



C257 ARCHAEOLOGY CENTRAL Method Statement Archaeological Evaluation and Watching Briefs Broadgate Ticket Hall (XSM10)

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Note for Readers

Various readers of this method statement and risk assessment are likely to be directly interested in different parts of the document. The following table is intended to help readers identify which sections cover their main interests.

Reader's main interest	Most relevant sections
Principal Contractor	2.1, 2.3 3.1 4 5 15 16 17 21 (in particular the list of attendances required in 21.8.1) 22
Health, Safety, & Environment	15 17 21 22
Contractual	1.1 2 4 7 8 10 14 18 19 20
Archaeological methodology	1 3 5 6 9 10 11 12 13

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(At back of document)

Fig 1 Planned and as-dug locations of the evaluation trenches

Fig 2 not used in this version

Fig 3 not used in this version

Fig 4 not used in this version

Fig 5 not used in this version

Fig 6 Proposed location of slip trench LIV 32 (LIV 33 to be determined)

1 Introduction

This version (v. 4) of the method statement and risk assessments has been revised following the first three months' fieldwork, and in particular following investigation of a 'near miss' incident involving the failure of lifting equipment operated by the Principal Contractor for MOLA. In particular, see the new risk assessments for Lifting Equipment (22.4) and the sewer (22.5).

Archaeological investigations are to be carried out on this site by the Museum of London Archaeology (MOLA). The requirements are set out in:

- A Crossrail **Site-specific Written Scheme of Investigation (SS-WSI)**: *Liverpool Street Station, Site-specific Written Scheme of Investigation, Doc. No. C138-MMD-T1-RST-C101-00001 Version 2, 29.04.10*
- An **Addendum to the WSI**: *Package C138 – Liverpool Street Station, Addendum to Written Scheme of Investigation: Trial Trench Evaluation – Broadgate Ticket Hall (XSM10), Doc. No. C138-MMD-T1-RST-C101- -00004 Revision 1.0, 19.08.10*

The scope was clarified in a meeting between representatives of PDP including the Project Archaeologist, the C138 FDC design archaeologist, J B Riney, and the C257 archaeological contractor (MOLA) on 14 February 2011.

The tasks covered by this method statement are as follows:

Task	FDC Notification	Principal Contractor	Provisional Programme (see also section 4.6)
<ul style="list-style-type: none"> • Trial Trench Evaluation (9 trial trenches in proposed utilities corridor, the roadway, & N pavement of Liverpool Street) Fig 1 	C138-0005	J B Riney	<p>c 19 Feb 2011 (c 4–5 months, including weekends)</p> <p>At 30.06.11, Trenches 1 and 2 remain to be completed, and Trench 14 not yet started.</p>
<ul style="list-style-type: none"> • General Watching Brief (up to 2 slip trenches LIV 32 & 33, and trench/TP 15, on British Land property in front of UBS Bdg, 100 Liverpool St) Fig 6 	C138-0009	J B Riney	<p>To be determined</p> <p>(LIV 32 & 33: 2 days, weekend ?)</p>

Table 1 Task information

One task specified in the addendum, General Watching Brief on one trial pit in the basement of Railway Tavern, Liverpool Street, was specified in previous versions of this method statement, and completed in February 2011.

Full details of the works for the other archaeological fieldwork at the Broadgate Ticket Hall site are not yet available and the principal contractors are not yet appointed/mobilised. Therefore the General Watching Brief/Targeted Watching Brief on secondary utilities diversions and Archaeological Excavation in the utilities corridor and station box ('Phase 2') (outlined in Section 2.1 of the Addendum to the WSI) are not included in this methodology.

This Method Statement has been developed in conjunction with the Principal Contractor, JB Riney, who will be responsible for ensuring that the archaeological works may be carried out as specified. It has included assessing their method statement for these works (see list below), in order that both parties are specifying the same procedures.

Documentation provided by JB Riney:

- Riney, *Method Statement, Liverpool Street & Finsbury Circus Archaeological Trial Trenches*, CRL doc no CRL1-PDP-C-GMS-C101-50001, v 3 26.01.11.
- Riney, *Liverpool Street & Finsbury Circus Archaeological Trial Trenches, Confined Space Working – Addendum*, CRL doc no CRL1-PDP-C-GMS-C101-50001, v 1 01.03.11.
- Riney, *Method Statement for Archaeological (TP14) & Sub-Station (TP15) Trial Trench Investigation outside 100 Liverpool Street (UBS Bank)*, CRL doc no CRL1-XRL-B-GMS-C101-50001, v 3 03.06.11.
- Riney, *Liverpool Street Archaeological Trial Trenches, Utility Support of EDF duct within excavation of Trial Trench 2*, CRL doc no CRL/JBR/LIS/UtilitySupport/002, v 1 05.05.11
- Riney, *Risk Assessment Form, Liverpool Street – Archaeology, Use of vertical hoist and winch within deep excavation (non passenger), RA0112*
- Expanded, *Method Statement, works to abandoned sewers, Crossrail C216*, LOR doc no MS-2011=012, rev 00 14.06.11

This method statement has been reviewed by the Principal Contractor and any comments or revisions incorporated. It will then be sent to the Crossrail Project Archaeologist (Jay Carver) and CDM H&S Advisor (Nick Dyball) for review.

The purpose of the evaluation is to provide information on the presence or absence, character, extent, date, preservation, and importance of the potential archaeological remains currently predicted on the site, in order to inform future mitigation of potential impacts of the Crossrail works. The purpose of the Watching Briefs is to mitigate the impact of the specified development works upon archaeological remains, by making an adequate record of them in during the construction ground works (a mitigation strategy of *preservation by record* in line with Crossrail requirements).

If the project design or scope/method of working are subject to changes during the works, the method statement will be updated and re-issued to the Project Archaeologist and CDM H&S Advisor for approval, in accordance with the specified document control procedures (see 7).

1.1 Site Description

The Broadgate Ticket Hall worksite (site of a new ticket hall and utilities corridor to the south) consists of an area in the road and pavement of Liverpool Street, to the east of Blomfield Street and to the south and east of the existing ticket hall/sub-station.

1.2 Geological and Topographical setting

The site lies on the sands and gravels of the Third (Taplow) Thames Terrace. The river terrace deposits are overlaid by a layer of alluvium, probably associated with the River Walbrook and the formation of Moorfields Marsh. Sporadic deposits of brickearth have been known to occur in areas of the site, overlying the river terrace gravels and sealed by the alluvium. The alluvium also seals stream channels of tributaries of the River Walbrook.

Boreholes around the Broadgate Ticket Hall site suggest that the terrace gravels slope down from c 109.25m ATD in the east to 107.0m ATD in the west.

1.3 Archaeological and Historic Background

The archaeological and historic background was covered in the WSI (see section 1 above) and only the archaeological potential of the site is summarised below.

The site has:

- high potential for post-medieval remains in the form of both disarticulated human remains and *in situ* burials relating to the Bethlehem hospital burial ground (BG208) within the carriageway of Liverpool Street, and the later post-medieval urbanisation of the area – both present in evaluation trenches, including artefacts from minor industry in the surrounding area (animal bone etc and glass working);
- high potential for Roman remains (Roman occupation in the form of gravel surfaces, make up layers, a beam slot, and artefacts; potential Walbrook deposits (overbank flooding and potentially channels and alluvium), ?land drainage ditches; and a compete beaker (possibly associated with burial) were present in the evaluation trenches – there is also potential for land reclamation and burials);
- high potential for reclamation/consolidation dumps (and possibly quarrying) from the medieval and early post-medieval periods;
- high potential for the Saxon (or earlier) to medieval Moorgate Marsh, including artefacts such as the bone skates and leather working remains recovered in evaluation;
- low potential for archaeological remains of Saxon date, owing to the presence of the Moorfields Marsh;
- low potential for prehistoric activity, which is likely to be limited to stray finds and sporadic truncated features.

1.4 Deposit survival

The following diagram has been revised from the initial evaluation results up to 28 June 2011. See also Crossrail 2010, *Summary of LSS85 archive – Broadgate Excavations, doc. No. C257-MLA-T1-XTC-C101_WS102-00001 v1*, 14 Jul 2010 and Site-Specific WSI for Liverpool Street Station (Document Number: C138-MMD-T1-RST-C101-00001 Version 2, 29.04.10).

Predicted Schematic typical section

Deposit	Thickness	Depth of Surface below ground level – Approximate	Depth of base below ground level – Approximate
Modern overburden	c 1–1.5m (highly variable locally)	0m	c 1–1.5m bGL
BURIAL GROUND c 6 bodies per m ³	c 1.1–1.5m	111.52–110.88m ATD (c 1–1.5m bGL)	110.09–109.83m ATD (c 2.3–2.8m bGL)
Consolidation for burial ground	c 0.3–0.6m	110.83–110.42m ATD (c 1.9–2m bGL)	110.45–109.83m ATD (c 2.3–2.5m bGL)
Post-ROMAN to Early POST MEDIEVAL dumps/consolidation	c 1–1.6m	110.45–109.83m ATD (c 2.3–2.5m bGL)	109.42–108.9m ATD (c 3.5–5m bGL)
MOORGATE MARSH	c 0.5m	109.42–108.9m ATD (c 3.5m bGL)	c 108.9–?m ATD (c 5m bGL)
ROMAN DEPOSITS (occupation, drainage, and Walbrook deposits)	c 1m	108.83–108.85m ATD (c 5m bGL)	c 108m ATD ⁽¹⁾ (c 6m bGL)
Terrace Gravels (archaeologically sterile)	Unknown	106.9m ATD ⁽¹⁾ (c. 6m bGL)	Unknown

⁽¹⁾ Only exposed in one trench to June 2011 (Tr 13)

2 Interfaces and Communication Plan

2.1 Interface with Project Archaeologist

The Method Statement has been developed jointly with the Principal Contractor and then submitted to the Project Archaeologist and Crossrail Safety/CDM Advisor for approval. Any comments have been incorporated. Regular progress reports will be submitted to the Project Archaeologist and will be augmented by progress meetings and site visits when required, in order to optimise communications and feedback.

2.2 Interface with C257 Contract Administrator

MOLA shall submit costings and timesheet reports in accordance with the C257 Contract to the Contract Administrator.

2.3 Interface with Principal Contractor

MOLA has liaised with the Principal Contractor (*J B Riney*) to prepare the Method Statement. The archaeological investigations will be undertaken under the auspices and supervision of the Principal Contractor. This interface extends to joint Health and Safety planning under CDM requirements. MOLA will provide the Principal Contractors with all necessary information to support site start-up (names of staff for inductions), health and safety planning; and (if required) to support the Principal Contractors' Permits to Dig. The majority of this information will be contained in this Method Statement. MOLA will liaise with the Principal Contractors regarding access, order of works, programme and commencement date. The Principal Contractors shall give MOLA 4 weeks notice of start date(s) for each work area or phase.

2.4 Interface with C138 Design Team

MOLA shall liaise with C138 FDC design archaeologist, Mike Court, to implement the correct archaeological design specification, described in the SS-WSI (Section 1 above).

2.5 Interface with External Consultees

C138 shall liaise with the City of London and English Heritage to inform them of the archaeological works.

3 Scope of Works

3.1 Planned Fieldwork Events

This Method Statement sets out the methodology and health and safety requirements for archaeological evaluation, excavation and watching brief work to be carried out in advance of construction of the Broadgate Ticket Hall for the future Crossrail Liverpool Street Station. This currently comprises the evaluation trial trenches and watching briefs described in section 1 and 2.3.

The mitigation strategy for the site is *preservation by record*.

3.2 Confirmation of Methods and Standards

The archaeological fieldwork and reporting will be conducted in accordance with the following guidance and standards:

- Brickley M and McKinley JI 2004. (eds.) Guidelines to the Standards for Recording Human Remains, BABAO/IFA paper no. 7
- Corporation of London Department of Planning and Transportation, 2004 Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance
- Crossrail Environmental Minimum Requirements (Crossrail 2008)
- Crossrail Archaeology Generic Written Scheme of Investigation (draft July 2009)
- Crossrail Archaeology Specification for Evaluation & Mitigation (including Watching Brief) (CR-PN-LWS-EN-SP-00001)
- Crossrail Code of Construction Practice
- Crossrail SS-WSI – Liverpool Street Station, Site-specific Written Scheme of Investigation, Crossrail April 2010, Doc. No. C138-MMD-T1-RST-C101-00001 Version 2 and addendum to the SS-WSI: Package C138 – Liverpool Street Station, Addendum to Written Scheme of Investigation, Crossrail August 2010, Trial Trench Evaluation – Broadgate Ticket Hall (XSM10), Doc. No. C138-MMD-T1-RST-C101- -00004 Revision 1.0
- English Heritage, July 2009, Standards for Archaeological Work, London Region, External Consultation Draft
- English Heritage/Church of England, 2005, Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England
- English Heritage Centre for Archaeology Guidelines, Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation (2002)
- English Heritage, 2004, Geoarchaeology: using earth sciences to understand the archaeological record
- Institute for Archaeologists (IFA) Standards and guidance for watching briefs and field evaluation (IFA 2001a and 2001b)

- Mays S, Brickley M, and Dodwell N, 2002, Centre for Archaeology Guidelines. Human Bones from Archaeological Sites: guidelines for producing assessment documents and analytical reports. English Heritage
- McKinley, J and Roberts, C, 1993, Excavation and Post-Excavation treatment of cremated and inhumed human remains. IFA technical paper 13
- Museum of London Archaeological Site Manual (1994)
- Museum of London General Standards for the preparation of archaeological archives deposited with the Museum of London (1998)
- Museum of London (Powers N (ed.)), 2008, Human osteology method statement, <http://www.museumoflondon.org.uk/NR/rdonlyres/2D513AFA-EB45-43C2-AEAC-30B256245FD6/0/MicrosoftWordOsteologyMethodStatementMarch2008.pdf>
- Museum of London Archaeology Service (Powers N), undated, Guidelines for the assessment of inhumations and disarticulated bone, unpublished
- United Kingdom Institute for Conservation's Conservation Guidelines No. 2

3.3 Aims and Objectives

3.3.1 Research Aims

The original aims and objectives were listed in the SS- WSI Liverpool Street Station (Doc. No., C138-MMD-T1-RST-C101-00001 Version 2, see section 4) and stated that 'Archaeological investigation and mitigation within the Crossrail worksites for Liverpool Street Station have the potential to contribute to the research themes set out below':

Evidence relating to the Walbrook, its tributaries and Moorfields Marsh deposits may provide data relevant to the following themes:

- Understanding London's hydrology, river systems and tributaries and the relationship between rivers and floodplains;
- Understanding how water supply and drainage provision were installed and managed;
- Refining our understanding of the chronology and function of the landward and riverside defences and extramural evidence of defensive or military structures in the Roman period;
- Understanding the relationships between urban settlements and royal villas or religious estates;
- Examining the proposal that there was an ideological polarity between town and anti-town systems: Roman towns did not so much fail as were discarded;
- The end of the Roman occupation: developing explanatory models to explain socio-political change and considering the influence of surviving Roman structures on Saxon development; and
- Examining the use in any one period of materials from an earlier period (e.g. Saxon use of surviving Roman fabric) and the influence on craftsmanship, manufacture and building techniques.

Evidence relating to the Medieval Bethlehem Hospital precinct and cemetery (BG208), bisected by Liverpool Street, may provide data relevant to the following themes:

- Understanding the differences, if any, between burial practices in the city and outlying cemeteries;
- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research;
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience; and
- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally and nationally.

3.3.2 Fieldwork Objectives

The overall objectives of the investigation are to establish the nature, extent and state of preservation of any surviving archaeological remains that will be impacted upon by the development.

The task-specific aims and objectives from the Addendum to the WSI (Doc. No. C138-MMD-T1-RST-C101- -00004 Revision 1.0, see section 2.2) are:

- Trial Trench Evaluation will refine the extent and significance of the archaeological resource and inform further mitigation measures.

Specifically, the archaeological investigations at the Liverpool Street (Broadgate Ticket Hall) work-site have the potential to recover [additions from initial fieldwork in square brackets]:

- Archaeological remains of Roman date relating to extra-mural activity, including burials [drainage of/into the Walbrook, and occupation];
- Medieval remains associated with St Mary Bethlehem Hospital;
- [consolidation and make up deposits representing reclamation of the former Moorgate Marsh]
- Post-medieval rubbish dumps and remains associated with the urbanisation of the area [including 18th/early 19th-century structures/buildings];
- Post-medieval burials within the known burial ground (BG208) that lies beneath the carriage way of Liverpool Street in the Broadgate Ticket Hall area [and waste from local workshops/industry apparently disposed of in the Burial Ground, eg bone, horn, and glass working waste];
- Waterlain deposits with the potential for organic preservation and palaeoenvironmental remains [both Walbrook alluvium and Moorgate Marsh].

3.4 Event Codes

The sitecode is **XSM10**.

4 Site Management Plan

4.1 Tools and Equipment

Tools and equipment appropriate for the archaeological works will be ordered by the Supervising Archaeologist and delivered to site by the MOLA Equipment Officer from the MOLA central store. See 21.8.2 for details.

