C257 ARCHAEOLOGY CENTRAL

Method Statement

Archaeological Evaluation and Watching Briefs

Moorgate Shaft

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Document History:

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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
Health, Safety, & Environment	15 17 21
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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1 Introduction

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 Design Package 138,* Crossrail, April 2010, Document No C138-MMD-T1-RST-C101-00001, Revision 2.0 and the *addendum to the SS-WSI for the Moorgate Shaft*, July 2010, Document No C138-MMD-T1-TCP-C101- 0001, Revision 2.0).

The tasks covered by this method statement are as follows:

Task	FDC Notification	Principal Contractor	Provisional Programme)
• **General Watching Brief** (Moorgate combined utility diversions at the Moorgate worksite), Fig 2 to Fig 7	C138-0011	C216 Laing O'Rourke	*c* 12 April 2011 to 29 November 2011 (*c* 7 months)
~~• **Trial trench evaluation** (Trench 6 only), Fig 1~~	~~C138-0004~~	~~C212 J F Hunt Demolition~~	**COMPLETED**
• **Trial trench evaluation** (3 remaining trenches), Fig 1	C138-0004	C501 Bam Nuttall - Kier JV	31 August 2011, 1 week
• **Targeted/General Watching Brief** (Moorgate Sewer Diversion)	tbd	C501 Bam Nuttall - Kier JV	*c* 28 November 2011 to 4 May 2012 (*c* 5 months)
• **Archaeological Excavation** (within Diaphragm Walled Shaft)	tbd	C501 Bam Nuttall - Kier JV	*c* 26 February 2013 for 2-3 weeks
• **General Watching Brief** (ground reduction, Moorgate worksite (outside Diaphragm Walled Shaft)	tbd	C501 Bam Nuttall - Kier JV	tbd
• **Targeted Watching Brief** (Moorgate worksite, outside Diaphragm Walled Shaft)	tbd	C502	tbd
• **General Watching Brief** (Boreholes in AMRO basement)	none	C501 Bam Nuttall - Kier JV	23 August 2011, *c* 1 week

Table 1 Task information

Details of the works for the other archaeological fieldwork at the Moorgate site are not yet available. Therefore the Targeted Watching Brief on Moorgate Sewer Diversion Manholes, General Watching Brief on Moorgate sewer diversion, Archaeological Excavation within the Diaphragm wall shaft and General/Targeted Watching brief outside the Diaphragm wall shaft at the Moorgate worksite (outlined in Section 2.1 of the Addendum to the WSI) are not included in this methodology. The Method Statement will be updated at a later date for these works. It should also be noted that the Power Auger Survey is no longer part of the remit for the C216 watching brief covered in this method statement.

This Method Statement has been developed in conjunction with the Principal Contractors (Bam Nuttall - Kier JV for the last three evaluation trenches) currently appointed (and will be further developed with the others when appointed, see 2.3), who will be responsible for ensuring that the archaeological works may be carried out as specified. The purpose of the Watching Brief is to mitigate the impact of the development works upon archaeological remains; by making an adequate record of them in advance of and during the specified construction ground works. The purpose of the evaluations 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 (part of a mitigation strategy of *preservation by record* in line with Crossrail requirements).

For the evaluation, this method statement should be read in conjunction with:

- C501 – Liverpool Street Station, Moorgate Shaft, Method Statement for Excavation of Investigative Trial Holes, doc. no. C501-BNK-C-CMS-C101-50016 v1, July 2011

If the project design or scope/method of working is subject to changes during the works, the Method Statement will be updated and re-issued to the Project Archaeologist and CDM Advisor for approval, in accordance with the specified document control procedures (see 8).

1.1 Site Description

The Crossrail worksite at Moorgate is situated in two discrete blocks of property located on either side of Moorfields in the City of London. The eastern block consists of 91–109 Moorgate and 12–20 Moorfields. The western block comprises 17–31 Moorfields, adjoining the southern side of Moorfields LUL ticket hall.

Associated utility diversion works will be undertaken at the following locations in the surrounding area:

- Junction of Ropemaker Street and Moorgate
- Moorfields
- Moorgate
- London Wall to Moorgate
- Fore Street Avenue
- Shaft and heading works - Fore Street Avenue to London Wall

1.2 Geological and Topographical setting

The geological and topographical setting was covered in detail in the SS-WSI – *Liverpool Street Station Design Package 138,* Crossrail, April 2010, Document No C138-MMD-T1-RST-C101-00001, Revision 2.0 summarised below.

The drift geology consists of Pleistocene terrace gravels, which have been located in boreholes at *c* 108.5m ATD, above which at between *c* 110.1 and 108.3m ATD were sandy clays, peats and organic sediments representing former marsh deposits. To date no *in-situ* brickearth has been observed between the interface between the terrace gravels and the marsh deposits.

The terrace gravels, forming the base of the archaeological sequence, are currently predicted to lie between 2.0m (C138 deposit model) and 1.1m (single location in recent investigation by Mott MacDonald in 91–109 Moorgate) below the surface of the basement slab.

1.3 Archaeological and Historic Background

The archaeological potential of the Moorgate Shaft site is summarised below, and covered in detail in the WSI SS-WSI – *Liverpool Street Station Design Package 138,* Crossrail, April 2010, Document No C138-MMD-T1-RST-C101-00001, Revision 2.0.

