etc.	<i>Main Contractor</i>
	All following	R	Contractors' Method Statements and Risk Assessments to be approved in writing prior to working. All site staff to confirm that they have read and understood MS and RA	<i>Designer</i> <i>Main Contractor</i> <i>Archaeological Contractor</i>
		I	Zoning of site activities to prevent unnecessary overlap of working areas	<i>Designer</i> <i>Main Contractor</i> <i>Archaeological Contractor</i>
		C	Ensure all site staff are competent and aware of risks (e.g. CSCS cards)	<i>Main Contractor</i> <i>Archaeological Contractor</i>
		E	Zoning of site activities to prevent unnecessary overlap of working areas	<i>Designer</i> <i>Main Contractor</i> <i>Archaeological Contractor</i>
	Contact with plant/machinery, slips, trips and falls	R	Minimum PPE to be worn at all times to include Hi-Visibility clothing, Hard Hats, site safety boots, safety glasses, gloves.	<i>Main Contractor</i> <i>Archaeological Contractor</i>



Activity	Health Risk	ERIC	Possible Control Measure	Responsibility
		I	Zoning of site activities to prevent unnecessary overlap of working areas	Designer Main Contractor Archaeological Contractor
		C	Minimum PPE to be worn at all times to include Hi-Visibility clothing, Hard Hats, site safety boots, safety glasses, gloves.	Main Contractor Archaeological Contractor
	Contaminated land issues	E		
		R		
		I	Any areas of contamination identified during excavation are to be reported and remedial measures put in place prior to further excavation.	Main Contractor Archaeological Contractor
		C	Staff required to wash hands before ingestion of food/drink etc.	Main Contractor Archaeological Contractor
Deep excavation	Falls from height, tripping etc. Objects falling from height.	E	N/a	
		R	Edge guards/appropriate fencing to be specified to provide a barrier to deep excavation and prevent objects falling in.	Main Contractor
		I	n/a	
		C	Deep excavation signs	
	Burial from spoil/loose material falling into grout shaft	E	Working direction is to be controlled, with specified areas for spoil storage and working areas.	Designer Main Contractor Archaeological



Activity	Health Risk	ERIC	Possible Control Measure	Responsibility
				Contractor
		R	Routes into working areas to be specified (to be determined by <i>Main Contractor</i>)	Designer <i>Main Contractor</i>
		I	n/a	
		C	2m clearance area to be observed around edge of trench	<i>Main Contractor</i> <i>Archaeological Contractor</i>
Plant and machinery	Proposed Archaeological contractor's working route towards proposed location of plant. Risk of contact with excavating machine arm, crushing etc.	E	n/a	
		R	Appropriate PPE to be provided and worn	<i>Archaeological Contractor</i>
		I	Ensure dedicated pedestrian routes on site.	<i>Main Contractor</i>
		C	Employ banksman	<i>Main Contractor</i>
Site Traffic	Risk of death or injury from contact with moving vehicles	E	<i>Main Contractor</i> to define pedestrian and vehicular access and egress routes.	<i>Main Contractor</i>
		R	n/a	
		I	Controlled crossing points and separation of vehicular/pedestrian routes.	<i>Main Contractor</i>
		C	n/a	
Use of hand tools	Risk of injury as a result of using hand tools, e.g. trowels, mattock, shovels	E	n/a	
		R	Appropriate PPE to be provided and worn. Training to be provided	<i>Archaeological Contractor</i>
		I		
		C		
Adverse weather	Changeable conditions leading to slips, trips and falls etc. Not applicable in	E	n/a	
		R	n/a	
		I	n/a	
		C	n/a	



Activity	Health Risk	ERIC	Possible Control Measure	Responsibility
	this case as work is within tunnel			
Unexploded ordnance (UXO)	Records indicate low risk	E	Main Contractor to employ UXO specialist to undertake site survey and probe for UXO	Main Contractor
		R	Briefing by UXO specialist to site staff where appropriate	Main Contractor
		I	Potential UXO to be reported immediately to site manager. All works halted	Main Contractor
		C	Following identification Authorities to be informed. Procedures for remediation as set out in Main Contractor's Method Statement	Main Contractor

Annex 4.2 Archaeological Contractors risk assessments and Health and Safety Plans

Please refer to Package Work Order C254 Works Information Chapter 3

Annex 4.3 Archaeological Contractor's Safety Audits, Safety Inspections, Reporting of Accidents

Please refer to Package Work Order C254 Works Information Chapter 3

Annex 4.4 Personal Protective Equipment (PPE)

Minimum personal PPE will consist of:

- Hi Visibility Vest (in the appropriate colour for the nature for the Worksite);
- Hard Hat;
- Gloves;
- Safety glasses;
- Laced boots with ankle support, steel insoles and toe caps (rigger boots are not permitted on Crossrail Sites);

Annex 4.5 Labelling of Hazardous Substances, Contaminated Land

Please refer to Package Work Order C254 Works Information Chapter 3

Annex 4.6 CRL Health and Safety Management System, CRL Drugs and Alcohol Policy

Please refer to Package Work Order C254 Works Information Chapter 3

Annex 4.7 CRL and work on Network Rail Land

Please refer to Package Work Order C254 Works Information Chapter 3



Annex 5 Environmental protection requirements

Please refer to Package Work Order C253 Works Information Chapter 4.



Annex 6 Programme and order of work for implementation of works and integration into other activities

Please refer to the outline programme in Fisher Street Shaft C300 - Pre-Construction Information (C123-JUL-C-RGN-CR086-SH003-Z-50002 Rev 2) and Construction Planning report – Fisher Street Shaft Complex (C123-JUL-N2-RGN-CR086_SH003_Z-0004 Revision 3.0).



Annex 7 Enabling and temporary works design requirements, attendances and implementation

Enabling works and temporary works requirements are outlined in Construction Planning report – Fisher Street Shaft Complex (C123-JUL-N2-RGN-CR086_SH003_Z-0004 Revision 3.0). Please refer additionally to Package Work Order C 253 Works Information Chapter 1 and 2.



Annex 8 Security requirements

Please refer to Package Work Order C253 Works Information Chapter 3.



Annex 9 Need for screening or other protective works

Please refer to Package Work Order C253 Works Information Chapter 4



Annex 10 Procedure for notification of the discovery of Human Remains

Please refer to Chapter 7.3 in this document.



Annex 11 Procedure for notification of the discovery of material falling under the Treasure Act 1996

Please refer to Chapter 7.4 in this document



Annex12 Procedure for notification of major unexpected discoveries

Please refer to Chapter 7.2 in this document