4.2 Training and Certification

MOLA provides Safety Training for its staff as follows:

- Induction Training for all staff (undertaken on joining MOLA, and as appropriate on individual projects).
- General H&S Training for supervisory staff (an H&S awareness course targeted at Field and Support Staff).
- Specialist H&S Training (designed to cover specialist areas and to update professional knowledge; as appropriate to deployment)

All MOLA staff on site will be competent to carry out their archaeological work. On site all staff will be supervised by a competent person.

For certain specific aspects of MOLA work only those members of staff with the relevant training and certification will be allowed to undertake them. These include Cable and Pipe/Underground Service Location, Chainsaw use, Confined Spaces (see 21.7.3) and Power Auger use.

All MOLA staff have passed a CITB Health and Safety Test to operative level and will carry the CSCS card on site at all times (CSCS, Construction Related Organisation CRO White Card for Archaeological Technician, Code 5363; other cards are available for site visitors etc).

All staff will have their MOLA ID cards with them (see 21.6.1).

4.3 Site Monitoring

The site will be monitored by the MOLA Contracts Manager (Elaine Eastbury, BSc) or Assistant Contracts Manager (Nicholas Elsdon, BSc) via site visits, as and when required, in order to provide advice and support to the MOLA Supervisor. MOLA H & S Advisor (Hascom) will also regularly monitor the site, see 15.4.

4.4 Progress Reporting

MOLA has agreed a programme of weekly written progress reports and progress meetings (If appropriate) with the Project Archaeologist. MOLA shall provide information describing progress on-site to date, the processing of samples and artefacts and feedback from initial assessment, and a BMOS report (see 15.6).

4.5 Resource Plan

General/Targeted Watching Briefs:

- The watching briefs will be supervised by a MOLA Supervisor (Grade 4 or 5) assisted by members of the MOLA field team (Grade 6) with support from MOLA Geomatics and Photographic team members when required. Other archaeological specialists (Grade 8, eg geoarchaeologists or osteologists), may be called in if necessary (including power augering).

Evaluation and Detailed Excavation:

- The evaluation and any detailed excavation will be supervised by a MOLA Supervisor (Grade 4 or 5) assisted by an estimated 2 members of the MOLA field team (Grade 6), with support from MOLA Geomatics and Photographic team members when required. Other archaeological specialists (Grade 8, as above) may be called in if necessary.

Staff will be drawn from the pool of CVs submitted to Crossrail for approval.

The named Supervisor will be confirmed to Crossrail and the Principal Contractor in advance, and added to subsequent versions of this method statement, once the firm start date has been notified to MOLA. Other staff to be assigned when required

For the watching briefs and evaluation:

- Robert Hartle, BA (Hons), MA, Senior Archaeologist, overall responsibility for site supervision and conduct of the fieldwork.

Direct Line (office): 020 7410 2238

Mobile: 07730 646060

- Graham Spurr, BSc (Hons), MSc, Senior Geoarchaeologist, responsibility for Geoarchaeology and environmental recording and sampling, and specialist advice to the Senior Archaeologist, via visits as required.

Direct Line (office): 020 7410 2232

Mobile: 07939659057

Other staff and specialists are to be determined when required.

All archaeological staff are direct MOLA employees, ordinarily full time.

4.6 Programme

The evaluation commenced in February 2011, and is currently expected (at 30.06.11) to continue to approximately the end of June 2011.

Work in Trench 1 is predicted to re-commence in week commencing 4th July 2011, when Trench 14 (evaluation) and Trench 15 (GWB) may potentially start.

The dates for the General watching brief (slip trenches in Liverpool Street) LIV 32 and LIV 33 are to be determined.

4.6.1 Working Hours

Work on the Broadgate Ticket Hall site may take place beyond the core Crossrail working hours, which are between 0800 to 1800 on weekdays and 0800 to 1300 on Saturdays as specified in the Environment Requirements (Section 4 of Works Information Vol 2). There is potential for weekend work to take place between 0800 to 1800 on Saturdays and 0900 to 1600 on Sundays. Operations anticipated to cause disturbance are limited to those hours specified within the Section 61 consent obtained by the Principal Contractor, in order to minimise disruption to local residents and the general environment.

MOLA will provide a site attendance when required during these specified periods, so that all the relevant Principal Contractor's ground works defined in this method statement are monitored and recorded.

5 Fieldwork Methodology

5.1 Evaluation Methodology

The following methodology was used for Trenches 5, 6, and 9, and may be used for Trench 14, depending on initial results. See 5.2 for the methodology for full excavation in other trenches. At the commencement of the evaluation, the Principal Contractor (J B Riney) will break out the concrete slab over each trial trench. The breaking out of the street surface and slab removal will not require an archaeological presence. The Principal Contractor will then remove any underlying modern overburden down to the first significant archaeological horizon, using a mechanical excavator fitted with a flat-bladed ditching bucket. This will be carried out under close supervision by the C257 MOLA Supervisor.

Any trenches dug below a depth of 1.2m (or less if edges are unstable) will require shoring, which will be supplied and installed by the Principal Contractor. The full attendance requirements for this work are outlined in 21.8.1. At the first significant horizon, predicted to be that of the post-medieval burials (at c 1.3–1.5m below ground level), the first level of shoring will be installed by the Principal Contractor.

One MOLA Supervisor and approximately two archaeologists will subsequently attend site, or as required. MOLA staff will enter each trench to assess, clean, investigate and record archaeological deposits and features (see 5.5). The trenches will not all be excavated down to natural geology, but to sufficient depth to fully achieve the stated objectives (see 3.3 and 5.2). It is currently intended that Trenches 1 and 2 will be fully excavated.

Wherever possible, any significant archaeological strata and features will be left *in situ* at the field evaluation stage, pending a decision with regard to an appropriate mitigation strategy. They will be adequately protected from deterioration, for example, by covering or wrapping the deposits and features in a geo-textile such as Terram and sealing this with a layer of sand or other suitable soft materials.

Where possible, localised later intrusions may be removed to expose archaeological deposits below, in order to more firmly establish the character of the archaeological sequence. Such intrusions will be removed by the Principal Contractor under close archaeological supervision, using machine or hand excavation as appropriate. Smaller intrusions that can be demonstrated to go through the burials, but are not large enough at depth to be excavated further, may be augered to provide information on the depth of the marsh deposits and any underlying material.

- Localised removal of modern intrusions is subject a safe method of working. Where all or part of the trench exceeds 1.2m depth (or in less stable ground conditions) the Principal Contractor will install adequate temporary support.
- No foundations will be removed if this would make any part of the trench unstable.
- The removal will not be undertaken if there is the obvious potential to damage significant archaeological remains visible beneath, or burials at the edges.

5.1.1 Evaluation methodology for Human Remains

- In the event of any *in-situ* articulated human remains being uncovered during the evaluation they will be cleaned and recorded by MOLA staff. Any *in-situ* human remains will not be excavated or removed from site during the initial evaluation. In those trenches where excavation stops at the top of the burial sequence, they will be reburied under a layer of Terram and clean sand before the trench is backfilled.
- In those trenches where excavation ceases at the top of the burial sequence, a MOLA Human Osteologist will attend prior to the backfilling of the site to assist with the calculation of the number of individuals visible in plan. This information will be included on the trench recording sheet.
- Any ex-situ human bones discovered will be collected, bagged up, examined by a MOLA Human Osteologist on-site and reburied in the trench in which they were found before it is backfilled. It is assumed that any excavated spoil that may possibly contain disarticulated human remains will be used to backfill the trenches from which it was derived and will not be removed from site. The Principal Contractor is required to confirm this as environmental health requirements normally exclude human remains leaving site in the contractor's spoil.
- Should lead coffins or sealed crypts be encountered, these will not be opened; they will be left *in situ* at the evaluation stage.

5.2 Detailed Excavation Methodology

The following methodology was used for Trenches 7 and 13, and is being used for Trenches 1 and 2. At least one trench per phase was selected to be completely excavated down to the base of archaeology (up to 6m). The selection of trenches for detailed excavation was undertaken in conjunction with the Project Archaeologist and Principal Contractor.

Trench 14 (not yet commenced) may be selected for excavation to full depth (up to 6m) if required.

Within trenches selected for detailed excavation, the following methodology will be adopted:

- For stratified burials (see 5.2.1), occupation deposits, land surfaces, structures etc – hand investigation, sampling and recording will be undertaken at the relevant archaeological horizon(s). Occupation deposits that may address the research objectives (3.3) will not be subject to machine excavation.
- For extensive marsh/alluvial deposits, uniform dumped levelling or infill – grading down carefully by machine, using a toothless ditching bucket, under archaeological supervision (*however, this is generally impossible because the shoring and depth of the trenches, along with suspended services, prevent machine excavation*). This would be undertaken in individual spit depths of up to 300mm each, working along the length of the trench. If further archaeological horizons, artefact scatters, cut features etc. are present within these deposits these will be excavated by hand, recorded and sampled. The methodology will be reviewed on site and revised where necessary, in the light of ground conditions encountered and in discussion with the Project Archaeologist.

- Where it is not possible to reach the base of the sequence for practical, logistical, or programming reasons (to be determined by the Project Archaeologist), hand augering may be used to investigate the base of the sequence.

5.2.1 Detailed Excavation Methodology for Human Remains

- In the case of post-medieval cemeteries the burials tend to be highly standardised and it is unnecessary to plan both skeleton and coffin. Where they exist, coffins will be planned to scale; skeletons will only be planned to scale if there is no coffin and will comprise c 6–8 points at eg the skull and joints, to indicate its position and location. Otherwise a sketch on the reverse of the skeleton recording sheet will suffice.
- Where skeletons and/or coffins conform to a standard, it will be noted as such on the relevant recording sheet, and only aspects which differ from the norm will be described.
- Any finds associated with the skeleton or coffin fittings will be located on the sketch (or scale plan), as appropriate.
- At all stages of archaeological work, human remains encountered will be treated with care and respect.
- An osteologist will be available throughout the project to offer advice to staff and will carry out regular site visits as required.
- The archaeologists will avoid leaving remains exposed overnight wherever possible.
- Excavated remains will be retained in secure storage at the Finsbury Circus worksite prior to transfer to the processing facilities.
- Digital record photographs will be taken of selected burials and significant deposits of disarticulated bone and other features.
- Infant and neonatal burials will be block-lifted to ensure full recovery. Where foetal remains are found in utero, they will be given a unique context number but will be retained with the remains of the mother throughout the post-excavation process.
- The skeleton will be lifted and placed in archive quality perforated plastic bags each containing two 'tyvek' labels with site code, context number and details. One label should be contained within the bag, the other stapled to the outside.
- Human burials will be recovered and bagged individually on site in a large opaque plastic bag to ensure that the integrity of each burial is retained.
- Any fragile or usual remains for example those with pathological lesions will be carefully packaged and stored on site and will be given priority for transportation to the MOLA offices at Mortimer Wheeler House to avoid damage.
- All human remains removed from the site to the secure storage at the Finsbury Circus worksite must be accompanied by a member of MOLA personnel who will ensure that they are safely located and accounted for.
- If intact sealed coffins or vaults are encountered, these will not be opened. Work will halt at that location; a specific risk assessment and revision to the method statement will be produced in conjunction with the Project Archaeologist, Principal Contractor and the MOLA Health and Safety Advisor. Coffins will be wrapped in a protective sleeve (thick gauge polythene and tape or similar) either by MOLA staff or a specialist contractor and removed from site for reburial.

5.3 Evaluation trench layout and details

The archaeological evaluation comprises the excavation of nine trial trenches in the footprint of the utilities corridor and in the road and northern pavement of Liverpool Street (see Fig 1). The trenches will measure c 2m x 2 to 6m x up to 6m deep, and be supported with sheet piles ('push and drop' method, not driven through burials) by the Principal Contractor.

The trenches will be sheeted to allow localised selective excavation to a depth of 6m if feasible (eg if suitable modern intrusions are present within the trench), and full excavation to 6m for those trenches described in section 5.2.

When the trench areas are initially opened the actual size of the trenches may vary in order to safely accommodate excavation around utilities. The Principal Contractor will be responsible for suspending or otherwise protecting any live services present within the trench and will carry out sufficient advance searches with utility companies and surveys on site to determine whether such services are to be anticipated. The presence of suspended services within the limits of a trench may present a constraint to the archaeological fieldwork.

5.4 Survey and setting out method

It is expected that the survey methodology employed will vary depending on the individual circumstances of each site, and the availability or suitability of using London Survey Grid control and co-ordinates. There are three possible approaches:

- The Principal Contractor will mark out the trial trenches/pits according to the restrictions of existing services and their permit to dig.
- Evaluation: MOLA will subsequently survey the trenches as dug.
- For the watching briefs, the Principal Contractor will supply MOLA with the co-ordinates of the test pits.
- Watching brief: MOLA will additionally survey in the engineers' trial pits/trenches where necessary (eg when archaeological features are present).
- Crossrail surveyors will, with sufficient advance notice, supply MOLA Geomatics with the relevant survey control and mapping to allow for survey preparation. In the event of MOLA Geomatics staff setting out trenches without Crossrail survey control, then they will reference locations to OSGB36 co-ordinates, using GPS/GNSS.

5.5 Evaluation Recording Methods

The archaeological remains will be recorded to best practice standards, in order to achieve archaeological objectives. The site recording will include as a minimum:

- The written record of individual context descriptions on appropriate pro-forma sheets.
- The drawn record: including, plans and section drawings of appropriate features, structures and individual contexts (1:10 1:20 or 1:50). 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.

- A stratigraphic matrix of the sequence of deposits and structures encountered in each trench will be produced.
- The photographic record: photographs taken with a digital camera of resolution of 12 megapixel or greater, providing similar resolution to a conventional 35mm SLR. The photographic record will include photographs of archaeological features, appropriate groups of features, structures, and quaternary deposits. Each photograph will be recorded on site using a proforma photographic record sheet, showing image number, area/test pit, context number(s), subject/description, direction of view, and date. In addition, appropriate record photographs will be undertaken to illustrate work in progress.
- Levels on plans, sections and other fieldwork records shall be related to OS datum.
- The location of all evaluation trenches, temporary grids and baselines will be electronically surveyed by MOLA Geomatics staff. After fieldwork a digital trench location plan will be produced.
- Other appropriate drawn and written records will be produced (for environmental sampling etc).

5.6 General Watching Brief Methodology

A general watching brief consists of a basic monitoring presence to observe the works carried out either by the Principal Contractor or their sub-contractor without constraint on their working methods (Crossrail 2009 Archaeology Specification for Evaluation & Mitigation (including Watching Brief) CR-PN-LWS-EN-SP-0001, version 3). This includes making a basic record of notes, measurements, drawings and photographs consistent with an observation role; eg depth, character, date and survival/truncation of deposit sequence, height of natural geology. Monitoring and recording during a general watching brief will generally be made by observation from ground level. During a general watching brief MOLA staff will only enter the trench or area of excavation by agreement with the Principal Contractor or their sub-contractor (providing that there is proper access and that it is safe to do).

Generally monitoring will only be undertaken when areas or trenches have been dug down the level of potential archaeological interest. For this reason, a flexible approach will be taken and kept under review. The monitoring presence may alternate between full and part-time depending upon the Principal Contractor's programme (eg the nature and intensity of ground works) and the archaeological results. For example, any areas where the Principal Contractor's works prove to be of insufficient depth to affect significant archaeological deposits will be scoped out of the Watching Brief. The MOLA Experienced or Senior Archaeologist undertaking the monitoring will make an appraisal inspection during the Principal Contractor's initial breaking out, removal of overburden etc. in order to determine at what depth the relevant deposits (if present) occur.

If potentially significant (but localised) remains are exposed, such that they cannot be recorded adequately under basic monitoring, then the status of the fieldwork event will be reviewed by Project Archaeologist and it may be redefined as a Targeted Watching Brief (see 5.7). This redefinition if authorised by the Project Archaeologist

would permit additional resources in terms of staff and attendance to allow for more intensive recording.

In the event of in-situ human remains being uncovered during the excavation any structural test pits or service diversion trenches being monitored, the excavation will cease. Then the remains will be cleaned and recorded by MOLA staff. At this point in terms of Crossrail archaeological procedure the site would be upgraded to a targeted watching brief (see 5.7). The decision to either excavate or remove any in-situ remains encountered in any structural test pits or service trenches at this stage will be made on an individual basis in conjunction with the Project Archaeologist. Any ex-situ human bones discovered will be collected, bagged up, examined by the Osteologist and reburied in the test pit in which they were found before it is backfilled. It is assumed that any excavated spoil that may possibly contain disarticulated human remains will be used to backfill the test pit or trench from which it was derived and will not be removed from site.

5.6.1 General watching brief tasks

The general watching brief tasks are:

- Monitoring of up to two slip trenches (LIV 32 and LIV 33) and Trench/TP 15 to be excavated on British Land property to the front of the UBS building, 100 Liverpool Street (FDC Notification C138-0009), see Fig 5. The slip trenches are likely to be 0.75–1.0m wide, and will be excavated to a depth of no more than 1.2m. The length of the trenches is yet to be agreed and the location of LIV 33 remains to be confirmed.

In the event of in-situ human remains being located these tasks will be upgraded to a targeted watching brief (see 5.7 and above).