The Moorgate Shaft site is situated to the north of the line of the Roman and medieval city wall and its associated defensive ditches. It is noted that the London Wall shaft and heading works (part of the combined utilities diversions) include one shaft located in Fore Street and the second in the Highway in London Wall, and as such are likely to be partly located over the area of the City ditch. Fieldwork to the north of site in 1989 at Moorgate Hall revealed a single Roman inhumation burial, which is part of an extra-mural cemetery which existed to the north of the Roman city. At least 28 cremation and 181 inhumations burials have been recorded in this locality, ranging in date from the 1st to the 4th centuries AD.

The construction of the city wall between *c* AD 180 and 225 appears to have impeded the drainage of the area and encouraged the development of more wet land deposits. Fitzstephen in the late 12th century described this area as a ‘great fen or moor’. In 1415, the Mayor of London Thomas Falconer built a postern gate (lower end of Moorgate at the junction with London Wall - outside the current works) (demolished in 1762) and he ordered the digging of ditches to try and drain the area. In 1512 and 1527 further drainage schemes were carried out in the Moorfields area, which allowed this area of wasteland to utilised for the first time in its history. The Agas map of *c* 1570, shows a road (Little Moorfields) leading north from the postern gate flanked on its western side by drying cloth being stretched on tenter frames. John Stow writing in *c* 1600 noted the presence of gardens and tenter-yards here. Rocque’s map of London (1746) shows that the road leading north from the postern gate was now known as Finsbury and it was flanked to the west by suburban development, behind which was another parallel street (Little Moor Fields), now known as Moorfields. Moorgate was widened in 1840. The construction of this stretch of the Metropolitan Line during 1865, by means of a huge linear trench dug from ground level (cut and cover) means that no archaeological deposits will survive under the northern part of the development (103–109 Moorgate).

The above should be read in conjunction with an Interim Statement issued following the completion of evaluation Trial Trench 6:

- C257 Archaeology Central, Interim Statement, Archaeological Evaluation, 91 to 109 Moorgate – XSP10, Doc. No. C257-MLA-X-RGN-CRG02-50028 v2, 13/07/11.

Interfaces and Communication Plan

2.1 Interface with Project Archaeologist

The Method Statement has been developed jointly with the Principal Contractors 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 documentation in accordance with the C257 Contract to the Contract Administrator.

2.3 Interface with the Principal Contractor

MOLA has liaised with the appointed Principal Contractors (J F Hunt Demolition, Laing O'Rourke, and Bam Nuttall - Kier JV) to prepare the Method Statement. The archaeological investigations will take place under the auspices and supervision of the Principal Contractors. 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 (e.g. 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 Crossrail Design Team

MOLA shall liaise with Crossrail 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

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

In particular, the C257 archaeological contractor will inform the Crossrail design archaeologist when Moorgate Marsh deposits (if present) are exposed in the evaluation trenches, so that the design archaeologist can invite the City of London Archaeology and Planning Officer to visit the site.

3 Scope of Works

3.1 Planned Fieldwork Events

This Method Statement sets out the methodology and health and safety requirements for archaeological work on the site in advance of construction at Moorgate. This currently comprises the evaluation trenches and trial trenches and watching brief described in section 1.

The mitigation strategy for the site will be 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:

- 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)
- SS-WSI – *Liverpool Street Station Design Package 138,* Crossrail, April 2010, Document No C138-MMD-T1-RST-C101-00001, Revision 2.0 and the addendum to the SS-WSI for the Moorgate Shaft, July 2010, Document No C138-MMD-T1-TCP-C101- 0001, Revision 2.0).
- Crossrail Archaeology Specification for Evaluation & Mitigation (including Watching Brief) (CR-PN-LWS-EN-SP-00001)
- Crossrail Code of Construction Practice
- 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)
- 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)
- United Kingdom Institute for Conservation's Conservation Guidelines No. 2

3.3 Aims and Objectives

The overall objectives of the trial trench evaluation is to establish the nature, extent and state of preservation of any surviving archaeological remains that will be impacted upon by the development. Those of the various watching briefs are to preserve by record any surviving archaeological remains that will be impacted upon by the relevant works.

Specifically, the archaeological investigations have the potential to recover:

- Artefacts of prehistoric date redeposited in later deposits.
- Remains of Roman extra-mural activity, potentially including burials.
- Evidence of the defensive ditch associated with the Roman and medieval City Wall
- Waterlain deposits from the Roman to medieval Moorgate Marsh, with the potential for organic preservation and palaeoenvironmental evidence.
- Late medieval and post-medieval drainage ditches, rubbish dumps and remains associated with the reclamation of Moorfields Marsh.
- In areas not truncated by later activity: remains of mid-17th-century or earlier buildings on the western side of Moorfields, and late 17th/early 18th-century or later buildings across the whole site.

3.4 Event Codes

The site code is **XSP10**.

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 Section Appendix 1, section 9.2 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.

In the case of the General Watching Briefs and Targeted Watching Briefs a MOLA Supervisor (Grade 5)/Senior Archaeologist (Grade 4) will be supervised by a MOLA Senior Archaeologist (Grade 3) or Contracts Manager/Assistant Contracts Manager via regular site visits, advice and mentoring.

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 and Power Auger use. However, it is anticipated that only Confined Spaces will be required on this site.

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

All staff will have their MOLA ID cards with them (see Appendix 1, section 7.1).

4.3 Site Monitoring

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

The results of the H&S monitoring, and the monthly HS&E incident summary form, along with monthly environmental audits will be submitted to Crossrail.

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.

4.5 Resource Plan

General/Targeted Watching Briefs:

- The general 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, e.g. geoarchaeologists or osteologists), may be called in if necessary.
- The Supervisor will be Sam Pfizenmaier BA (Hons), mobile: 07738 883738; other staff to be assigned when required.

Evaluation:

- The evaluation 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, as above) may be called in if necessary.
- The Supervisor will initially be Robert Hartle BA (Hons), MA, mobile: 07730 646060, to be replaced by Matthew Ginnever, mobile 07 894 280 557.

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, once the firm start date has been notified to MOLA.

All archaeological staff are direct MOLA employees, ordinarily full time. The working hours are set out in 4.7 below.

4.6 Programme

Evaluation

- Evaluation Trench 6 was excavated between 25th November and 1st December 2010.
- The remaining 3 trenches are scheduled to be excavated in w/c 30 August 2011.

General Watching brief on combined Utility Diversions and London Wall Heading

- The general watching brief on C216 combined utility diversions started on 19th April 2011 and is currently expected to continue until 29th November 2011. The anticipated programme of excavation work associated with the diversions is as follows:

Area	Start	Finish
Met Line Diversions (Phase 1 & 2)	12-04-11	09-05-11
Initial Diversions 91–109 Moorgate/Moorgate Northbound (Phase 3)	03-05-11	04-07-11
Moorgate Southbound from junction with Finsbury Circus (Phase 3 & 4)	14-07-11	12-08-11
Heading – Fore St Avenue to London Wall	16-06-11	08-09-11
Moorgate Northbound (up to junction with Ropemaker St)	25-07-11	31-08-11
Moorgate Southbound (from junction with Ropemaker Street)	15-09-11	14-10-11
London Wall to Moorgate	12-08-11	17-08-11
Moorfields	23-09-11	06-10-11
Fore St Avenue	18-08-11	26-08-11
Fore St/Moor Lane	23-09-11	10-10-11
Ropemaker Junction	31-10-11	29-11-11

The timing and overall duration of the general and targeted archaeological watching briefs will be determined by the Principal Contractor's programme. At present the remainder of the programme consists of the following tasks but dates still have to be confirmed:

- TWB C216 Moorgate Station Sewer Diversion: *to be determined*
- TWB C502 Main Works ground reduction: *to be determined*

4.7 Working Hours

Work on site shall only take place within 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). Operations anticipated to cause disturbance are limited to these hours (or as specified within a 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 MS are monitored and recorded.

4.8 Timesheets

During General Watching Briefs and Targeted Watching Briefs, MOLA will supply timesheets included in the weekly progress reports to Crossrail.

4.9 Access

Access to the C501 site will be from the gate off Moor Place. Access to the basement is via scaffold stairs.

Access to the Combined Utilities Diversion sites will initially be via the Crossrail compound in Finsbury Circus (entrance on northern side). Access to work areas *to be determined as they become available*. See Appendix 1, section 7.1.

MOLA staff will comply with the Principal Contractor's site rules on security, access, safe walking routes, etc.

4.10 Requirements from Principal Contractor

These are listed in Appendix 1, section 9.1. They include welfare facilities, currently predicted to be for up to 6 people for the evaluation and 1–3 for the watching brief.

5 Fieldwork Methodology

5.1 Evaluation Methodology

Before the commencement of the evaluation, the Principal Contractor will break out the concrete slab over each trial trench (3 remaining at 23 August 2011), and remove the concrete and any associated overburden. This does not require an archaeological presence.

They 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, under supervision by the C257 MOLA Supervisor.

At the first significant horizon, MOLA staff will enter each trench to assess, clean, investigate and record archaeological deposits and features (see 5.3). The trenches will be excavated to a depth and over an area to allow a full understanding the entire sequence of surviving archaeological deposits, however, the trenches will not necessarily be excavated down to natural geology over their whole area, but to sufficient depth/area to fully achieve the stated objectives (see 3.3). Where appropriate, and with the agreement of the Crossrail Archaeologist, any significant archaeological strata and features may 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. However, there will be no mitigation strategy of preservation *in situ* within the footprint of the Moorgate Shaft beyond the mitigation/excavation phase.

However, where possible, it may be decided to selectively remove any low grade dumped deposits, 19th-century building foundations or modern intrusive features etc to expose archaeological deposits below, in order to more firmly establish the character of the archaeological sequence.

- The removal will not be undertaken if there is the obvious potential to damage any archaeological remains visible beneath, (eg remains present within proposed temporary works areas).
- No foundations will be removed if this would make any part of the trench unstable.
- Where all or part of the trench exceeds 1.2m depth (or less instable ground conditions) the Principal Contractor will install adequate temporary support.

If archaeological deposits are present, without sufficient modern intrusions to allow an adequate assessment of underlying strata, the following methodology will be adopted:-

- For stratified occupation deposits, land surfaces, structures etc. – further hand investigation, sampling and recording at the relevant archaeological horizon(s). Occupation deposits that may address the research objectives (3.3) will not be subject to machine excavation. Hand investigation will be selective and sample-based, not total and focused to the stated objectives. The aim at the field evaluation stage will be to establish the nature, extent, date and survival quality of any potentially significant archaeological remains. Such remains may be left *in situ* at the evaluation stage, if required, as described above.

- For extensive uniform dumped levelling, infill or naturally-deposited alluvium (e.g. Moorgate Marsh) – grading down carefully by machine, using a toothless ditching bucket, under archaeological supervision. 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 hand investigation, recording and sampling will be carried out, to a degree appropriate to the extent and significance of remains. In particular, an objective is to establish whether any Moorgate Marsh deposits seal a Roman land surface or have merely accumulated in large cut features such as brickearth or gravel quarries. The base of the marsh will therefore be treated as a significant archaeological horizon, subject to sufficient hand investigation and palaeo-environmental sampling to address these questions. The methodology and sampling strategy outlined above will be reviewed on site and revised where necessary, in the light of ground conditions encountered and in discussion with the Project and City Archaeologists.