5.7 Targeted watching brief methodology

A targeted watching brief comprises the observation and recording of the Principal Contractor's or their sub-contractor's works with specific operations carried out under the supervision of a MOLA Senior Archaeologist. Targeted watching briefs are carried either out in areas where the density of archaeological features or deposits are not considered of sufficient significance to warrant investigation in advance of construction, or they may be carried out in areas where access prior to construction has been impossible and where, as a result, there is a possibility of unexpected discoveries (Crossrail 2009 Archaeology Specification for Evaluation & Mitigation (including Watching Brief) CR-PN-LWS-EN-SP-0001, version 3).

It should be noted that during a targeted watching brief, the Archaeological Contractor may impose constraints on, or require changes to, the Principal Contractor's or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works. These constraints may include restrictions on the type of equipment used, the methodology employed, stopping excavation works to allow time for recording and the installation of temporary works or other attendances such as pumping out, in order that the archaeologists may enter the works excavations safely. In addition to man-made deposits, some assessment and basic recording of any naturally deposited levels will be necessary, eg alluvial deposits. This may require the attendance of a MOLA Geoarchaeology specialist to take samples of such deposits. Normally if the remains are localised the Principal Contractor's works may continue in other areas (subject to a safe method of working and monitoring. It is expected that the Principal Contractor

will make allowance in their work programme to take account of the delays that a targeted watching brief may cause.

During a targeted watching brief MOLA staff will compile a basic record consisting of notes, measurements, drawings and photographs consistent with an observation role; eg depth, character, date and survival/truncation of deposit sequence, height of natural geology.

If potentially very significant (but localised) remains are exposed, such that they cannot be recorded adequately under the scope of the targeted watching brief, then subject to the Project Archaeologist's approval, additional archaeological resources and time may be required at that location (to allow for more detailed follow-up recording and perhaps limited excavation). Such work would be considered separately to the procedure for unexpected archaeological discoveries that fall outside the scope of the SS-WSI (Crossrail 2009, section 7.A2 and section 14.2 of this document).

6 Environmental archaeology investigation methodology

Within the Crossrail Broadgate Ticket Hall site the focus of the environmental archaeology work will be on Roman extra-mural activity, the Moorfields Marsh deposits, late medieval/post-medieval marsh reclamation and the likely post-medieval burials. As the site lies within the area of the Moorfields Marsh, it is anticipated that there will be a geoarchaeological component to the work. Potentially the work may include the following types of deposit, if present and suitable:

- Cut features such as rubbish pits or ditches
- Walbrook alluvium and overbank flooding deposits
- Marsh deposits
- Reclamation dumps
- Burials

This work will be conducted under the environmental archaeology sampling strategy (archaeological science strategy) for the Liverpool Street Station site, see below.

6.1 Sampling strategy for Liverpool Street Station

This sampling strategy addresses the whole archaeological project for Liverpool Street Station. At the initial field evaluation stage, sampling would be targeted to establishing the environmental archaeology potential of deposits, eg by taking selected bulk samples. This allows the more detailed sampling described below to be undertaken in a more informed manner generally as part of the following mitigation phase of the archaeological project (where this is warranted).

6.1.1 Overview

Selected medieval and Roman negative features, fills of the Walbrook channel and the 'Moorfields Marsh' deposits will be targeted for environmental sampling. The aim of this sampling is to evaluate the degree of preservation and range of environmental remains preserved within the archaeological deposits, assess their potential to

address the overall site objectives and identify any additional research aims that might also be addressed by the archaeological deposits surviving on the site.

In general, sampling will be undertaken by the archaeologists excavating each trench. Given the semi-natural nature of the Walbrook channel and Moorfields Marsh deposits, however, a geoarchaeologist will be on call to visit the site, advise and where necessary record and take samples from selected deposits.

6.1.2 General Methodology

For each trench the Project Manager(s) and Site Supervisor(s) will ensure the following with the support of a MOLA Environmental Archaeologist / Geoarchaeologist:

- That a range of suitable samples are collected from the site for the recovery of an appropriate range of environmental evidence that will contribute to the research strategy that underpins the requirement for excavation and recording.
- That the environmental procedures outlined in the *Archaeological Site Manual* (MoL 1994) and *Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002) are followed.
- That general bulk samples, 40 litres in size (20L if waterlogged) will be the standard samples taken and that the processing methods are designed to recover a wide a range of materials from the same deposit in a single sample. In addition, as a number of post-excavation analytical techniques will be employed on the material recovered, a number of different sampling approaches will be required. These might include: gridded/spatial bulk samples, to sample horizontal stratigraphy where it survives (ie floor layers), the sample size will depend on feature; column bulk samples (c 2–20L) to sample ditches, deep refuse deposits and natural deposits; spot samples for dating; monolith and micromorphology samples to recover *in-situ* blocks of sediments or complex strata.

Sample	Sampled by	Material	Processing
Hand Collected	Archaeologist	Human Bone	Hand washing
	Archaeologist	Large/small mammal, bird, fish	Power-hosed
Bulk (general 40 litre sample)	Archaeologist	Large/small mammal, bird, fish, reptile, amphibian, marine molluscs, eggshell, plant macrofossils	Flotation or wet sieving
		Insects	Paraffin flotation
		Artefacts	Hand Washed
Column bulk (20 litre)	Archaeologist on advice of geoarchaeologist	Freshwater and terrestrial molluscs, ostracods	Disaggregated and wet sieved
Monolith	Geoarchaeologist	Sediments	Laboratory cleaning
		Pollen and Diatoms	Sub-sampled for external Specialist
Kubiena	Geoarchaeologist	Soils/complex strata	External Specialist
Spot/Grab	Archaeologist	Coprolites, unidentified organic materials	Specialist
	Geoarchaeologist	Pollen, diatoms, ostracods,	Sub-sampled from

		forams, radiocarbon	auger hole cores for external specialists
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- The sampling strategy will be monitored throughout the excavation and adapted in light of the preservation and the type of features encountered. A MOLA Environmental Archaeologist/Geoarchaeologist will undertake site visits to provide advice and additional advice will be sought from the EH Regional Archaeological Science Advisor when necessary. A MOLA Environmental Archaeologist/Geoarchaeologist will be on site during any visit made by the EH Regional Archaeological Science Advisor.
- As a general policy, uncontaminated negative features will be bulk sampled and bone collected by hand. Horizontal stratigraphy if it survives will be sampled on a spatial basis where appropriate. Unstratified contexts, make-up layers and contexts thought to have a high degree of residual or intrusive material will not be sampled. Bulk samples may also be taken to recover artefacts such as evidence for metalworking and/or other industrial activity.
- If excavated, human burials will be recovered individually, with separate parts of the body (ie right arm, torso, left leg etc.) bagged separately on site. Samples will be taken for analysis of the abdominal area if the soil conditions are wet or moist. Control samples will also be taken by consultation with the appropriate Specialist. Cremations will be excavated in consultation with specialists.
- That the environmental procedures outlined in section 3.2, and in particular the following documents are followed if required and requested by the Project Archaeologist:
 - Archaeological Site Manual (MoL 1994)
 - Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation (English Heritage 2002)
 - Centre for Archaeology Guidelines. Human Bones from Archaeological Sites: guidelines for producing assessment documents and analytical reports (English Heritage (Mays S, Brickley M, and Dodwell N) 2002b)
 - Human osteology method statement (Museum of London (ed. Powers N) 2008)

6.1.3 Sampling approach to main features anticipated

- *Cess/rubbish pit fills*: in general a 40 litre sample will be taken from each fill within the pit. If the fill is deep and homogeneous samples should be taken from the top, middle and base of the fill. The sample size may be reduced to 20 litres if waterlogged.
- *Fills behind Walbrook revetments*: If substantial dumps of refuse survive behind the riverside revetments where possible a section will be cut through the deposits and a sample column of continuous 10–20 litre bulk samples taken through the profile, respecting context boundaries. This sampling method allows any changes in the type of refuse dumped to be assessed throughout the profile.
- *Discrete rubbish dumps/middens*: a single 40 litre sample will be taken, if they are extensive these will be sampled spatially with smaller bulk samples (for example: 10–20 litres at 1m intervals), and if deep, at different depths, as there may be variations within the deposit.

- *Occupation deposits (sunken floors, cellars etc)*: as for midden deposits, but paying particular attention to corners and other areas where greater accumulation occurred. Where appropriate soil blocks for micromorphology will also be taken from these deposits.
- *Ditches/Linear cuts*: will be sampled at several locations along the length (40 litre bulk samples at intervals for macro-remains (plants, insects, molluscs) and 20 litres for waterlogged deposits). Any natural accumulations encountered within such features will have monolith samples taken (for study of sediments and micro-organisms eg pollen), with an adjacent column of continuous bulk sample slabs, respecting context interfaces, for macro-remains.
- *Walbrook and Moorfields Marsh deposits*: examination and sampling of these deposits will be undertaken by the MOLA geoarchaeology team. A key requirement is for a section face to be cut or maintained through deposits of interest for recording and sampling. Sampling would typically consist of overlapping monoliths for off-site sedimentary examination and micro-fossils, with an adjacent column of continuous bulk sample slabs, respecting context interfaces, for macro-remains and grab samples for dating as appropriate.

Processing will take place at the MOLA base during the excavation so that results can feed back onto site and inform any modifications needed in the sampling strategy.

A MOLA Environmental Archaeologist will be present to discuss the sampling and results of any processing undertaken during any site visit made by the EH Regional Science Advisor and if requested by Kathryn Stubbs (Senior Archaeologist, Corporation of London, Planning Department)

6.2 Power auger methodology (if required)

Small intrusions may be augered to provide information on the depth of the marsh deposits and any underlying archaeology (see 5.1). Such investigations may be undertaken by hand auger (up to 3m depth, and if feasible) or a power auger as appropriate.

The locations of power auger surveys will be determined by MOLA in liaison with the Principal Contractor.

Only staff trained in the safe use of the power auger will use it.

The aim of any augering will be to provide deposit depth and survival information to inform mitigation measures at the Broadgate Ticket Hall worksite. It will be informed by the geoarchaeological sampling strategies (see 6).

Auger holes will be drilled to elucidate the likely deposit sequence and thicknesses of key deposits (post medieval/medieval, marsh, Walbrook and Roman) to help target any mitigation trenches and plan the trench sizes and depths.

- A Cobra petrol-driven hand-held power auger will be used to drill auger holes, operated by a team of two geoarchaeologists.
- To avoid any existing services at their locations, either auger holes will require starter/inspection pits to be dug by the Principal Contractor in advance of the auger survey, or the associated trial trenches/pits will be used for the same purpose.

- **Power augering will NOT be undertaken in areas designated as confined spaces (by the Principal Contractor or MOLA) see 21.7.3. Therefore power augering will not be undertaken in trenches or sondages measuring less than 2m x 2m – this includes all of the remaining evaluation trenches.**
- Each auger hole will recover window samples one metre long, at decreasing widths of 100mm, 75mm and 50mm with depth, as appropriate. Power augering will be undertaken to a depth of 6m or the surface of the terrace gravels, whichever is less (gravels are estimated to be c 4–6m below ground level, at c 107–109m TD).
- The window samples will be cleaned, recorded according to standard geoarchaeological practice. They will be reported on in the fieldwork report for the associated watching brief or evaluation.
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7 Deliverables and Submission Programme

MOLA shall provide the following reports in accordance with the C257 Contract and the Site Specific Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001 Version 2, 29.04.10) and Addendum (C138-MMD-T1-RST-C101- -00004 Revision 1.0, 19.08.10) to the Project Archaeologist or as otherwise instructed by the Project Archaeologist:

- Organisation of site monitoring visits, as and when requested by the Principal Archaeologist.
- A weekly illustrated progress report to the Project Archaeologist containing the information required at part 5.10 of the C257 Contract.
- A short illustrated interim statement within 1 week of the completion of fieldwork if required.
- A survey report within 2 weeks of the completion of fieldwork.
- A Fieldwork Report will be prepared within 6 weeks if required. All levels cited in these reports should be Above Tunnel Datum (TD = OD +100m). All Co-ordinates cited in these reports should be based on the Crossrail survey grid, apart from archive copies which will use OS National Grid.
- MOLA will produce monthly progress photographs of archaeological work on the sites in this method statement to contribute to the 30 per month required across the whole of the C257 contract (see 14.3).
- MOLA will complete an SMR (OASIS) Summary Sheet for the works (ie one per fieldwork event). This Summary Sheet will be included in the Fieldwork Report if required.
- A Summary report of no more than 500 words for the works shall be prepared by MOLA for submission to the Project Archaeologist for subsequent publication within the London Archaeologist Annual Fieldwork Round-up.

8 Document Control and Record Keeping

MOLA will access the Crossrail eB control system for transmitting reports and other deliverables. The primary report deliverables (as per 7) will be submitted to the

Project Archaeologist (and Crossrail CDM Advisor in the case of Method Statements) in draft form (Version 1.0). Any tracked changes or comments added by the Project Archaeologist and/or Crossrail CDM Advisor will then be incorporated and future dated versions (2.0 etc) will be returned via eB accompanied with the appropriate Checklist with Contractor's responses.

9 Artefact Recovery and Conservation

At the evaluation stage, the objective is to establish what range and quality of finds and environmental evidence if present and then to develop a sampling regime appropriate to the potential of each category of material. Sampling strategies are developed on a site-specific basis to meet the evaluation objectives stated in the Crossrail Site-specific WSI; and the following professional standards, in consultation with appropriate specialists:

- MOL Archaeological Finds Procedure Manual (2006)
- Relevant English Heritage Centre for Archaeology Guidelines eg on Environmental Archaeology (English Heritage 2002)
- Guidelines of the Society of Museum Archaeologists for the Selection, Retention and Dispersal of Archaeological Collections (SMA 1993).
- English Heritage/Church of England, Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England (2005)
- IFA Guidelines to the standards for recording human remains (2004)
- Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics produced by the Medieval Pottery Research Group Occasional Paper 2, (Slowikowski, A, Nenk, B. and Pearce, J 2001)

In general all material from stratified archaeological deposits is retained unless it is clearly residual or part of a large but routine assemblage, in which case samples of both typical and diagnostic items are retained.

Due allowance will be made for occasional specialist attendances which may be needed on and off-site to complete the investigation to the appropriate specified standard. These would only be called upon on a case-by-case basis, if significant structures or strata are revealed. Such attendances may include artefact conservation, photography, surveying, environmental sampling, finds assessment, geoarchaeology and scientific dating. MOLA has a full range of in-house specialists and can therefore deploy such resources at short notice, if needed, eg to advise on sampling strategies.

All finds and samples will be treated in a proper manner and to Museum of London standards. They will be exposed, lifted, cleaned, conserved, marked, bagged and boxed in accordance with the guidelines set out in the United Kingdom Institute for Conservation's Conservation Guidelines No. 2 and the Museum of London's Standards for the Preparation of Finds to be permanently retained by the Museum of London. Metal objects will be x-rayed and appropriate objects then selected for conservation.

9.1 Retention and Disposal

The finds retrieval policies of the Museum of London will be adopted. An adequate and representative sample of finds and deposits as advised by appropriate MOLA specialists who will be available to attend site as required (see 11.1).

10 Treasure

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

To protect the finds from theft, MOLA 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, MOLA shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor.

11 Archaeological Science Strategy

Where necessary, the strategy for sampling archaeological and environmental deposits and structures (which can include soils, timbers, animal bone and human burials) will be developed by MOLA in accordance with English Heritage and IFA guidelines. Advice will be sought from appropriate MOLA specialists and if additionally required from English Heritage. Subsequent on-site work and assessment of the processed samples and remains will be undertaken by MOLA Specialists.

If necessary, samples for absolute dating such as C14 or timber samples for dendrochronology will be submitted to nominated MOLA external laboratories. This will only be done with the prior approval of the Project Archaeologist where there are particular research objectives to be addressed by such dating.

See 6.1 for the site-specific sampling strategy.

11.1 Specialist Strategy

An appropriate programme of ceramic dating and study of other excavated artefactual and environmental materials will be undertaken by MOLA Specialists as their contribution to the Fieldwork Report.

11.2 Excavation and Recording of Human Remains

The required methodology for human remains is set out in detail in the SS-WSI and the MOLA Framework Method Statement (Technical Submission 2.4, section 4.6) and is not repeated here. It is anticipated that human remains will be present on this site and an exhumation licence has been applied for from the Ministry of Justice, and received on the 17th February 2011 (see 14.4).

In the case of those trenches not being excavated to full depth, if human remains are present, any complete or semi-complete, articulated burials will be left *in situ*, suitably covered and protected, at the exploratory or enabling works stage of Crossrail works.

Protective measures may include covering with Terram and sand before the trench is backfilled (to be provided by the Principal Contractor). Any *in situ* human remains will be recorded to watching brief standard (cleaned, location recorded and photographed). Any re-deposited, disarticulated human bones will be collected, examined briefly by the Osteologist, bagged, labelled and returned to the trench in which they were found, before it is backfilled (for Trenches 1 and 2 it is currently planned that they will be stored securely until an exhumation contractor is in place). The advice of a MOLA Osteologist will be sought where the nature of a deposit containing human remains is ambiguous. Similarly, if any of the contractor's excavated spoil may also contain further disarticulated human bone it must not be removed from site but should be re-filled by the Principal Contractor into the trenches on completion.