5.2 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 (Fig 1). There are three possible approaches:

- Where appropriate, evaluation trenches may be manually marked out on site by MOLA staff in relation to retained features included on OS mapping (e.g. adjacent structures or property boundaries) 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, 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.
- Where a Permit to Dig has been issued, it may be more appropriate for the Principal Contractor to set out the trenches that they will be opening up and to supply MOLA with the co-ordinates. MOLA will then additionally survey in the as dug trenches.

The first trench, Trench 6, was dug in November/December 2011.

The remainder of the archaeological evaluation will comprise the excavation of 3 trenches in August/September 2011.

See Fig 1 for trench layout.

5.3 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).

5.4 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 to 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 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.

Based on current information regarding the anticipated depths of excavation for the **combined utilities works**, the following methodology is proposed, which would involve 3 levels of monitoring:

1) ***Excavation areas less than 1.2m deep*** – no monitoring required. This includes the 3m zones around LUL interfaces where the maximum depth permitted is 0.5–0.6m, see Fig 3.

2) ***Excavation areas between 1.2 to 1.5m deep*** – intermittent visits, eg 2 to 3 visits per week, or as required.

3) ***Excavation areas extending below 1.5m*** – daily or continuous monitoring presence as required. These areas include the London Wall heading/shafts, and the proposed deeper excavation (to *c* 2m) at the Ropemaker Street junction, see Fig 3, Fig 5–Fig 7.

These requirements would be reviewed as the work progresses, in conjunction with the Crossrail design archaeologist and the Project Archaeologist.

The MOLA monitoring archaeologist will maintain regular contact with a nominated member of the Principal Contractor's team on site regarding the overall work programme and progress, including any changes to the proposed depths of excavation. Due to the nature of the work, depths of excavations may need to be revised depending on local conditions. Trial holes excavated locally at the start of each section will be monitored as required. Within the categories described above, the frequency of visits will be adjusted as necessary as work progresses to take into account areas where it can be shown that existing disturbance has already removed archaeological deposits, or where there are areas of unexpected archaeological survival.

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 5.6). This redefinition, if authorised by the Project Archaeologist, would permit additional resources in terms of staff and attendance to allow for more intensive recording.

London Wall heading and shafts

The London Wall heading and shafts will be designated confined spaces; all MOLA staff working in such designated areas will be trained and certificated to work in confined spaces.

The shafts will initially be excavated to a depth of *c* 1–1.5m and the first hydraulic support frame and trench sheets installed. Excavation will then continue to depth using both mechanical excavator and by hand using pneumatic clay spades; the trench sheets will be lowered and additional frames installed as the shaft deepens. The MOLA Senior Archaeologist will monitor the excavation of the shafts from ground level and will only enter the shaft by agreement with the Principal Contractor or their sub-contractor, providing that there is proper access and that it is safe to do so.

The heading will be driven by excavating the face using pneumatic hand tools and support frames will be installed as the heading progresses. Excavation of the material from the heading will be monitored from ground level as it is removed via the base of the shaft. Where feasible and where the work can be undertaken safely, the MOLA Senior Archaeologist will be allowed access to examine the exposed faces within the heading. This will only be undertaken with the agreement of the Principal Contractor or their sub-contractor. Members of the Principal Contractor/sub-contractor team, including the Top man will be present at all times.

5.5 General watching brief tasks

There is one current general watching brief task (the others will be added when the principal contractors are appointed and information available):

- General watching brief on C216 Moorgate Combined Utilities Diversions and London Wall Heading (FDC Notification C138-0011).

The dimensions of the single service trench to accommodate the combined utilities are likely to vary according to local conditions, but the trench is generally anticipated to be up 1m deep and may be up to 3m wide. Deeper excavation is required at some locations, eg 1.5–2m at the Ropemaker Junction (junction of Moorgate and Ropemaker Street), where it will be necessary to excavate underneath existing utilities (see Fig 3). Fig 4 indicates the location of 3m zones around LUL interfaces where excavation will be restricted to *c* 0.5–0.6m; it is currently anticipated that no monitoring will be required in these areas.

The London Wall Heading works (Fig 2, Fig 5–Fig 7) involve the construction of two temporary pits 3m x 3m x *c* 5m deep and a connecting heading 20m long. One shaft will be located in Fore Street and the second in the Highway in London Wall. The works are located in close proximity to an existing underground car park (Fig 2) and are in an area just to the north of the line of the Roman and medieval City wall, therefore they are likely to be partly located over the City ditch.

5.6 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).

5.7 Targeted watching brief tasks

There are two targeted watching brief tasks:

- Targeted watching brief on C216 Moorgate Station Sewer Diversion
- Targeted watching brief on C502 Main Works ground reduction in the wider Moorgate Shaft worksite (Moorfields, Fore Street Avenue, and basement of 17–31 Moorfields.

The Principal Contractors for these works are not yet appointed/mobilised. When they are, this method statement will be updated with the relevant detail.

5.8 General/Targeted Watching Brief Recording Methods

The archaeological remains will be recorded to best practice standards, recognising the special circumstances of a watching brief which demand flexibility in order to achieve archaeological objectives and requirements within the construction environment.

The recording will include as a minimum:

- The written record of individual context descriptions on appropriate pro-forma.
- The drawn record: including, plans and section drawings of appropriate features, structures and individual contexts (1:50 1:20 or 1:10). Isolated archaeological remains (artefacts) may be spot located in plan and a height provided where possible. Deposits which are regular in plan (pits and ditches) may be located though co-ordinates, annotated with dimensions, and may be recorded digitally.
- Other appropriate drawn and written records will be produced (for environmental sampling etc.).
- 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.

6 Geoarchaeological investigation methodology

Geoarchaeology is the study of soils and sediments in either a natural or anthropogenic context, that either contain human cultural material or are contemporary with human habitation within the region being studied (ie the Pleistocene/Lower Palaeolithic and later). It can include techniques of landscape reconstruction such as palaeobotany etc.

Within the Crossrail Liverpool Street site there will be a geoarchaeological component to the work on a number of sites to investigate the Moorgate Marsh

deposits and the channels of the former Walbrook stream and its tributaries, where present.

At Moorgate, this work is currently predicted to include:

- Sampling of the Moorgate Marsh sequence with bulk samples and/or soil monolith tins as appropriate to the deposits encountered.

This work will be conducted under the geoarchaeological and paleoenvironmental sampling strategy (archaeological science strategy) for the Liverpool Street site, and that for the Moorgate sub-site, see below.

6.1 Sampling strategy for all Liverpool Street sub-sites

This sampling strategy addresses the whole archaeological project for Liverpool Street. At the initial field evaluation stage, sampling would be targeted to establishing the palaeo-environmental potential of deposits e.g. by testing sub-samples of bulk material. 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).

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.

General Methodology

For each trench the Contract Manager and MOLA Supervisor 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 (i.e. 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, forams, radiocarbon	Sub-sampled from augerhole cores for external specialists

- 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 (i.e. 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.

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.
The MOLA Head of Human Environment or a suitable 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 Sampling strategy for Moorgate

The sampling strategy for the Moorgate sub-site is the same as that for the whole Liverpool Street site (6.1), with the most likely methods required being sampling of

the Moorgate Marsh deposits, and potentially Roman burials and possibly Walbrook deposits beneath the Marsh.

A profile/section through the Marsh deposits will be investigated by a Geoarchaeologist, paying particular attention to the interface at the base of the Marsh sequence, how it first formed, and when. Recovery of dating evidence from the sequence by the archaeologists will therefore be important, and samples may be required for radiocarbon dating from the base of the sequence.

7 Deliverables and Submission Programme

MOLA shall provide the following reports to the Project Archaeologist in accordance with the Crossrail, 2009 Archaeology Specification for Evaluation & Mitigation including Watching Brief CR-PN-LWS-EN-SP-0001, version 3 and the WSI and Addendum (see section 1) 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.

  (an initial Interim Statement for the evaluation (Trench 6) was delivered in December 2010; the Project Archaeologist will decide if an additional Interim Statement is required at the conclusion of the evaluation).
- A survey report within 2 weeks of the completion of fieldwork.
- A Fieldwork Report will be prepared within 6 weeks if required. This will include the results of Geoarchaeological investigation and an assessment of the deposits sampled. All levels cited in these reports should be Above Tunnel Datum (ATD = OD +100m). All Co-ordinates cited in these reports should be based on the London 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).
- 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 and 6.2 for the site-specific and sub-site-specific sampling strategies.

11.1 Specialist Strategy

An appropriate programme of ceramic dating and study of other excavated artefactual and environmental materials (including deposits of Geoarchaeological significance) 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 not likely that human remains will be present on this site, however, there is potential for Roman burials or disarticulated human remains at the base of the archaeological sequence.

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 (basically cleaned, location recorded and photographed). Any re-deposited, disarticulated human bones will be collected, bagged, labelled and returned to the trench in which they were

found, before it is backfilled. 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.

If this proposed method for retaining human remains is not feasible, eg where the Principal Contractor may be under instruction to reach a certain depth and that can only be achieved by removing *in situ* remains, then further resources would be needed for a more detailed prior investigation and record, as per *additional follow up recording* (see 5.1) and the Crossrail, 2009 Archaeology Specification for Evaluation & Mitigation including Watching Brief CR-PN-LWS-EN-SP-0001, version 3. A Ministry of Justice licence would be obtained by MOLA if required.

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.

13.1 Survey

- For evaluations the trenches may be manually marked out on site in relation to existing real world features by the site engineers or 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 (e.g. 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.
- For 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

In the event of the unexpected discovery of human remains on site, MOLA will obtain a Burial Licence from the Ministry of Justice.

15 Health and Safety

15.1 CDM Responsibilities and Reporting

- MOLA will be supporting and reporting to the Principal Contractor (JF Hunt Demolition & Bam Nuttall Kier JV for the evaluation; Laing O'Rourke for the general watching brief on combined utilities diversions; *to be appointed* for other WBs) 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 (not 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.
- 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. These services may include providing, site accommodation, plant for the excavation of trenches and other equipment such as lighting, handrails, shoring and ladders. These requirements are listed in detail in separate documents.

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 combined utility diversion works are on a highway and therefore MOLA will comply with the Principal Contractor's regulations.

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 Elsden, Assistant Contracts Manager
  nelsden@museumoflondon.org.uk
  Direct Line: 020 7410 2282
  Mobile: 07 872 127 296

- Sam Pfizenmaier, Site Supervisor (Senior Archaeologist)
  MOLA office: 020 7410 2200
  Mobile: 07730 883738

- Robert Hartle, Site Supervisor (Senior Archaeologist)
  Direct Line (office): 020 7410 2238
  Mobile: 07730 646060

- Matthew Ginnever, Site Supervisor (Senior Archaeologist)
  Mobile: 07 894 280 557

15.6 Behavioural Safety BMOS

Mobile phones, personal CD players, iPods, and similar will not be used by MOLA staff in archaeological trenches or areas of work. Smoking and naked flames are/is 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 (see 4.3).