For those trial trenches where excavation is undertaken to the base of archaeological deposits and therefore the above method for retaining human remains is not feasible, the detailed excavation methodology for human remains described in section 5.2.1 will be employed.

11.3 Processing of Human Remains

Where detailed excavation of in-situ burials has been required, the following processing methodology will be employed:

- Treatment of all remains and samples will be to professional standards and in accordance with United Kingdom Institute for Conservation guidelines.
- Inhumations will be washed over a 1mm mesh using a spray hose. Any block lifted remains such as those of neonates, will be processed using a flotation tank with a 1 mm mesh to ensure complete recovery.
- The remains will be washed and packaged.
- Separate processing methods exist for cremated remains but it is not currently envisaged that these will be encountered during evaluation.
- The remains will be transferred to a purpose-built facility where they will be slowly air dried.
- The remains will then be packaged to archive standard under the direction of the Senior Osteological Processor. Human bone will not be marked.

11.4 Assessment Scanning of Human remains

Following processing as in 11.3, the following assessment scanning methodology will be employed:

- Inhumations will be assessed by a MOLA Human Osteologist. Assessment of all stratified deposits of human remains will be carried out according to English Heritage Centre for Archaeology Guidelines 2002 and MOLA standards (Powers, unpublished).
- Assessment data will be recorded in an Excel worksheet. For each context, the level of preservation and completeness will be estimated and a basic catalogue (by body area, not bone, ie skull, dentition, arms, legs etc) will be compiled.
- The remains will be rapidly scanned to provide basic demographic data. Remains will be classified as adult or subadult. Subadults will be subdivided into age

groups based on the timings of the eruption of the molar teeth. Basic observation on adult sex will be made.

- Gross pathological changes will be noted using a coding system compatible with that used at analysis.
- The minimum number of individuals within each context will be noted.
- A summary catalogue of disarticulated bone will be produced if appropriate, to aid in establishing the number of individuals within each trench.

12 Archiving and Dissemination Method

The required methodology for off-site work including specialist method statements, assessment, analysis, publication and archive is set out in the SS-WSI and is not repeated here.

The site-specific publication and archive requirements will be agreed in conjunction with the Project Archaeologist in the light of the overall approach being developed for the Crossrail project (eg publication format and the extent to which individual sites may be grouped spatially or thematically; and degree to which the archive will be systematised and deposited as a single whole).

13 IT Capability – Digital Survey Recording, Data Capture and Curation

The required methodology for IT (including site survey) will be carried out in accordance with the C257 Contract and project standard survey requirements.

- For evaluations the trenches may be manually marked out on site in relation to existing real world features by MOLA staff in the locations specified by the Project Archaeologist on a suitable hardcopy site plan. If trench locations are required to be set out on Crossrail London Survey Grid co-ordinates, then Crossrail surveyors will need to supply MOLA Geomatics with the relevant survey control and mapping sufficiently in advance of the site visit to allow for survey preparation. In the event of MOLA Geomatics staff setting out trenches without Crossrail survey control, then they will reference locations to OSGB36 co-ordinates, through using GPS/GNSS. It is expected that the survey methodology employed will vary depending on the individual circumstances of each site, and the availability or suitability of using London Survey Grid control and co-ordinates.
- For dispersed Watching Briefs occurring on large sites the Principal Contractor's survey controls may not yet have been installed (eg for service diversions etc at the early enabling works stage). Here the primary aim will be to use digital techniques (such as direct survey capture of works locations and archaeological features) to speed recording and data handling and so minimise any risk of delay to the Principal Contractor.
- Targeted Watching Briefs it is proposed that Principal Contractor's surveys assist with the location of temporary base lines and the plotting of significant archaeological features where appropriate.
- Upon completion of the fieldwork a Site Survey Report will be compiled.

14 Additional Details

14.1 Standards and Guidance

See Section 3.2.

14.2 Unexpected and Nationally-important remains

In cases where unexpected discoveries cannot be preserved in situ, the response plan would revert to the normal Crossrail mitigation strategy of further archaeological investigation (preservation by record). The aim would be a rapid and commensurate response, targeted to just those remains unavoidably affected by the works.

Recording and sampling methods would also be proportionate to the significance of the remains. Additional archaeological resources would be deployed to achieve this, in order to minimise any delay to the Principal Contractor's works. With flexibility and good communication it is often possible for the development works to continue in other areas while localised discoveries are recorded.

14.3 Progress Photographs

In addition to the archaeological photography specified in the SS-WSI and this Method Statement MOLA will submit a monthly professional photographic record of the progress of the archaeological scope of works. The photographs from the sites in this method statement will form part of the 30 required each month across the whole of the C257 contract.

14.4 Management of Consents

MOLA will liaise with the Employer and Principal Contractor regarding supply of any necessary information in support of required consents, eg road closures, Permit to Dig.

In general separate consents for archaeological works are unlikely to be required, the exception being human remains.

- MOLA has applied for a burial licence and received for the authority to exhume human remains for archaeological purposes for the evaluation, detailed excavation and watching briefs listed in section 1 (Licence number 11-0013, 17th February 2011). This has been forwarded to the Design Archaeologist and Project Archaeologist for distribution to the Principal Contractor and any others who require them. A copy will be kept on site with the site supervisor.
- In a letter of the 24 May 2011 amending the conditions of the above licence, the Ministry of Justice permitted that 'spoil which may contain disarticulated human remains shall be stored safely, privately and decently by JB Riney & Co Limited, London under the control of a competent member of staff'.

15 Health and Safety

15.1 CDM Responsibilities and Reporting

- MOLA will be supporting and reporting to the Principal Contractor (J B Riney for the Evaluation trial pits in Liverpool Street and General Watching Briefs on trenches to the front of the UBS building) and to the Crossrail Project Archaeologist and CDM Co-ordinator:
- MOLA will be implementing archaeological designs in the SS-WSI prepared by the appropriate FDC consultant, therefore not acting as CDM Designer under the Construction (Design and Management) Regulations 2007.

MOLA will provide:

- A current health and safety policy, including defined operational procedures and managerial responsibilities, risk assessment/control, and measures to ensure that a safe method of working is implemented by the archaeological team on site, including appropriate advice and support from office-based managers.
- Adequate safety information in the MOLA site accommodation including the WSI, current Health and Safety Policy, Health and Safety at Law Poster, Data Protection Compliant Accident Book, and copies of Public and Employers Liability Insurance. The Supervisory Archaeologist is responsible for ensuring that this information is made available.
- Compliance with current legislation and HSE guidance; including the Construction Design and Management Regulations (CDM) 2007 as a Designer; and the Principal Contractor's Health and Safety Policy, safety inductions and fire and emergency procedures.
- Field staff qualified to operative level (or higher) of the CITB Health and Safety test and therefore eligible to carry a Construction Related Organisation (CRO) White Card for Archaeological Technician (Code 5363).
- Services of a Contract Manager, Project Officer and Supervisory Archaeologist to manage site investigations, including liaison with the Principal Contractor's Health and Safety Co-ordinator and Principal Contractor, attendance at site meetings etc. The Supervisory Archaeologist will act as principal liaison with the Principal Contractor.
- Services of a professional health and safety consultant to attend site when required; reporting to the Supervisory Archaeologist and Project Officer, with any concerns or recommendations copied to the Principal Contractor's site manager
- A safety monitoring/reporting procedure. This should include accident reporting by the Supervisory Archaeologist to non RIDDOR and RIDDOR standard and any necessary liaison and follow-up of agreed safety actions with the Principal Contractor's site manager
- All necessary staff supervision, training and personal protective equipment (PPE) including tool box talks and safety inductions for new staff.
- Personal protective equipment (PPE) as listed in 21.8.3, but not any additional PPE required by the Principal Contractor's method of work or Health and Safety plans.

- Review and compliance with the Principal Contractor's Construction Phase Plan under the CDM Regulations 2007.
- Trained First Aiders, 'Where to get First Aid' poster and a First Aid kit (to be located in the MOLA site accommodation). The Principal Contractor will also have first aid facilities on site.

The Principal Contractor will provide:

- Overall control and supervision of the site and a safe working environment. The archaeological organisation will be unable to complete the specified works in any area where this is not provided.
- Technical services and attendances to the archaeologists as required (see 21.8.1). These services may include providing site accommodation, plant for the excavation of trenches and other equipment such as handrails, shoring and ladders. These requirements are listed in detail in separate documents.
- Construction Phase Plan

The CDM Co-ordinator will provide:

- Overall co-ordination of health and safety planning and management.
- A communications structure; including contact details for key personnel, meetings, reporting, etc.
- Supply of material information: eg services and contamination reports; any relevant requirements regarding rights of way, noise, hours of operation, etc.

15.2 Rail Sites

This is not a designated rail site.

15.3 Highway Sites

The Evaluation Trial Trenches in Liverpool Street are on a highway and therefore MOLA will comply with the Principal Contractors regulations. (The slip trenches and Trench/TP 15 to the front of 100 Liverpool Street are off the public highway).

15.4 Health and Safety Reporting

Adherence to health and safety procedures will be monitored by the MOLA Health and Safety Consultant, Contract Manager, Project Officer and Site Supervisor. The consultant will attend site for regular monitoring visits and, on each occasion, will supply a report on the archaeological work, containing any necessary health and safety recommendations. This will be forwarded to the Principal Contractor's site manager. Where appropriate to the scale of work, regular on-site progress meetings will be held between MOLA, the Project Archaeologist and the Principal Contractor at which any safety issues may be discussed, agreed and actioned.

15.5 Liaison with Principal Contractor

The MOLA supervisory archaeologist will act as the principal point of contact with the Principal Contractor's site manager throughout the periods of site investigation.

Contact details will be exchanged. The supervisory archaeologist will be supported and advised by the MOLA Fieldwork Director and project management team as needed.

15.5.1 C257 MOLA Project Management team contact details

- Elaine Eastbury, Contracts Manager
eeastbury@museumoflondon.org.uk
Direct Line: 020 7410 2237
Mobile: 07730 646063
- Nicholas Elsdon, Assistant Contracts Manager
nelsden@museumoflondon.org.uk
Direct Line: 020 7410 2282
- Robert Hartle, Site Supervisor (Senior Archaeologist)
Direct Line (office): 020 7410 2238
Mobile: 07730 646060

15.6 Behavioural Safety BMOS

Mobile phones, personal CD players, i-pods and similar will not be used by MOLA staff in archaeological trenches or areas of work. Smoking and naked flames are not permitted in the trenches or areas of work. Alcohol is not permitted on site. This aspect will be monitored by the MOLA Supervisor and H and S Advisor and reported on in the progress report (see 4.3).

16 Emergency Response

16.1 Emergency Preparedness & Response Plan

An Emergency Preparedness/Continuity Plan for the Liverpool Street Station sites was submitted by MOLA to Crossrail on 04/02/11.

A General Emergency Preparedness Plan (EPP) is currently being prepared within the MOLA Health and Safety Plan for C257. This should be referred to for generic emergency and accident issues.

Site-specific issues are as follows:

- MOLA staff will comply with the Principal Contractor's (JB Riney) Emergency Plan.

Employers Incident Response Contact	Crossrail helpdesk 0345 602 3813
Principal Contractor Incident Response Contact	Contracts Manager N Carlsson 07977992038 / 0208 983 0077 or General Manager J Coe 07595201876 / 0208 983 0077
MOLA Incident Response Contact	<ul style="list-style-type: none"> • Elaine Eastbury, Contracts Manager eeastbury@museumoflondon.org.uk Direct Line: 020 7410 2237 Mobile: 07730 646063 or • Nicholas Elsdon, Assistant Contracts Manager nelsden@museumoflondon.org.uk Direct Line: 020 7410 2282
Local A&E location	<p><i>Full A & E at:</i> The Royal London Hospital, Whitechapel Road, E1 1BB Telephone 0207 377 7781 Tube: The hospital is located opposite Whitechapel underground station. It is served by the Hammersmith and City and District lines as well as the London Overground (formerly the East London line).</p>

16.2 Training

MOLA provides Safety Training for its staff as in Section 4.2.

The MOLA Senior Archaeologist will attend all emergency training/inductions on Preparedness/Response Plan provided by the Principal Contractor.

16.3 Emergency & Accident Equipment

- MOLA Archaeologists when working singly on the watching brief tasks will carry a single person First Aid Kit and mobile phone.
- During the evaluation a first aid box will be located in the archaeological office on site.
- It expected that the Principal Contractor will also provide basic first aid facilities on site.

16.4 Monitoring & Testing

MOLA staff will comply with Crossrail requirements.

16.5 Emergency & Accident Incident Reporting

All accidents and emergencies must be reported to the Principal Contractor (Ronan Maughan, Works Supervisor, J B Riney), who will call the emergency services, if required. They will also be reported to the Crossrail Helpdesk (24 hour helpline) Call: 0345 602 3813 or helpdesk@crossrail.co.uk

All accidents and emergencies must be reported to the following personnel at Crossrail and MOLA:

- Jay Carver, Project Archaeologist, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ
DD 0203 229 9258, Int 2258
Mobile 07870 191 705
- Linda Muzikants, PDP Project Manager, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ
DD 0203 197 5854
Mobile 0758 020 1733
- Nick Dyball, CDM Advisor, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ
Mobile 07718 861941
- George Dennis, Senior Contracts Manager, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
DD 0207 410 2200, Int 2256
- Ian Grainger, Field Manager, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
DD 0207 410 2200, Int 2271

17 Environmental Management

The archaeological works will be carried out whilst the Principal Contractor is in possession of the site. MOLA will therefore request a copy of the Principal Contractor's Environmental Management Plan prior to commencement and will supply any necessary inputs with regard to MOLA works. MOLA will comply with the Principal Contractor's Environmental Management System as documented in their Environmental Management Plan, and contribute to their EMS reporting if required.

If any remedial action is needed, eg controls for dust, water, noise or controlled waste, this will be agreed with and undertaken by the Principal Contractor as part of the required attendances (see 15 and 21.8.1). In addition an updated MOLA corporate Environmental Management Plan is currently being prepared for submission to Crossrail.

The nominated environmental person is: Alison Telfer, atelfer@museumoflondon.org.uk, 020 7410 2276.

17.1 Contamination

MOLA staff will not disturb or damage asbestos, or undertake asbestos removal from a building, structure, or buried material. If asbestos is found the Principal Contractor will be responsible for having it dealt with by a licenced contractor.

17.2 Water Disposal

The Principal Contractor is responsible for disposal of any ground water pumped from the trenches or other excavations, in accordance with their environmental management plan, with which MOLA will comply.

17.3 Site Waste Management Plan

MOLA staff will adhere to the Principal Contractor's site waste management plan.

It is anticipated that very little waste will be removed from the site from the archaeological works, but any produced will be disposed of by the Principal Contractor in accordance with their Waste Management Plan.

17.4 Vehicles/Motorised Equipment

MOLA staff will liaise with the Principal Contractor to provide safe access and parking for MOLA vehicles if required to attend site:

- Ford Silver Transit (Medium Wheelbase) – EA55 NBJ – Harry Matthews, Equipment Officer, 07730 646063.
- 1.7 Turbo Diesel Astra Estate – KC54 XTZ – Sarah Jones, Geomatics Manager, 0207 410 2200 Int 2287.

17.5 Other Requirements

MOLA staff will always be courteous with any members of the public they have dealings with.

18 Quality Assurance Plan

An updated Quality Assurance Plan has been prepared for submission to Crossrail in accordance with the format specified at part 5.4 of the C257 contract. Records will be kept and supplied to Crossrail in accordance with procedures set out in Crossrail Specification CR-PN-LWS-EN-SP-00001, as amplified by the SS-WSI. The MOLA responsible procurement representative is Dawn Jackson, who is a member of the Senior Management Group.

19 Community Relations

MOLA will co-operate with the Principal Archaeologist and Principal Contractor regarding any notified community relations issues in relation to the Construction Community Relations Strategy Framework as defined in the Works Information.

MOLA will in the first instance refer any media enquires or community relation issues to the Crossrail Helpdesk and the Project Archaeologist.

20 Responsible Procurement

An updated Responsible Procurement document was submitted to Alison Jackson, Crossrail on 6th August 2010.

21 Health and Safety Method Statement

21.1 Introduction and Purpose

21.1.1 Project Background

Archaeological investigations are to be carried out on this site by Museum of London Archaeology (MOLA). The requirements are set out in:

- A Crossrail **Site-specific Written Scheme of Investigation** (SS-WSI – Liverpool Street Station, Site-specific Written Scheme of Investigation, Doc. No. C138-MMD-T1-RST-C101-00001 Version 2
- An **Addendum to the Written Scheme of Investigation**: Trial Trench Evaluation - Broadgate Ticket Hall (XSM10), Doc. No. C138-MMD-T1-RST-C101- -00004 Revision 1.0

21.2 Scope of Document

This Method Statement sets out the specific MOLA safe methods of working to be applied to:

- **Archaeological Evaluation trenches** in the footprint of the utilities corridor and in the road and northern pavement of Liverpool Street
- **General Watching Brief** on the excavation of slip trenches, and Trench/TP 15 to the front of 100 Liverpool Street

This method statement has been developed in conjunction with the Principal Contractors, who will be responsible for ensuring that the archaeological works may be carried out as specified.

21.3 Responsible Persons and Site Management

21.3.1 Site Management

The MOLA Senior Archaeologist/Site Supervisor will ensure that a copy of the MOLA Welfare, Health & Safety Method Statement is made available to the Principal Contractor at the site. Where further changes or additions to the WH&S Method Statement are required and agreed these should be appended to the site master copy by the MOLA Senior Archaeologist/Site Supervisor.

All changes to the WH&S Method Statement will be signed off by the Project Archaeologist, Crossrail H & S Advisor, MOLA Senior Contract Manager and MOLA Field Manager.

21.4 Scope of Works

21.4.1 Proposed archaeological works

The scope of archaeological works is set out in 21.2, and in section 1 of the method statement, above.

21.5 Methodology, Programme and Sequence

The current programme is set out in section 4.6 of the method statement, above.

21.6 Health and Safety Control Measures

21.6.1 Site Access/Vehicle Movements

On arrival at the site, MOLA staff will sign in, establish contact with the nominated Site Manager (or equivalent) attend any inductions etc. in accordance with the required access procedure for the site (to be notified to MOLA in advance by the Principal Contractor). All MOLA staff working on site will carry identification and CSCS cards.

Safe access routes from the site gate to work Areas and any offices and/or facilities will be erected and maintained at all times throughout the course of the archaeological evaluation by the Principal Contractor. Where it is not possible to segregate vehicle movements, the Principal Contractor will use a banksman, especially when loading/unloading vehicles, plant, equipment, and materials, and reversing vehicles and plant. This is particularly relevant within the narrow space of the evaluation area in Liverpool Street.

21.6.2 Services

The location and making safe of live services before or during archaeological works is the responsibility of the relevant Principal Contractor in control of the site. MOLA staff will exercise care and due diligence and report any discovery of unexpected services or other ground hazards promptly to the Principal Contractor, Project Archaeologist and MOLA H & S Officer.

21.7 Safety of Excavations

21.7.1 Entering the Trench during Evaluations

- MOLA staff will not enter any excavation until the Principal Contractor has issued a Clearance to Enter Permit confirming that it is safe to do so and that there is safe access/ingress to the archaeological investigation areas. The Principal Contractor will also ensure that the excavations are maintained in safe condition for the duration of the archaeological investigation. The Principal Contractor will supply attendances as required in 21.8.1.

21.7.2 Shoring

- Where required during the Evaluation the trench will be shored in a suitable manner by the Principal Contractor and safe access arranged.

21.7.3 Confined Spaces

- All nine of the evaluation trial trenches (Trenches 1 to 14) will be designated confined spaces. The trial pit in the basement of the Railway Tavern may also be designated a confined space, if sufficient depth is reached. All MOLA staff working in such designated areas will be trained to work in Confined Spaces. See section 22.8.
- The Principal Contractor is responsible for monitoring and control of Confined Spaces, and for provision of gas monitoring, rescue equipment, and other equipment or procedures required. The appointed J B Riney 'top man' will carry out an initial assessment of the confined space atmosphere and continually monitor at regular intervals, recording this as excavation progresses. All personnel will be trained in confined space working and deemed to be competent.
- As a result of recent information received by JB Riney about methane ingress to the adjacent sub-station, gas monitors will be dropped down each trench by the Principal Contractor prior to anyone entering. If high levels of methane are detected, this will be dealt with by the Principal Contractor prior to any work commencing.
- All personnel entering the excavation will be required to wear a harness and be trained in the use of escape sets. The number of personnel entering the excavation at any one time is to be kept to an absolute minimum, sufficient only to carry out the task in hand.
- Given the proposed dimensions of the trial trenches and test pit, designation may change as excavation progresses. This will be kept under constant review.

21.7.4 Machine Excavation

- Machine excavation will be monitored by the MOLA Senior Archaeologist/ Site Supervisor, but will at all times be under the control of the Principal Contractor.

21.7.5 Hand Excavation during Evaluation or Targeted Watching Brief

- Hand excavation will be limited to selected times/areas defined by the MOLA Senior Archaeologist/ Site Supervisor, with the agreement of the Principal Contractor, and will be properly fenced, demarcated and signed.

21.7.6 Lone Working (watching briefs)

- The monitoring MOLA Supervisor will complete the necessary signing in procedures for each site visit and will also notify the Principal Contractor's Site Manager of their presence, and which works are to be monitored. The MOLA Supervisor will only be providing an attendance to observe, monitor and record the defined Principal Contractors works and therefore will not be working alone.

In particular the MOLA Supervisor will not attend works or enter excavations when the Principal Contractor is not present.

21.7.7 Contamination

- Recent information received by JB Riney about methane ingress has resulted in all of the evaluation trenches being designated confined spaces (see 21.7.3).
- MOLA has been issued with the Crossrail Line 1 Assessment of Contaminated Land Impacts Technical Report Volume 1, Doc. No. 1E0322-C1E00-00013, dated February 2005) by the Principal Contractor. Any necessary remedial action will be agreed with the Principal Contractor as part of the H & S Plan and supplied as an attendance item (21.8.1 below). Wherever possible such action must be undertaken by the Principal Contractor prior to MOLA commencement on site. If this is not done there may be operational constraints on the MOLA safe method of working that could restrict achievement of the archaeological scope of works set out in the SS-WSI.

21.7.8 Ordnance

MOLA has received the Principal Contractor's Construction Phase Unexploded Ordnance Risk Assessment (Section 8.5, Riney Construction Phase Health and Safety Plan: Liverpool Street and Finsbury Circus Trial Trenches (Supplier Doc. No. CR-LIS_FIN-CPP-NC-001, version 1.0, dated 04-01-11). Based on the CLRL specialist desk study, this identified a low risk of the discovery of unexploded ordnance at the Liverpool Street site.

The Principal Contractor's Method Statement states that:

- All operatives to be trained and competent to carry out the works
- All operatives to be briefed at site induction on emergency response plan as laid out in the Construction phase Health and Safety Plan
- Flame retardant overalls to be worn by all operatives when excavating

The MOLA Supervisor shall comply with the PC's rules. If Ordnance is unexpectedly found the MOLA Supervisor shall inform the PC immediately and withdraw to a safe place outside the area designated by the PC.

21.7.9 Site Rules

- All MOLA Staff will comply with the Principal Contractor's site rules and with the MOLA single person watching brief rules (when applicable).

21.8 Planning and Resources

21.8.1 Principal Contractor's Supply of Attendances

The site specific requirements for services, facilities and attendances to be provided by the Principal Contractor, to enable MOLA to undertake the defined archaeological works are set out below. Those items in **bold will be required** for this site – others may be required, depending on site conditions, which will be reviewed on site by the MOLA Supervisor in conjunction with the Principal Contractor's nominated Site

Manager (these requirements will be communicated to the Principal Contractor in the event that they are needed):

- **general site security** including hoardings, gateway, warning notices, etc; to create a secure site perimeter, sufficient to prevent unauthorised access. If the Principal Contractor has retained security guards, it is recommended that the archaeological investigation areas be added to their schedule for regular patrols, particularly out of hours.
- **specific site security**: it will be necessary to separately secure individual archaeological trenches via a physical barrier (such as Heras fencing) as the trenches are located in public areas and human remains are likely to be encountered. Secure storage (eg lockable tool store/hut) is required for human remains, other finds, samples and tools and equipment at the Finsbury Circus worksite (in future to be the worksite in Liverpool Street).
- **temporary roofing and side screening to archaeological excavations where burials are exposed** (eg monoflex on scaffolding frame or similar) in order to screen any human remains from public view. The roof needs to have adequate water drainage and ventilation and temporary openings will need to be incorporated into the design to enable the safe removal of spoil from the trench. Any areas adjacent to the trench where spoil containing human remains may be visible from surrounding buildings should also be screened from the public gaze.
- **providing safe access** to the site and the specified archaeological investigation areas via separately identified pedestrian routes, signing, safety guard-rails, secure ladders etc. This includes segregating these areas from any vehicles and plant operating nearby eg via a robust physical barrier (see 21.6.1).
- adequate *ventilation* and protection from noise, fumes and dust where plant is in use, especially within standing buildings
- **managerial services** – nominated points of contact for Principal Contractor and other key members of development team.
- **technical advice** to be available if required (eg via client or Principal Contractor's consulting engineer) re protection of adjacent streets and buildings, removal of obstructions, depth of excavation, live services etc.
- **specific site welfare**: in addition, owing to the presence of human remains and a sewer on site, facilities for washing hands and (if necessary) removing dirty clothes (eg disposable overalls, if these become necessary) will be required adjacent to the trenches on the worksite in Liverpool Street – eg a small unit with sinks, or portaloo. **This is particularly required for the excavation around the sewer exposed in evaluation Trenches 1 and 2.**
- **general site accommodation and welfare facilities with electricity and water**. To include, at the Finsbury Circus worksite (in future to be the worksite in Liverpool Street): furnished main base cabin as work space; separate male/female changing areas, toilets and washing facilities; plus additional steel cabin for secure storage of MOLA PPE, equipment, camera and paperwork and finds (including human remains). It is provisionally estimated that accommodation etc for 1 to 6 people will be required for the evaluation.
- **site preparation and clearance**. Removal of structures, rubbish, spoil heaps, demolition materials, slab, modern obstructions, infill, made ground, etc. as required, prior to and during the archaeological investigation. The majority will be by mechanical excavator, under archaeological supervision, but occasional hand work by labourers may be needed (eg clearing individual obstructions, modern

intrusions, or removing spoil from investigation areas if the machine cannot re-enter).

- **removal of spoil from trenches.** Before hand excavation commences, an electric hoist and gantry will be installed by the Principal Contractor adjacent to each trench to allow the removal of spoil via a 45litre capacity bucket or similar. The hoist will be operated by a suitably qualified person supplied by the Principal Contractor, and checked at the intervals specified in the Principal Contractor's method statement/risk assessment for the use of the equipment.
- **transport/mounding/storage of spoil** from archaeological investigation areas. This includes removal from site, if necessary. **Any spoil which may contain human remains will either be stockpiled under secure conditions at the Finsbury Circus worksite and used for backfilling, or at Riney's depot to be dealt with by an exhumation contractor once appointed.** Such spoil will need to be screened from public view both during transportation and temporary storage.
- **filling back and reinstatement upon completion** (trenches are normally backfilled, for safety reasons, unless there are client instructions to the contrary).
- **supply of plant and equipment;** principally a mechanical excavator of appropriate size; supplied with driver, breaker, toothed digging bucket and toothless ditching blade; hoists for removal of spoil from trenches and operators. Other plant such as dumpers, compressor/breakers and pumps may also be needed.
- **accreditation and supervision of operatives, plant and equipment,** including supply of sufficient qualified banksmen/supervisors to control plant movements and adequate certification for plant and operatives.
- **temporary support:** design, installation and maintenance of appropriate temporary support and edge protection to excavations, where deeper than c 1.2m (or as required in unstable ground). This will be via benching/battering back and/or shoring, depending on a depth and ground conditions.
- **other safety measures in deep excavations:** monitoring of air quality and provision of rescue facilities and equipment in any areas defined by the Principal Contractor as a confined space. Where hoists are used in shored shafts less than 4metres x 4metres area, MOLA staff shall leave the shaft before hoisting of bucket takes place and not under normal operations re-enter until bucket is lowered back into position: Unless:
 - suitable space or protection is afforded within the shaft so that staff will not be at risk should the bucket fall;
 - a banksman or topman is constantly present to ensure that the bucket is not re-lowered or suspended over the trench while staff are working in the trench;
 - there is clear agreement that the hoist or machine operating as a hoist will not be in operation for a specified time period at that location and will not in any case recommence operations without the agreement of the MOLA supervisor or suitable deputy.
 - Where mechanical or electrical hoists are in use in larger excavation trenches, the area in which the hoist is in use must be clearly demarcated and no staff will enter this area while the hoist is being raised or lowered or in the interval between these operations except under the circumstance specified above.

- **pumping-out:** a suitable method to keep the trenches dry, eg pumping into a previously investigated trench, to create a sump.
- **110v. site lighting and power supply** for access routes to excavations, plus individual task lighting within trenches (eg tripod-mounted spotlights) if required. The need for lighting depends on the depth, season and weather conditions or on ambient light level if working inside a standing building or roofed screening/cover.
- **locating and making safe any live services or hazardous substances (above or below ground):** preliminary services searches should be carried out by the Principal Contractor via the statutory undertakers etc, plus on-site inspection and testing where required. Where there is reason to believe from previous uses that the ground or adjacent buildings may be contaminated the Principal Contractor should make arrangements for advance inspection, sampling, testing and where necessary specialist remediation. The results of such surveys should be forwarded to MOLA prior to commencement on site. Any identified hazards will be addressed in the health and safety planning. Excavations to be scanned for services by Principal Contractor before and during excavation, as per JB Riney method statements (CRL doc no CRL1-PDP-C-GMS-C101-50001, v 3 26.01.11; & 03.06.11, see section 1). Any unexpected hazards encountered during the investigations will also need to be made safe by the Principal Contractor before archaeological fieldwork may continue. In the event of the accidental disruption of a live service by archaeologists or sub-contractors under archaeological supervision the MOLA supervisor will inform both their project manager and the Principal Contractor and, when appropriate, call the relevant emergency number.
- **development of a safe method of working:** archaeologists will not be able to work within excavations whilst attendances (such as installing temporary support or removing spoil) are taking place, and when demolition, construction or heavy plant activity occurs adjacent or overhead.
- **First Aid:** provision of First Aid facilities, and an emergency plan. On evaluations or watching briefs with small numbers of staff, MOLA may not be able to supply a first aider. In that case, the services of the Principal Contractor's qualified first aider(s) may be required.

21.8.2 Equipment

Equipment will be supplied by the MOLA equipment central store:

- First Aid Kit
- Hand tools (including hand auger if required), dumpy levels, stationary, grid pegs, digital camera, etc.
- Power auger if required

Any specialised equipment such as power augers will have certification of maintenance kept at MOLA headquarters.

21.8.3 PPE

All MOLA staff are supplied with and will wear or use the following PPE where required and as appropriate:

Safety Helmets (EN397)
Ear Defenders (EN 352-3)
Safety spectacles (EN166)
Dust masks plain and valved (EN149 2001)
Hi-visibility vests (EN471) – orange
Gloves Nitrile and latex disposable, PVC, EN374
Safety footwear - steel toecap and mid-sole boots and Wellingtons EN345-47 (No riggers are allowed)
Flame retardant overalls

21.8.4 Staff

The timing and overall duration of the evaluation and the various watching brief/evaluation tasks listed earlier will be determined by the contractor's programme and the nature and extent of any surviving remains. It is envisaged that General Watching Briefs will be initially carried out by one MOLA Supervisor, with a second archaeologist coming in to assist with any recording work if required. The evaluation will be supervised by one MOLA Supervisor assisted by an adequate number of field staff, depending on the number and size of trenches that are to be available to be worked. Other archaeological specialists may be called in if necessary.

It is *provisionally* estimated that 1 to 6 archaeologists and specialists might be required on site for the evaluation and watching briefs. MOLA will notify the Principal Contractor if more staff are required.

21.9 Briefing Arrangements

21.9.1 MOLA Staff Induction – New Starters

- All MOLA staff shall receive a full induction including Health and Safety on commencement of their first day of work with the organisation. A record of the induction is kept.
- The MOLA Supervisor will be briefed by MOLA Contracts Manager/Assistant Contracts Manager on all relevant aspects of work before work commences. This briefing will include all SS-WSI, Method Statements (PC's and including this document.
- The MOLA Supervisor will be responsible for briefing any other MOLA staff on site before they commence work on all aspects of the work and documents.

21.9.2 Site Specific Inductions, Weekly Briefings and Tool Box Talks

- Where a site is under the control of a Principal Contractor (as in this case), MOLA staff will attend all initial site inductions and subsequent toolbox talks as required and managed by the Principal Contractor.
- Irrespective of whether the site is controlled by MOLA or a Principal Contractor, on larger projects eg those with more than 2–3 staff and of a week or longer duration, regular toolbox talks will be given by the MOLA Supervisor or other suitable member of staff using the CITB: construction site safety tool box talks

manual. As a minimum requirement these talks will occur 1–2 times per week and be of 10–15 minutes duration.

21.10 First Aid

21.10.1 Trained First-Aid Personnel

During the evaluation there will be at least one MOLA Archaeologist who is a qualified First Aider (ie 3 day FA at work course) on site.

21.10.2 First Aid Documents

The MOLA site safety documents will be located with the first aid kit in the site office/mess hut/canteen. The safety documents will include a minimum of:

- Current Health and Safety at Law Poster for display where legislation requires
- Accident Book compliant with the Data Protection Regulations.
- MOLA Public Liability Insurance & Employers Liability Insurance for display
- Where To Get First Aid poster – to be displayed if required.
- Current MOLA Health and Safety Policy
- A copy of the site Welfare, Health and Safety Method Statement, extracted from the Site WSI, and modified as agreed during the course of the site.