16 Emergency Response

16.1 Emergency Preparedness & Response Plan

An Emergency Preparedness/Continuity Plan has been prepared by MOLA and submitted to Crossrail for approval.

MOLA staff will comply with the Principal Contractor's Emergency Plan – for C501 Bam Nuttall - Kier JV:

- C501 – Liverpool Street Station Advanced Works, Moorgate Shaft, Emergency Preparedness Plan, doc. no. C501-BNK-O1-STP-C101-50002 v2, May 2011.

Site-specific issues are as follows:

Employers Incident Response Contact	Crossrail helpdesk 0345 602 3813
Principal Contractor Incident Response Contact: Laing O'Rourke Kier	 Duty Manager: Grant Eade 07770 748151 Alex Mowe alex.mowe@kier.co.uk Mobile : 07887 632269
MOLA Incident Response Contact	• Elaine Eastbury, Contracts Manager eeastbury@museumoflondon.org.uk Direct Line: 020 7410 2237 Mobile: 07730 646063 or • Nicholas Elsden, Assistant Contracts Manager nelsden@museumoflondon.org.uk Direct Line: 020 7410 2282 Mobile: 07 872 127 296
Local A&E location	*Full A & E at:* 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).

16.2 Training

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

The MOLA Experienced 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's project manager (Alex Mowe (07 887 632 269) for the Evaluation August/September 2011, Grant Eade (Laing O'Rourke Site Manager) for the General Watching Brief on combined utilities diversions), 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

- Raymond Davies, CDM Advisor, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ

  DD 0203 197 5416 Int 5416

- 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, H&S Compliance Manager, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED

  DD 0207 410 2200, Int 2255

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 Appendix section 9.1). 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.

17.4 Vehicles/Motorised Equipment

Evaluation August/September 2011: vehicles must enter site via the Lorry Holding Area (LHA) on London Wall. All movements must be booked in by 9am the day before arrival to Luke Rogers (luke.rogers@kier.co.uk).

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 Appendix 1: Health and Safety Method Statement

1. Introduction and Purpose

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 Design Package 138, Crossrail, April 2010, Document No C138-MMD-T1-RST-C101-00001, Revision 2.0 and the addendum to the SS-WSI for the Moorgate Shaft, July 2010, Document No C138-MMD-T1-TCP-C101-0001, Revision 2.0).

2. Scope of Document

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

- Archaeological Trial Trench Evaluations in the basements of 91-109 Moorgate and 17-31 Moorfields
- GWB (general watching brief) Moorgate Combined Utilities Diversions and London Wall Heading
- TWB (targeted watching brief) Moorgate Station Sewer Diversion
- TWB ground reduction in Moorgate Shaft worksite
- GWB (general watching brief) AMRO basement

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.

3. Responsible Persons and Site Management

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 appropriate Principal Contractor at the site. Where further changes or additions to the WH&S Method Statement are required and agreed these should 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 H&S Compliance Manager.

4. Scope of Works

The scope of archaeological works is set out in section 2 of the appendix and in section 1 of the method statement, above.

5. Methodology, Programme and Sequence

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

The timetable, length of programme and sequence of tasks are to be confirmed by the Principal Contractors.

5.1. General Watching Brief (combined utilities diversions)

The first task is currently expected to be the monitoring of excavations for the Metropolitan Line diversions, starting on 12th April.

5.2. Evaluation

One archaeological evaluation trench (Trench 6) has already been excavated at 91-109 Moorgate; the remainder of the trenches are to be excavated in w/c 30 August 2011.

There are no provisional dates for the remaining general/targeted watching briefs as of the date of this document 04/04/11.

6. Risk Assessments

Overall and site specific risk assessments for the Evaluation and General Watching Brief on combined utilities are included in the following section.

6.1. MOLA Risk Assessment – Evaluation Trenches

Site- Moorgate Shaft		**Type of Work**		**Evaluation Trenches**
Persons Affected	**No**	**Classification**	**No**	
Employees	1–6	Site Supervisor	1	
Other workers		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	x
Falls from height	x	Contamination	x	Temperature	
Falls on level	x	Micro organisms		Noise	x
Manual Handling		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	
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 Bam Nuttall - Kier JV safety policy, site specific method statement, permits to work, instructions.

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	x		
Falls from height	x			Contamination		x		Temperature			
Falls on level	x			Micro organisms				Noise	x		
Manual Handling				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			
UXO	x							On/Near Water			

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

See Site Specific Risk Assessment for Buried Services

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

6.2. MOLA Risk Assessment – General/Targeted Watching Brief

Site - Moorgate Shaft site (including combined utilities diversions)	**Type of Work**	**General/Targeted Watching Brief**

Persons Affected	**No**	**Classification**	**No**
Employees	1-3	Experienced	Up to 3
Other workers		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	x	Vehicles	
Chainsaw		Hand Tools	x	Human Remains	
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 & Bam Nuttall - Kier JVsafety policy, site specific method statement, permits to work, instructions.

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	x			Temperature			

Falls on level	x			Micro organisms				Noise	x		
Manual Handling				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			
UXO	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

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

6.3. 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

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

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.

Physical:

180 degree machines - When using the backhoe the front bucket must be lowered to the ground

360 degree machines - 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.

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.

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.

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:	**Site - Moorgate Shaft site: Evaluation, General/Targeted Watching Brief (including combined utilities diversions)**		
Frequency and Duration of Task:	**Daily, up to 7 mths**	**Number of Staff Involved:**	**Up to 6**

Specific Hazards Identified?