21.10.3 First Aid Equipment

During the evaluations, a MOLA First Aid kit, of an appropriate size for the site, will be located in the site office/hut etc (at Liverpool Street, not the Finsbury Circus compound). For 1 to 2 person watching briefs, a 'bum bag' will be carried by the MOLA Senior Archaeologist at all times.

21.11 Accident, Incident, Near Miss and Environmental Incident Reporting

21.11.1 Reporting of Accidents/Incidents and Dangerous Occurrences

The Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) Regulations, 1995 sets out requirements for the reporting of certain types of accidents. RIDDOR notifiable accidents will be reported immediately by the MOLA site supervisor as specified in Section 16.5 of the method statement, above.

21.11.2 Documentation

In order to identify quickly problem areas and allow corrective action to be taken all accidents, dangerous occurrences and near misses, including those that do not cause injury, will be reported immediately to:

- Principal Contractor's Site Manager
- MOLA supervisor
- MOLA H & S officer
- MOLA Senior/Contracts Manager
- Crossrail Project Archaeologist
- Crossrail Helpdesk.

The site accident book for both the Principal Contractor and MOLA should be filled in giving details of the incident.

21.11.3 Investigation of Accidents and Dangerous Occurrences

MOLA will comply with the Principal Contractor's and Crossrail procedures.

MOLA will also initiate internal procedures as follows:

- Initial accident/incident report to MOLA Senior Contract Manager and Field Manager and action taken as appropriate.
- Non Riddors investigated by Senior Contract Manager/Field Manager.
- Riddors investigated and reported on to Senior Management Consultant by MOLA H & S Consultants.

21.11.4 Key Project Personnel

- George Dennis, Senior Contracts Manager, MOLA
- Elaine Eastbury, Contracts Manager, MOLA
- Nicholas Elsdon, Assistant Contracts Manager, MOLA

21.12 Emergency Procedures – Site General

All MOLA staff will comply with the Principal Contractor's procedures as outlined at the Site Specific Induction.

21.13 Emergency Services Contact Details

The Principal Contractor will confirm the hospital location:

Minor A& E at:

St Bartholomew's
West Smithfield Street, EC1
Telephone 020 7377 7000

Tube: St Paul's (Central Line)

Full A & E is at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

The MOLA supervisor will dial 999 for fire, ambulance and police in the case of an emergency if the Principal Contractor's Site Manager or his deputy is not present on site.

21.14 Route to Hospital

The Principal Contractor will advise on route to hospital at their site specific induction. The location and directions will also be displayed in the site offices and canteen.

22 Risk Assessments

22.1 MOLA Risk Assessment – Evaluation Trenches

Site: Broadgate Ticket Hall (Liverpool Street)		Type of Work		Evaluation Trenches
	Persons Affected	No	Classification	No
	Employees	Up to 6	Experienced	Yes
	Other workers	Yes	Inexperienced	
	Public		Disabled	

Known and Suspected Hazards on site (tick as appropriate)					
Mobile Plant	x	Power Auger	x	Ionising radiation	
Moving Machine Parts		Access equipment	x	Lasers	
Moving objects		Hazardous Substances		Ultraviolet	
Falls from height	x	Contamination	x	Temperature	
Falls on level	x	Micro organisms		Noise	x
Manual Handling	x	Vermin/Weil's Disease	x	Vibration	
Buried services	x	Fumes/Gas		Weather	x
Electrical		Lone working		Hot/cold objects	
LPG etc		Welfare		Physical attack etc	
Fire/Explosion		Confined spaces	x	Vehicles	
Chainsaw		Hand Tools	x	Human Remains	x
UXO	x	Lifting equipment	x	On/Near Water	

Control Measures Required

Compliance with H&S at Work Act 1974, Construction(Design and Management) Regulations 2007 and MOLA H&S Policy

Compliance with MOLA Generic or Site Specific Risk Assessment(s) for the Hazards marked above
Compliance with Principal Contractor's safety policy, site rules, permits to work, instructions and in particular site specific method statement. Attendance of Principal Contractor's induction on first day at work

Implementation and attendance of tool box talks by Principal Contractor and MOLA

MOLA supervisors to be trained and competent.

Certified First Aider on site.

Assessment of Remaining risk (Low, Medium, High) (see notes on reverse)

	L	M	H		L	M	H		L	M	H
Mobile Plant		x		Power Auger		x		Ionising radiation			
Machine Parts				Access equipment	x			Lasers			
Moving objects				Hazardous Substances				Ultraviolet			
Falls from height	x			Contamination	x			Temperature			
Falls on level	x			Micro organisms				Noise	x		
Manual Handling	x			Vermin/Weil's Disease	x			Vibration			
Buried services		x		Fumes/Gas				Weather	x		
Electrical				Lone working				Hot/cold objects			
LPG etc				Welfare				Physical attack etc			
Fire/Explosion				Confined spaces		x		Vehicles			
Chainsaw				Hand Tools	x			Human Remains		x	
UXO	x			Lifting equipment			x	On/Near Water			

Emergency action/additional assessment required for remaining medium/high risk

See Site Specific Risk Assessments for Mobile Plant, Buried Services, Confined Spaces, Power Auger, Human Remains

Competent Person(s) appointed to take action:

MOLA Supervisor

Report seen by (initials)

PM: GD

SA(s): TBC

Client: JC/RD

Contractor:

Other:

Archaeologists:

TBC

22.2 MOLA Risk Assessment – Detailed Excavation

Site: Broadgate Ticket Hall (Liverpool Street)			Type of Work			Detailed Excavation					
	Persons Affected	No	Classification	No							
	Employees	Up to 8	Experienced	Yes							
	Other workers	Yes	Inexperienced								
	Public		Disabled								
Known and Suspected Hazards on site (tick as appropriate)											
Mobile Plant	x	Power Auger	x	Ionising radiation							
Moving Machine Parts		Access equipment	x	Lasers							
Moving objects		Hazardous Substances		Ultraviolet							
Falls from height	x	Contamination	x	Temperature							
Falls on level	x	Micro organisms		Noise			x				
Manual Handling	x	Vermin/Weil's Disease	x	Vibration							
Buried services	x	Fumes/Gas		Weather			x				
Electrical		Lone working		Hot/cold objects							
LPG etc		Welfare		Physical attack etc							
Fire/Explosion		Confined spaces	x	Vehicles							
Chainsaw		Hand Tools	x	Human Remains			x				
UXO	x	Lifting equipment	x	On/Near Water							
Control Measures Required											
Compliance with H&S at Work Act 1974, Construction(Design and Management) Regulations 2007 and MOLA H&S Policy											
Compliance with MOLA Generic or Site Specific Risk Assessment(s) for the Hazards marked above											
Compliance with Principal Contractor's safety policy, site rules, permits to work, instructions and in particular site specific method statement. Attendance of Principal Contractor's induction on first day at work											
Implementation and attendance of tool box talks by Principal Contractor and MOLA											
MOLA supervisors to be trained and competent.											
Certified First Aider on site.											
Assessment of Remaining risk (Low, Medium, High) (see notes on reverse)											
	L	M	H		L	M	H		L	M	H
Mobile Plant		x		Power Auger		x		Ionising radiation			
Machine Parts				Access equipment	x			Lasers			
Moving objects				Hazardous Substances				Ultraviolet			
Falls from height	x			Contamination	x			Temperature			
Falls on level	x			Micro organisms				Noise	x		
Manual Handling	x			Vermin/Weil's Disease	x			Vibration			
Buried services		x		Fumes/Gas				Weather	x		
Electrical				Lone working				Hot/cold objects			
LPG etc				Welfare				Physical attack etc			
Fire/Explosion				Confined spaces		x		Vehicles			
Chainsaw				Hand Tools	x			Human Remains		x	
UXO	x			Lifting equipment			x	On/Near Water			

Emergency action/additional assessment required for remaining medium/high risk

See Site Specific Risk Assessments for Mobile Plant, Buried Services, Confined Spaces, Power Auger, Human Remains

Competent Person(s) appointed to take action:

MOLA Supervisor

Report seen by (initials)

PM: GD

SA(s): TBC

Client: JC/RD

Contractor:

Other:

Archaeologists:

TBC

22.3 MOLA Risk Assessment – General Watching Brief

Site - Broadgate Ticket Hall (Liverpool Street)		Type of Work			General Watching Brief
	Persons Affected	No	Classification	No	
	Employees	1–2	Experienced	1–2	
	Other workers	Yes	Inexperienced		
	Public		Disabled		

Known and Suspected Hazards on site (tick as appropriate)

Mobile Plant	x	Power Auger		Ionising radiation	
Moving Machine Parts		Access equipment		Lasers	
Moving objects		Hazardous Substances		Ultraviolet	
Falls from height	x	Contamination	x	Temperature	
Falls on level	x	Micro organisms		Noise	x
Manual Handling	x	Vermin/Weil's Disease	x	Vibration	
Buried services	x	Fumes/Gas		Weather	x
Electrical		Lone working		Hot/cold objects	
LPG etc		Welfare		Physical attack etc	
Fire/Explosion		Confined spaces		Vehicles	
Chainsaw		Hand Tools	x	Human Remains	x
UXO	x			On/Near Water	

Control Measures Required

Compliance with H&S at Work Act 1974, Construction(Design and Management) Regulations 2007 and MOLA H&S Policy
 Compliance with MOLA Generic or Site Specific Risk Assessment(s) for the Hazards marked above
 Compliance with Principal Contractor's safety policy, site rules, permits to work, instructions, and in particular site specific method statement (CSJV Works Package Plan (WPP), CRL doc. no. C248-SKC-C-GMS-CR094_WS111-50013).
 Attendance of Principal Contractor's induction on first day at work
 Implementation and attendance of tool box talks by Principal Contractor and MOLA
 MOLA supervisors to be trained and competent.
 Certified First Aider on site.

Assessment of Remaining risk (Low, Medium, High) (see notes on reverse)

	L	M	H		L	M	H		L	M	H
Mobile Plant	x			Power Auger				Ionising radiation			
Machine Parts				Access equipment				Lasers			
Moving objects				Hazardous Substances				Ultraviolet			
Falls from height	x			Contamination				Temperature			
Falls on level	x			Micro organisms				Noise	x		
Manual Handling	x			Vermin/Weil's Disease	x			Vibration			
Buried services		x		Fumes/Gas				Weather	x		
Electrical				Lone working				Hot/cold objects			
LPG etc				Welfare				Physical attack etc			
Fire/Explosion				Confined spaces				Vehicles			
Chainsaw				Hand Tools	x			Human Remains		x	
UXO	x							On/Near Water			

Emergency action/additional assessment required for remaining medium/high risk

See Site Specific Risk Assessments for Buried Services

Competent Person(s) appointed to take action: MOLA Supervisor	Report seen by (initials)	
	PM NJE	Archaeologists
	SA(s) TBD	
	Client JC/RD	
	Contractor	
Other		

22.4 MOLA Site Specific Risk Assessment – Lifting Equipment

MOLA RISK ASSESSMENT		LIFTING EQUIPMENT (whether fixed hoist , mechanical excavator being used as lifting equipment, or other equipment)			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Collapse of sides			•	
2	Striking existing services				•
3	Persons falling in			•	
4	Plant, bucket, and materials falling in				•
5	Flooding			•	
6	hazardous atmosphere				•
7	contaminated soil				•
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Health and Safety Policy, in particular safety rule 24.16, and the separate clarification of that rule (both reproduced below).</p> <p>Management of Health & Safety at Work Regulations 1999</p> <p>Construction (Design and Management) Regulations 2007, Confined Spaces Regulations 1997 Standards including: 6031: Earthworks</p>					
<p>Planning: Project Managers to negotiate wherever possible that excavation shafts are wider than four metres. Where this is not possible ensure that spoil removal is by a beam hoist rather than a crane - smaller buckets should be used as these are more controllable. Electric hoists are preferred as they would reduce fume hazard.</p> <p>Sufficient numbers of trained operatives and competent supervision must be available before work starts. Sufficient and suitable plant must be available for trench support before work starts.</p>					
<p>Physical: Principal Contractor responsible for providing lifting equipment of suitable type and capacity.</p> <p>MOLA staff will NOT operate lifting equipment, other than to fill buckets which have been lowered to a stable surface or platform.</p> <p>The Principal Contractor must set up the lifting equipment so as to avoid obstructions to raising the bucket, in particular the shoring and live services (some form of protection may be required).</p>					
<p>Management: Ensure safe system of work provided in collaboration with Principal Contractor, taking account of prevailing conditions.</p> <p>MOLA staff to be warned of the site-specific hazards and measures required to prevent accidents, by means of initial site inductions/briefings and periodic tool box talks.</p> <p>The lifting equipment should be operated, and inspected on a daily basis, by a trained, competent, operative/supervisor from the Principal Contractor (J B Riney), and receive a thorough examination on a weekly basis by a third party (the hire company, Thameside Lifting Ltd).</p> <p>The Principal Contractor will provide a top man, to be constantly present, to ensure that the bucket is not raised or lowered with personnel in the area in which it could fall. This area to be agreed with all parties and clearly demarcated before the commencement of any lifting operation.</p>					

MOLA Site Supervisor to check that Principal Contractor has carried out the inspections of lifting equipment required by their method statement/risk assessment (and described above). **Lifting equipment not to be used if MOLA Site Supervisor is not satisfied that appropriate inspections have been conducted.** However, this does **not** mean that MOLA staff are trained to assess the competency of the Principal Contractor's staff conducting inspections.

Personnel working in deep shafts to stand well clear of the hoisting equipment in a protected area when the bucket is hoisted and lowered into shaft. If this is not possible then personnel must leave the shaft before hoisting and NOT re-enter UNTIL after the bucket has been lowered into place. MOLA personnel are NOT to guide the bucket past obstructions.

Training:
Principal Contractor's staff operating and inspecting lifting equipment must have received appropriate training.

Where necessary operatives must be instructed to leave excavation shaft before the bucket is hoisted and not to re-enter until bucket is lowered back into shaft (This applies to contractors as well as MOLA employees.)

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:	Broadgate Ticket Hall (Liverpool Street) – Evaluation and Detailed Excavation		
Frequency and Duration of Task:	Daily, up to 5 months	Number of Staff Involved:	Up to 8
Specific Hazards Identified?			
Mechanical hoist bucket or contents striking person in trench during lifting or lowering of bucket			
Failure of hoist/lifting equipment, leading to bucket or contents falling on staff in trench			
Bucket hitting shoring or live utilities, and damaging it			
Control Measures Required?			
MOLA safety rule 24.16:			
MOLA staff to leave the shaft before hoisting of bucket takes place and not under normal operations re-enter until bucket is lowered back into position unless:			
<ul style="list-style-type: none"> – suitable space or protection is afforded within the shaft so that staff will not be at risk should the bucket fall; – a banksman or topman is constantly present to ensure that the bucket is not re-lowered or suspended over the trench while staff are working in 			

the trench;

- **there is clear agreement that the hoist or machine operating as a hoist will not be in operation for a specified time period at that location and will not in any case recommence operations without the agreement of the MOLA supervisor or suitable deputy.**

Clarification of terms and other guidelines for work in deep excavations less than 4 x 4m in area

The following guidelines are issued to supplement MOLA Health and Safety Rule 24.16

Suitable space – must be sufficient so that if the bucket/skip does fall there is no likelihood of injury, even if the bucket/skip does topple or roll on impact or collide with trench supports. Determination of this will depend on:

- o the size and depth of the trench,
- o the size and type of the bucket/skip
- o the type of hoist used i.e. fixed hoist or mobile crane or mechanical excavator used as crane.
- o the type of shoring being used – in particular the positioning of the props braces and struts
- o the type of ground

Determination should only be undertaken by **persons competent** (see below) to do so. It is unlikely that in a trench 2m x 2m in area or less that this option will be appropriate once the trench depth is c 2m or deeper, unless the bucket or skip is small enough to make the risk of injury low, and should not be used if such a trench is c 4m deep or more.

Consideration must also be given to the bracing within the trench (eg cross-bracing) and other obstructions (eg services crossing the trench above the level of excavation) and the likelihood that these will affect the fall path, rendering it unpredictable.

It should also be considered likely that the bucket will fall – or material fall from it – at its highest point on the lift as the bucket is being swung before or after emptying, which will also make the fall path unpredictable.

Suitable protection – would have to be a shelter sufficiently robust to withstand the impact of the bucket/skip dropped to the maximum intended depth – usually 5–6m. This would depend on the size and type of bucket being used.

It is extremely unlikely that this option could or would be used in a trench less than 4m x 4m. Please do not implement without first consulting the MOLA H&S advisor and Field Manager

Bucket/skip size

MOLA should seek to use the **smallest possible bucket size** relative to the size of the trench and the obstructions with in it that it is practicable to use without significantly increasing the number of lifting operations (and thus the risk from the lifting operations) or indeed rendering the methodology entirely counterproductive for

efficient spoil removal.

Competent persons

In this context a competent person within MOLA would be any field supervisor (Senior Archaeologist or Project Officer) who has sufficient experience of working in such shafts (either as a supervisor or archaeologist) in the opinion of the Field Manager. They should also hold an entry into confined spaces certificate and, where possible, an IOSH supervising safely certificate. If in doubt the supervisor should always seek advice from the MOLA H&S advisor or Field Manager and should never implement a methodology against the instruction or advice of a Principal Contractor or site agent/manager.

The **Project Officer/Senior Archaeologist** has a responsibility for the safety of MOLA staff and sub contractors on site, and must therefore be **the person to determine a safe system of work** for lifting operations within deep trenches and not the individual archaeologists carrying out the work. The Project Officer/Senior Archaeologist must also ensure that the safe system of work is communicated to all affected staff and that it is adhered to.

Top Persons

Top Persons are usually – although not always – non-MOLA staff and often work for a contractor sub-contracted to the Principal Contractor, not MOLA. It is essential – whatever the origin of the top person – that they are **fully briefed** with regard to MOLA procedures with regard to the excavation of deep trenches and the use of hoists. In particular they must be made aware of the **exclusion zone** for MOLA staff in force during lifting operations in any trench where it is practicable to have such a zone, and that where this is not practicable MOLA staff must vacate the trench during lifting operations.

Also:

The rule above means that MOLA staff must **NOT guide the bucket** past obstructions such as shoring and live services, as this will put them in the **danger zone of a falling bucket** or other equipment if the lifting equipment should fail.

Assessment of Remaining Risks:	High	Medium	Low
Serious and Imminent Danger Identified:	Yes	No	

What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1
020 7377 7000
Tube: St Paul's

Full A & E at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Defects noted in lifting equipment by Principal Contractor or MOL Archaeology
Near miss or accident involving lifting equipment

Competent Persons Appointed to Take Action

Principal Contractor Site Manager: Neil Carlsson
MOLA Supervisor: Robert Hartle

Circulation of Risk Assessment

Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: NE	Name: Nicholas Elsden	Date: 17/06/11

22.5 MOLA Site Specific Risk Assessment – Sewer/Weil’s disease

MOLA RISK ASSESSMENT		SEWER/WEIL’S DISEASE (Rodents etc)			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Bites and Scratches		•		
2	Faeces/urine/bacteria/insects etc			•	
3	Weil’s Disease/Leptospirosis		•		
4	Rodent corpses etc		•		
5	Damage (loss of) to food & equipment	•			
6					
7					
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Health and Safety Policy Management of Health and Safety at Work Regulations 1999 Construction(Design and Management) Regulations 2007 Instruction Card for Work in Rat Infested Buildings & Sewers HSE GS 0406 Leptospirosis: Are you at Risk? HSE IND(G)84L</p>					
<p>Planning: Is there standing water? Are there any broken sewers/drains? YES Conduct Risk Assessment and if possible arrange for: Future access to be blocked eg broken sewer repaired Drying of site – removal of damp/standing water Ensure Instruction Card HSE GS 0406 is available for all staff. Ensure adequate first aid supplies and washing facilities are available. Ensure adequate supplies of suitable PPE are available – eg robust gloves</p>					
<p>Physical: Do not touch a rodent (alive or dead) with unprotected hands, wear gloves. Wash hands before eating or smoking. Cover all cuts and grazes with waterproof plasters promptly. Wear other protective clothing as appropriate Check/secure all food supplies. Do not eat contaminated food. Keep all working areas/office space/ canteen areas clean, tidy, and secure. Carry Instruction Card HSE GS 0406 Report any illness to your doctor (Flu like symptoms with persistent and severe headaches)</p>					
<p>Management: Monitor any rodent presence, arrange for extermination or removal, block any obvious/new access points where possible. Ensure all staff wear appropriate PPE. Ensure all staff have Instruction Card HSE GS 0406 Ensure all staff keep food secure Ensure all office/canteen/work areas are kept clean and secure. Ensure first aid given promptly in the event of cut or graze Ensure any staff showing Flu like symptoms/headaches has time to visit doctor.</p>					
<p>Training: Tool Box Talk: Make sure all staff are aware of the risks and control measures attendant on work in rodent infested sites and specifically about Leptospirosis and Weil’s Disease</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT

For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete

Site/Location/Task:	Broadgate Ticket Hall (Liverpool Street) – Evaluation and Detailed Excavation		
Frequency and Duration of Task:	Daily, up to 5 months	Number of Staff Involved:	Up to 8
Specific Hazards Identified?			
<p>Partly-broken open sewer in evaluation Trenches 1 and 2, and future excavation area (ands may be sealed by time fieldwork re-commences in this area).</p> <p>Small quantity standing water in base of sewer – ? accumulated rainwater</p>			
Control Measures Required?			
<p>MOLA staff will not enter the sewer. Removal of sewer structure as excavation proceeds on either side to be undertaken by the Principal Contractor.</p> <p>Gloves (part of standard PPE) to be worn</p> <p>Strict adherence to rules on no eating, drinking, or smoking on site, and before washing hands and face.</p> <p>All cuts, no matter how small, to be cleaned and covered with sterile waterproof plasters before work commences.</p> <p>Principal Contractor to provide hand washing facilities on site in Liverpool Street during evaluation. As a <i>minimum</i>, this should be water and soap, or disinfectant gel etc. Full washing faculties to be provided in welfare units at Finsbury Circus during evaluation.</p>			
Assessment of Remaining Risks:	High	Medium	Low
Serious and Imminent Danger Identified:	Yes	No	
What Emergency Action Required?			
<p>Staff must consult a doctor if they develop flu-like symptoms. All MOLA staff to carry Weil's Disease cards, for presentation to the doctor.</p> <p>MOLA Supervisor to report all such incidents to J B Riney Site Manager or specified deputy in his absence, and to Crossrail and MOLA.</p>			
Circumstances Requiring Additional Assessment?			
<ul style="list-style-type: none"> • Staff member diagnosed with Weil's disease or other illness/infection which may have been caused by/associated with the sewer. • If rodents, or their faeces, are seen on site. • If water or sewage enters the trench via the sewer, or after heavy rain. 			

Competent Persons Appointed to Take Action			
<ul style="list-style-type: none"> • Principal Contractor Site Manager: Neil Carlsson • MOLA Supervisor: Robert Hartle 			
Circulation of Risk Assessment			
Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: NJE	Name: Nicholas Elsden	Date: 28.06.11

22.6 MOLA Site Specific Risk Assessment – Mechanical Excavators

MOLA RISK ASSESSMENT		MECHANICAL EXCAVATORS			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Shovel or load dropping inadvertently			•	
2	Overturning of machine		•		
3	Materials dropping from shovel or bucket			•	
4	Persons struck by machine			•	
5	Restriction of driver's vision.			•	
6	Hydraulic fluid spray		•		
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Health and Safety Policy Operational Procedures (September 2010) Construction(Design and Management) Regulations 2007 Control of noise at Work regulations 2005 Control of Vibrations at Work Regulations 2005 British or European Standards including: 5228: Noise on construction sites. 6912: Safety in earthmoving machinery 6913: Operation & maintenance of earthmoving machinery</p>					
<p>Planning: MOLA Staff will not operate Mechanical excavators. Choice of hire equipment and requirements assessed with regards to ground conditions and local operational requirements. Choice of Excavators and driver/operator to be from sub-contractors competent to provide the machinery and service required.</p>					
<p>Physical: <u>180 degree machines</u> - When using the backhoe the front bucket must be lowered to the ground <u>360 degree machines</u> - At least 600mm clearance to be allowed for tail swing. No persons are allowed to stand or work within operating radius without the operator's permission. Loads must not be slewed over personnel, vehicle cabins or huts. Overhangs are not to be created on high workfaces. Wheels/tracks are to be at 90 degrees to the workface. Travel and operations on a gradient must be controlled to ensure machine stability. A banksman is to be used where driver's vision is impaired or operating in congested areas.</p>					
<p>Management: Certification of drivers must be checked. Drivers must be over 18 years old. MOLA Staff must not operate mechanical excavators All trenching and deep excavation work must be supervised to ensure the stability of machine and excavation, and that persons do not work within the swinging radius of a backhoe. Vehicles must be checked by drivers before use and secured afterwards. Management must ensure speed restrictions are enforced, and monitor use on sloping ground. Noise levels are to be monitored and assessed as may be necessary.</p>					
<p>Training: Driver training to CITB/CSCS (or equivalent) standard is required; also to comply with BS 6264: Operator training for earthmoving machinery. Excavator driving by uncertificated operatives is not permitted; this also applies to our subcontractors and the self-employed.</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:		Broadgate Ticket Hall (Liverpool Street) – Evaluation, Detailed Excavation and Watching Brief	
Frequency and Duration of Task:		Daily, up to 5 months	Number of Staff Involved: Up to 8
<p>Specific Hazards Identified? Persons struck by machine Fall of material from bucket</p>			
<p>Control Measures Required?</p> <p>All mini excavators and similar plant to be operated and controlled by trained and CPCS certified operatives under the overall supervision of the J B Riney Site Manager or designated deputy. No MOLA staff to operate any plant. No MOLA staff to supervise or direct machine operations except for archaeological work as specified in the MS. Compliance with J B Riney’s permit to work. Archaeological supervision to be by MOLA Supervisor only. No staff to stand/move within operating circle of active plant. All staff to attend induction and toolbox talks. All staff to wear required PPE. First Aider and First Aid Box present. Machine to operate within the J B Riney Method Statement</p>			
Assessment of Remaining Risks:		High	Medium Low
Serious and Imminent Danger Identified:		Yes	No

What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1
020 7377 7000
Tube: St Paul's

Full A & E at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Competent Persons Appointed to Take Action

Principal Contractor Manager: TBC

MOLA Supervisor: TBC

Circulation of Risk Assessment

Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29/06/11

22.7 MOLA Site Specific Risk Assessment – Underground Services

MOLA RISK ASSESSMENT		UNDERGROUND SERVICES			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Contact with electricity or gas supplies			•	
2	Contact with sewage			•	
3	Flooding from water services			•	
4	Explosion or asphyxia from gas leaks			•	
5					
6					
7					
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Health and Safety Policy Operational Procedures (September 2010) Excavations to be scanned for services by Principal Contractor before and during excavation, as per WPP. Excavations (by PC) require Permit to Dig. Electricity at Work Regs.1989 Construction(Design and Management) Regulations 2007 DSEAR 2002 Regulatory Reform (Fire Safety) Order 2005 HSE Guidance Booklet HS(G)47 - Avoiding danger from underground services. Highways Act 1980, New Roads and Streetworks Act 1991 DoT ACOP - Safety at Street Works & Roadworks Traffic Signs Manual, Chapter 8 National Joint Utilities Group publications : No.3 - Cable locating devices No.42 - Identification of small buried mains and services.</p>					
<p>Planning: All work to be planned in advance, taking account of the above. Full details of underground services must be obtained in advance from the relevant authority, including Television Cable Companies, BT and other telephone companies, and private property owners.</p>					
<p>Physical: Plans and cable location equipment to be available before work starts. Plans must not be assumed to be accurate, and location devices to be used in addition. Trial holes to be dug, using hand digging to confirm locations, taking account of physical indications such as junction boxes and manholes. The lines of services to be marked, using paint, wooden pegs, etc. All services to be assumed to be live until proven otherwise. Services crossing excavations to be supported. Services in concrete to be isolated before breaking operations begin.</p>					
<p>Management: Site supervisors or the person in charge to ensure that services are located and marked before further work begins. Full consultation to be held with relevant authorities to agree precautions to be carried out before work begins. All personnel, machine operators and subcontractors to be fully briefed before they begin work. All temporary services to be properly marked.</p>					
<p>Training: The person in charge must be trained in operation of cable locating equipment, and the requirements of HS(G)47. Personnel locating services must be similarly trained</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:	Broadgate Ticket Hall (Liverpool Street) – Evaluation, Detailed Excavation and Watching Brief		
Frequency and Duration of Task:	Daily, up to 5 months	Number of Staff Involved:	Up to 8
<p>Specific Hazards Identified?</p> <p>Contact with existing services –during initial breaking out and machine clearance of trenches under archaeological supervision, but also risk of encounter during subsequent hand digging. Electrocution Explosion, fire Sewage and Flooding Asphyxiation</p>			
<p>Control Measures Required?</p> <p>Compliance with Principal Contractor’s permits to work/permit to dig system. Principal Contractor operative to check trench location with CAT scanner for live electrical services before commencement of breaking out operations and again before each new level of machining thereafter. Where feasible, trench locations to be adjusted to avoid live services (PC) Discovery of a buried services (live or otherwise) will be reported to the Principal Contractor’s Manager immediately and work shall cease on the trench until the Principal Contractor Manager or designated deputy declares it safe to resume. Services within/at edges of trench to be supported by PC All staff to attend induction and toolbox talks All staff to wear required PPE (including flame retardant overalls) First Aider and First Aid box present</p>			
Assessment of Remaining Risks:	High	Medium	Low
Serious and Imminent Danger Identified:	Yes	No	

What Emergency Action Required?			
MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence			
Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:			
<i>Minor A& E at:</i>			
St Bartholomew's, West Smithfield Street, EC1			
020 7377 7000			
Tube: St Paul's			
<i>Full A & E at:</i>			
The Royal London Hospital			
Whitechapel Road			
London E1 1BB			
Telephone 0207 377 7781			
Tube: Whitechapel (Hammersmith and City and District Lines)			
Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.			
Circumstances Requiring Additional Assessment?			
Competent Persons Appointed to Take Action			
Principal Contractor Site Manager: TBC			
MOLA Supervisor: TBC			
Circulation of Risk Assessment			
Employees and Volunteers	x		
Principal Contractor	x		
Client	x		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29/06/11

22.8 MOLA Site Specific Risk Assessment – Confined Spaces

MOLA RISK ASSESSMENT		CONFINED SPACES			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Toxic gases				•
2	Asphyxiation - lack of oxygen				•
3	Explosion				•
4	Fire				•
5	Excessive heat			•	
6	Drowning				•
7					
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Safety Policy, Confined Spaces Regulations 1997 Construction (Design and Management) Regulations 2007 HSE Guidance Note GS5 - Entry into confined spaces. Local Authority/ client safety standards, e.g. on sewer entry.</p>					
<p>Planning: The confined space should be formally identified as such by a competent person. Note: what constitutes a confined space is open to interpretation and may vary from project to project. Eliminate need for entry where possible . Eliminate use of hazardous materials by selection of alternative methods of work or materials. Assessment of: ventilation available and possible local exhaust ventilation requirements, potential presence of hazardous gases/atmosphere, process by-products, need for improved hygiene/welfare facility.</p>					
<p>Physical: Documented entry system must apply, preferably Permit to Work. Adequate ventilation must be present or arranged. Detection equipment must be present before entry to check on levels of oxygen and presence of toxic or explosive substances. The area must be tested before entry (both start of work and after breaks) and continually during the presence of persons in the confined space. Breathing apparatus or airlines must be provided if local ventilation is not possible. Where no breathing apparatus is assessed as being required, emergency BA and rescue harnesses must be provided. Rescue equipment including lifting equipment, resuscitation facilities, safety lines and harnesses must be provided. A communication system with those in the confined space must be established. Air must not be sweetened with pure oxygen. Precautions for safe use of any plant or heavier-than-air gases in the confined space must be established before entry. Necessary PPE and hygiene facilities must be provided for those entering sewers</p>					
<p>Management: The management role is to decide on the nature of the confined space and to put a safe system into operation, including checking the above. Flood potential and isolations must be checked.</p>					
<p>Training: Full training is required for all entering and managing confined spaces. Rescue surface party must be trained, including in first-aid and operation of testing and rescue equipment. All personnel must be certificated as trained, and supervisory staff trained to the same standard</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:	Broadgate Ticket Hall (Liverpool Street) – Evaluation and Detailed Excavation		
Frequency and Duration of Task:	Daily, up to 5 months	Number of Staff Involved:	Up to 8
<p>Specific Hazards Identified? All of the evaluation trial trenches (T1–3, T5–10, T12–14) will be confined spaces. The trial pit in the basement of the Railway Tavern may also be designated a confined space, if sufficient depth is reached. Ingress of methane gas to adjacent substation (information received by J B Riney).</p>			
<p>Control Measures Required?</p> <p>The Principal Contractor is responsible for the formal identification, monitoring and control of Confined Spaces, and for provision of gas monitoring, rescue equipment, and other equipment or procedures required. The appointed J B Riney ‘top man’ will carry out an initial assessment of the confined space atmosphere and continually monitor at regular intervals, recording this as excavation progresses.</p> <p>Only trained, certificated MOLA operatives to work in areas designated as confined spaces.</p> <p>All personnel entering the excavation will be required to wear a harness and be trained in the use of escape sets. The number of personnel entering the excavation at any one time is to be kept to an absolute minimum, sufficient only to carry out the task in hand.</p> <p>No power augering to be undertaken in designated confined spaces.</p> <p>As a result of recent information received by JB Riney about methane ingress to the adjacent sub-station, gas monitors will be dropped down each trench by the Principal Contractor prior to anyone entering. If high levels of methane are detected, this will be dealt with by the Principal Contractor prior to any work commencing.</p> <p>Permit to enter/permit to work system to be used.</p>			
Assessment of Remaining Risks:	High	Medium	Low
Serious and Imminent Danger Identified:	Yes	No	

What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1

020 7377 7000

Tube: St Paul's

Full A & E at:

The Royal London Hospital

Whitechapel Road

London E1 1BB

Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Air monitor indicates poor air quality/presence of gas
Accident within the confined space