Persons struck by machine

Fall of material from bucket

Control Measures Required?

All mini excavators and similar plant to be operated and controlled by trained and CPCS certified

Principal Contractors' operatives under the overall supervision of the Laing O'Rourke Site Manager and/or Bam Nuttall - Kier JV 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 Principal Contractor'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 Principal Contractor's Method Statement and Risk Assessments

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 Principal Contractor's 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:

Full Accident and Emergency:

The Royal London Hospital

Whitechapel Road

E1 1BB

Tel: 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).

Minor injuries unit:

St Bartholomew's

West Smithfield Street

EC1

Tel: 020 7377 7000

Tube: St Paul's/Barbican

The minor injuries unit treats injuries including cuts and grazes, broken bones, minor burns and scalds, bites and stings, strains and sprains, minor head injuries, minor eye or ear problems.

The unit is open Monday to Friday, 8am–8pm (closed weekends and bank holidays).

Emergencies: MOLA supervisor to 999 in absence of PC Site Manager or specified deputy.

Circumstances Requiring Additional Assessment?			
Competent Persons Appointed to Take Action **Principal Contractor Site Manager: TBC** **MOLA Site 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:** **01/04/11**

6.4. 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					

Compliance with:

MOLA Health and Safety Policy Operational Procedures (September 2010)

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.

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.

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.

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.

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

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:	**Site Evaluation, General/Targeted Watching Brief (including combined utilities diversions)**		
Frequency and Duration of Task:	**Daily – up to 7 mths**	**Number of Staff Involved:**	**Up to 6**

Specific Hazards Identified?

Contact with existing services –during initial breaking out and/or machine clearance of trenches during archaeological monitoring, but also risk of encounter during any subsequent hand digging.

Electrocution

Explosion, fire

Sewage and Flooding

Asphyxiation

Control Measures Required?

Compliance with Principal Contractor & Bam Nuttall - Kier JV permits to work 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.

Discovery of buried service (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.

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

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 Principal Contractor's Manager of specified deputy in his absence

Ensure all serious none emergency casualties not treatable by first aid are accompanied to the nearest A&E:

Full Accident and Emergency:

The Royal London Hospital

Whitechapel Road

E1 1BB

Tel: 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).

Minor injuries unit:

St Bartholomew's

West Smithfield Street

EC1

Tel: 020 7377 7000

Tube: St Paul's/Barbican

The minor injuries unit treats injuries including cuts and grazes, broken bones, minor burns and scalds, bites and stings, strains and sprains, minor head injuries, minor eye or ear problems.

The unit is open Monday to Friday, 8am–8pm (closed weekends and bank holidays).

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

Circumstances Requiring Additional Assessment?

Competent Persons Appointed to Take Action **Principal Contractor Manager** **MOLA Site Supervisor**			
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:** **01/04/11**

6.5. 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

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.

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.

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 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

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.

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

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:	**Moorgate Shaft site – General Watching Brief (Combined Utilities Diversions)**		
Frequency and Duration of Task:	**Daily,** **Up to 7 mths**	**Number of Staff Involved:**	**1-3**

Specific Hazards Identified?

The London Wall shafts and heading will be confined spaces. Other deeper areas of excavation may also be designated a confined space, if sufficient depth is reached.

Access/egress

Evacuation of injured operative

Control Measures Required?

The Principal Contractor/ Bam Nuttall - Kier JV or appointed specialist sub-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 Principal Contractor (or specialist sub-contractor) 'top man' will carry out an initial assessment of the confined space atmosphere and continually monitor at regular intervals, recording this as excavation progresses.

Access/egress point to be identified and kept clear at all times.

Only trained, certificated MOLA operatives to work in areas designated as confined spaces. During the General Watching Brief, shaft and heading excavations should not be entered by MOLA operatives without prior agreement with the Principal Contractor or their sub-contractor.

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.

Permit to enter/permit to work system to be used.

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 Laing O'Rourke 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:

Full Accident and Emergency:

The Royal London Hospital

Whitechapel Road

E1 1BB

Tel: 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).

Minor injuries unit:

St Bartholomew's

West Smithfield Street

EC1

Tel: 020 7377 7000

Tube: St Paul's/Barbican

The minor injuries unit treats injuries including cuts and grazes, broken bones, minor burns and scalds, bites and stings, strains and sprains, minor head injuries, minor eye or ear problems.

The unit is open Monday to Friday, 8am–8pm (closed weekends and bank holidays).

Emergencies: MOLA supervisor to call 999 in absence of PC 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:** **01/04/11**

6.6. 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

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

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.

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

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
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.)

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:	**Moorgate Shaft site Evaluation and General Watching Brief (Combined Utilities Diversions)**		
Frequency and Duration of Task:	**Daily,** **up to 7 mths**	**Number of Staff Involved:**	**Up to 6**

Specific Hazards Identified?

Monitoring of deep excavations associated with the London Wall shaft and heading:

-Mechanical hoist bucket or contents striking person in trench

-Persons falling in

-Flooding

-Hazardous atmosphere

Control Measures Required?

Principal Contractor/ Bam Nuttall - Kier JV appointed specialist sub-contractor to:

-provide shoring and safe trench access

-scan for services

-provide barriers around deep excavations

-measures from separate Confined Spaces risk assessment

During the General Watching Brief, MOLA staff only to enter excavations with prior agreement with the Principal Contractor or their sub-contractor

If work is being undertaken within the area of the shaft, 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:

- 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 Principal Contractror's 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:

Full Accident and Emergency:

The Royal London Hospital

Whitechapel Road

E1 1BB

Tel: 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).