Competent Persons Appointed to Take Action

Principal Contractor Site Manager: TBC

MOLA Supervisor: TBC

Circulation of Risk Assessment

Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29/06/11

22.9 MOLA Site Specific Risk Assessment – Deep Excavations

MOLA RISK ASSESSMENT		DEEP EXCAVATIONS (less than 4x4m)			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Collapse of sides			•	
2	Striking existing services				•
3	Persons falling in			•	
4	Plant, bucket, and materials falling in				•
5	Flooding			•	
6	hazardous atmosphere				•
7	contaminated soil				•
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Safety Policy, COSHH Regs 2002. Management of Health & Safety at Work Regulations 1999 Construction (Design and Management) Regulations 2007, Confined Spaces Regulations 1997 Standards including: 6031: Earthworks</p>					
<p>Planning: See Confined Spaces Risk Assessment. Project Managers to negotiate wherever possible that excavation shafts are wider than four metres. Where this is not possible ensure that spoil removal is by a beam hoist rather than a crane - smaller buckets should be used as these are more controllable. Electric hoists are preferred as they would reduce fume hazard. Sufficient numbers of trained operatives and competent supervision must be available before work starts. Sufficient and suitable plant must be available for trench support before work starts. Suitable monitoring equipment and personnel trained in its use will be required where known exposure to toxic substances or lack of oxygen may occur. Location of existing services must be complete before work starts, also information obtained on ground conditions.</p>					
<p>Physical: Substantial barriers must be erected around excavation shafts greater than 2m deep. Where poor ventilation is identified, the atmosphere must be continually monitored. Stop barriers must be used to prevent vehicle entry. Spoil and materials must be stacked at least 1.5m from the edge of excavation shafts. Ladders must be provided for safe access/egress and secured at all times. Suitable signs and barriers must be provided to warn of the work</p>					
<p>Management: Ensure safe system of work provided, taking account of prevailing conditions including weather, traffic and ensure all parts of structures placed over shafts for weather protection is secure. Personnel working in deep shafts to stand well clear of the hoisting in a protected area when the bucket is hoisted and lowered into shaft. If this is not possible then personnel must leave the shaft before hoisting and NOT re-enter UNTIL after the bucket has been lowered into place. Provide suitable PPE as required and ensure its correct use. Inspect excavations daily, and record thorough examination weekly in F91</p>					
<p>Training: Supervisors must have received training in general site safety, theory and practice of excavation work. Where necessary operatives must be instructed to leave excavation shaft before the bucket is hoisted and not to re-enter until bucket is lowered back into shaft (This applies to contractors as well as Company employees.)</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:		Broadgate Ticket Hall (Liverpool Street) – Evaluation and Detailed Excavation	
Frequency and Duration of Task:		Daily, up to 5 months	Number of Staff Involved: Up to 8
<p>Specific Hazards Identified? Mechanical hoist bucket or contents striking person in trench Persons falling in Flooding Hazardous atmosphere</p>			
<p>Control Measures Required? Principal Contractor to provide shoring and safe trench access Principal Contractor to scan for services Principal Contractor to provide barriers around deep excavations Measures from separate Confined Spaces risk assessment</p> <p>MOLA staff to leave the shaft before hoisting of bucket takes place and not under normal operations re-enter until bucket is lowered back into position unless:</p> <ul style="list-style-type: none"> – suitable space or protection is afforded within the shaft so that staff will not be at risk should the bucket fall; – a banksman or topman is constantly present to ensure that the bucket is not re-lowered or suspended over the trench while staff are working in the trench; – there is clear agreement that the hoist or machine operating as a hoist will not be in operation for a specified time period at that location and will not in any case recommence operations without the agreement of the MOLA supervisor or suitable deputy. 			
Assessment of Remaining Risks:		High	Medium Low
Serious and Imminent Danger Identified:		Yes	No

What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1
020 7377 7000
Tube: St Paul's

Full A & E at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Competent Persons Appointed to Take Action

Principal Contractor Site Manager: TBC
MOLA Supervisor: TBC

Circulation of Risk Assessment

Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29/06/11

22.10 MOLA Site Specific Risk Assessment – Human Remains

MOLA RISK ASSESSMENT		HUMAN REMAINS			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	lead solid (coffins etc)/ dust			•	
2	powdered wood, parasite eggs, mould spores			•	
3	Public outrage	•			
4	Affront to staff religious/personal beliefs		•		
5	Confined spaces e.g. Crypts Vaults		•		
6	Puncture wounds from bone, coffins, etc		•		
7	Possible Pathogens/micro organisms	•			
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Safety Policy, Health and Safety at Work Act 1974, COSHH Regulations 2002 Provision and Use of Work Equipment Regulations 1998 (amended 2002) Management of Health and Safety at Work Regulations 1999 Burial Act 1857, Section 25, The Disused Burial Grounds (Amendment) Act 1981 The Pastoral Measure 1983, Section 65 and schedule 6) Control of Lead at Work Regulations 2002</p>					
<p>Planning: A copy of the licence or faculty regulating the work must be obtained and any specific requirements implemented Consider type of site and age of interments - crypt, churchyard, charnel pit, the condition of the remains and the possible, though unlikely, pathogens present e.g. Small Pox, and the likelihood of lead dust, soft tissue, mould, parasite eggs, powdered wood, Advice should be sought from a competent authority on the need for provision of staff with confirmed Small Pox vaccinations, and those tasks for which only these are suitable defined. Provision of specialised Personal Protective Equipment and contamination/decontamination procedures to be considered, and health monitoring for those staff working regularly with lead coffins, soft tissue, within vaults/crypts etc Provision of staff with confined spaces training for task within crypts, vaults, tombs, etc to be considered and specialist safety equipment for same: harness, winch, escape set, gas monitor etc Site security, and screening from the public to be considered Access to the site for representatives of the local Environmental Health Officer</p>					
<p>Physical: All staff to wear the required PPE: Basic PPE is suitable surgical or waterproof heavy gloves. Where required, disposable overalls, head covering, helmet, face shield, dust mask/respirator, safety boots will be used. At the end of each working day those items which cannot be cleaned and disinfected, i.e. overalls and dust masks, should be disposed of properly. All staff to observe decontamination procedures with regards to dirty and clean areas of the site</p>					
<p>Management: All staff to be given induction and regular tool box talks specific to human remains. No staff to be required to work on site if it contravenes their personal or religious beliefs Site specific risk assessments for specific hazards e.g. individual vaults Clear definition of tasks reserved for staff with Small Pox vaccination/confined spaces training where required</p>					
<p>Training: Persons working in confined spaces to be fully trained and certificated</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT			
<p>For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete</p>			
Site/Location/Task:	Broadgate Ticket Hall (Liverpool Street) – Evaluation, Detailed Excavation and Watching Brief		
Frequency and Duration of Task:	Daily, up to 5 months	Number of Staff Involved:	Up to 8
<p>Specific Hazards Identified? Public outrage Possible Pathogens/micro organisms risks associated with any surviving coffins</p>			
<p>Control Measures Required? Copy of the Ministry of Justice guidance relating to the work must be available on site and any specific advice implemented. Site will be secured and areas of excavation of human remains will be screened from the public at all times. Also consider the need to screen well-preserved human remains from other contractors working in the area. All staff to be given induction and regular tool box talks specific to human remains. All staff involved in excavation of human remains to practice good hygiene and to wear the appropriate protective clothing (gloves). The type, age, state of preservation and characteristics of the burials will be continually assessed with regard to specific risks posed to site staff and other personnel through excavation. These risks include the possible, though unlikely, pathogens present, e.g. Small Pox, and the likelihood of lead dust, soft tissue, mould, parasite eggs, powdered wood. If appropriate, advice will be sought from a competent authority on the need for provision of staff with confirmed Small Pox vaccinations, and those tasks for which only these are suitable defined. Site specific risk assessments to be undertaken for specific hazards e.g. individual vaults The following measures will be implemented where required: provision of specialised Personal Protective Equipment and contamination/decontamination procedures, health monitoring for those staff working regularly with lead coffins, soft tissue, within vaults/crypts etc. If intact sealed coffins or vaults are encountered during the evaluation work, these will not be opened. They will be suitably protected and left <i>in situ</i>. Access to the site should be available to representatives of the local Environmental Health Officer.</p>			
Assessment of Remaining Risks:	High	Medium	Low
Serious and Imminent Danger Identified:	Yes	No	

What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1
020 7377 7000
Tube: St Paul's

Full A & E at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Site specific risk assessments to be undertaken for any specific hazards e.g. individual vaults, intact sealed coffins, presence of pathogens such as Small Pox.

The following measures will be implemented where required: provision of specialised Personal Protective Equipment and contamination/decontamination procedures, health monitoring for those staff working regularly with lead coffins, soft tissue, within vaults/crypts etc.

If intact sealed coffins or vaults are encountered, these will not be opened. Work will halt at that location; a specific risk assessment and revision to the method statement will be produced in conjunction with the Project Archaeologist, Principal Contractor and the MOLA Health and Safety Advisor. Coffins will be wrapped in a protective sleeve (thick gauge polythene and tape or similar) either by MOLA staff or a specialist contractor and removed from site for reburial.

Competent Persons Appointed to Take Action

Principal Contractor Site Manager: TBC

MOLA Supervisor: TBC

Circulation of Risk Assessment

Employees and Volunteers	X		
Principal Contractor	X		
Client	X		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29/06/11

22.11 MOLA Site Specific Risk Assessment – Power Auger

MOLA RISK ASSESSMENT		POWER AUGER			
Significant Hazards		Assessment of Risk			
		Insignif	Low	Medium	High
1	Danger of disturbance of live services			•	
2	Manual handling injuries			•	
3	Moving machine parts			•	
4	Petrol fumes/explosion			•	
5					
6					
7					
ACTIONS ALREADY TAKEN TO REDUCE RISKS					
<p>Compliance with: MOLA Safety Policy. Construction(Design and Management) Regulations 2007 Control of Noise at Work regulations (2005) Control of Vibrations at Work Regulations 2005 Provision and Use of Work Equipment Regs.1998 (amended 2002) Manual Handling Operations Regs. 1992 (amended 2002) Management of Health and Safety at Work Regs.1999 (amended 2002).</p>					
<p>Planning: The Power Augers will only be used under the guidance of MOLA Geoarchaeology staff. Routes of all known underground services to be verified before work commences. A CAT scan Will be carried out in advance of augering at each location.</p>					
<p>Physical: No persons other than the auger operators are allowed to stand or work within operating radius without the operator's permission. Due care must be taken when lifting heavy auger parts, to avoid back injuries As there is a danger from petrol fumes, augering will NOT be undertaken in confined spaces, augering will NOT be undertaken in confined spaces, ie trial trenches or sondages measuring less than 2m x 2m. Ear protectors will be worn whilst drilling. A minimum of 2 geo-archaeologists or other trained staff will be present during all drilling work. Steel toe-capped footwear, Hard hats and a high visibility jacket will be worn at all times.</p>					
<p>Management: All operatives working within the augering area will wear head protection. Each auger area to be CAT scanned before augering commences.</p>					
<p>Training: Experienced operators only can use this machinery</p>					

MOLA SITE/TASK SPECIFIC RISK ASSESSMENT

For each site, location, and task the appropriate generic assessment should be reviewed to ensure that all significant hazards and their risks are identified and controlled.
Completion of this Risk Assessment will ensure that your assessment is both appropriate and complete

Site/Location/Task: Broadgate Ticket Hall (Liverpool Street) – Evaluation

Frequency and Duration of Task:	Occasional visits of up to 1 day	Number of Staff Involved:	1–3
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Specific Hazards Identified?
 Danger of disturbance of live services
 Manual handling injuries
 Moving machine parts
 Petrol fumes/explosion

Control Measures Required?
 Principal Contractor to scan for services and to suspend/otherwise support any live services present within trench.
 Manual handling assessment for lifting heavy parts
 Only trained operatives to use power auger
 Power auger not to be used in designated confined spaces.

Assessment of Remaining Risks:	High	Medium	Low
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Serious and Imminent Danger Identified:	Yes	No
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What Emergency Action Required?

MOLA Supervisor to report all accidents/incidents to J B Riney Site Manager or specified deputy in his absence

Ensure all serious non- emergency casualties not treatable by first aid are accompanied to the nearest A&E at:

Minor A & E at:

St Bartholomew's, West Smithfield Street, EC1
020 7377 7000
Tube: St Paul's

Full A & E at:

The Royal London Hospital
Whitechapel Road
London E1 1BB
Telephone 0207 377 7781

Tube: Whitechapel (Hammersmith and City and District Lines)

Emergencies: MOLA supervisor to call 999 in absence of J B Riney Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?

Competent Persons Appointed to Take Action

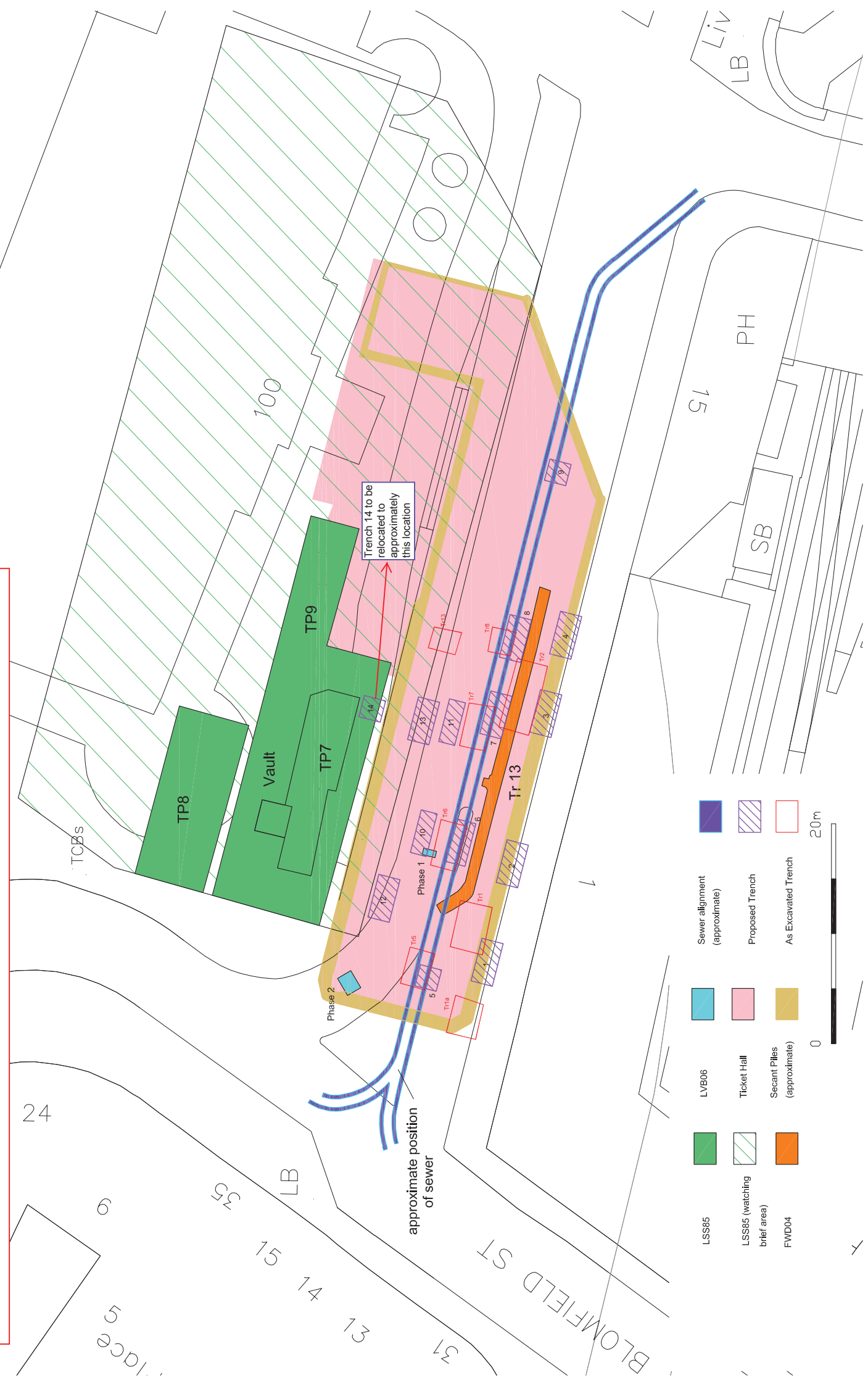
Principal Contractor Site Manager: TBC
MOLA Supervisor: TBC

Circulation of Risk Assessment

Employees and Volunteers	x		
Principal Contractor	X		
Client	x		
Sub Contractor			
Public/Visitors			
Other Occupier			
Risk Assessment Prepared by	Signed: LD	Name: Lesley Dunwoodie	Date: 29.06.11

Fig 1: Planned and as-dug locations of the evaluation trenches.

Trenches 1a and 5 to 13 completed at 24.06.11, Trenches 1 and 2 ongoing, Trench 14 not yet started.



- Sewer alignment (approximate)
- LSS85
- Ticket Hall
- Secant Piles (approximate)
- LSS85 (watching brief area)
- FWD04
- Proposed Trench
- As Excavated Trench
- LVB06
- Ticket Hall
- Secant Piles (approximate)