Minor injuries unit:

St Bartholomew's

West Smithfield Street

EC1

Tel: 020 7377 7000

Tube: St Paul's/Barbican

The minor injuries unit treats injuries including cuts and grazes, broken bones, minor burns and scalds, bites and stings, strains and sprains, minor head injuries, minor eye or ear problems.

The unit is open Monday to Friday, 8am–8pm (closed weekends and bank holidays).

Emergencies: MOLA supervisor to call 999 in absence of PC 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:** **01/04/11**

7. Health and Safety Control Measures

7.1. 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 monitoring of the works by the Principal Contractor.

7.2. Services and Ground Hazards

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.

8. Safety of Excavations

8.1. Entering the Trench during General or Targeted Watching Briefs

- MOLA Staff will not enter the trench if it is declared unsafe by the Principal Contractor.

8.2. 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 9.1.

8.3. Confined Spaces

- The London Wall shafts and heading (part of the Combined Utilities Diversion works) will be designated confined spaces; other excavations for the combined utilities may be designated confined spaces if sufficient depth is reached. All MOLA staff working in such designated areas will be trained to work in Confined Spaces. See Appendix, section 6.7.
- The Principal Contractor or appointed specialist sub-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 PC/sub-contractor '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.
- 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 combined utilities trench, designation may change as excavation progresses. This will be kept under constant review.

8.4. Machine Excavation

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

8.5. 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.

8.6. 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.

8.7. Contamination

- MOLA has been issued with the Crossrail Line 1 Assessment of Contaminated Land Impacts Technical Report Volumes 1 and 2, Doc. No. 1E0322-C1E00-00013, dated February 2005) by the Principal Contractor. Any necessary remedial action will then be agreed with the Principal Contractor as part of the H & S Plan and supplied as an attendance item (9.1 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.

8.8. Ordnance

- In the event of MOLA not having been issued with an Ordnance Report from the Principal Contractor all MOLA Staff 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.

8.9. 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).

9. Planning and Resources

9.1. 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:

- ***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 may be necessary to separately secure individual archaeological trenches via a physical barrier (such as Heras fencing) eg if there are public areas nearby or human remains are encountered.
- ***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.
- ***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) ré protection of adjacent streets and buildings, removal of obstructions, depth of excavation, live services etc.
- ***site accommodation and welfare facilities with electricity and water.*** To include, at the Finsbury Circus worksite 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. For the basic monitoring component of a small watching brief, these facilities would normally be shared with the Principal Contractor's site establishment and separate work space is not normally required. For the general watching brief on combined utilities, shared desk space and lockable storage (eg small cabinet) for site paperwork will be required.
- ***site preparation and clearance***. Removal of structures, vegetation, 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 mechanical excavator, under archaeological supervision, but occasional hand work by labourers may be needed (eg clearing individual obstructions or removing spoil from investigation areas if the machine cannot re-enter).
- ***transport/mounding/storage of spoil*** from archaeological investigation areas. This includes removal from site, if necessary.
- ***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. Other plant such as dumpers, compressor/breakers, hoist 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 to excavations, where deeper than *c* 1.2 m (or as required in unstable ground). This will be via benching/battering back and/or shoring, depending on 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.
- *temporary roofing* (*not required*) to archaeological excavations (eg clear plastic sheets on scaffolding frame). Needs to have adequate water drainage and ventilation. Local, portable frames would only be required if significant remains are present. There is no need for routine roofing of all excavation areas.
- ***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
- ***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. 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.

9.2. Equipment

Equipment will be supplied by the MOLA equipment central store:

- First Aid Kit
- Hand tools, 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.

9.3. 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)

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

9.4. 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 available to be worked. Other archaeological specialists may be called in if necessary.

10. Briefing Arrangements

10.1. 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.

10.2. 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, e.g. those with more than 2-3 staff and of a week or longer duration, regular toolbox talks will be given by the MOLA Senior Archaeologist 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.

11. First Aid

11.1. Trained First-Aid Personnel

During the evaluation there will be at least one MOLA staff, who is a qualified First Aider (i.e. 3 day F.A. at work course) present on site.

11.2. 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.

11.3. First Aid Equipment

A MOLA First Aid kit, of an appropriate size for the site, will be located in the site office/mess hut/canteen or in the case of a small watching brief a 'bum bag' will be carried by the MOLA Supervisor at all times.

12. Accident, Incident, Near Miss and Environmental Incident Reporting

12.1. 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 (main document).

12.2. 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 Section 9 (main document):

- 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.

12.3. 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 H&S Compliance Manager and action taken as appropriate.
- Non Riddors investigated by Senior Contract Manager/H&S Compliance Manager.
- Riddors investigated and reported on to Senior Management Consultant by MOLA H & S Consultants.

12.4. Key MOLA Project Personnel

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

13. Emergency Procedures – Site General

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

14. Emergency Services Contact Details

The Principal Contractor will confirm the hospital location:

Full Accident and Emergency:

The Royal London Hospital

Whitechapel Road

E1 1BB

Tel: 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).

Minor injuries unit:

St Bartholomew's

West Smithfield Street

EC1

Tel: 020 7377 7000

Tube: St Paul's/Barbican

The minor injuries unit treats injuries including cuts and grazes, broken bones, minor burns and scalds, bites and stings, strains and sprains, minor head injuries, minor eye or ear problems.

The unit is open Monday to Friday, 8am–8pm (closed weekends and bank holidays).

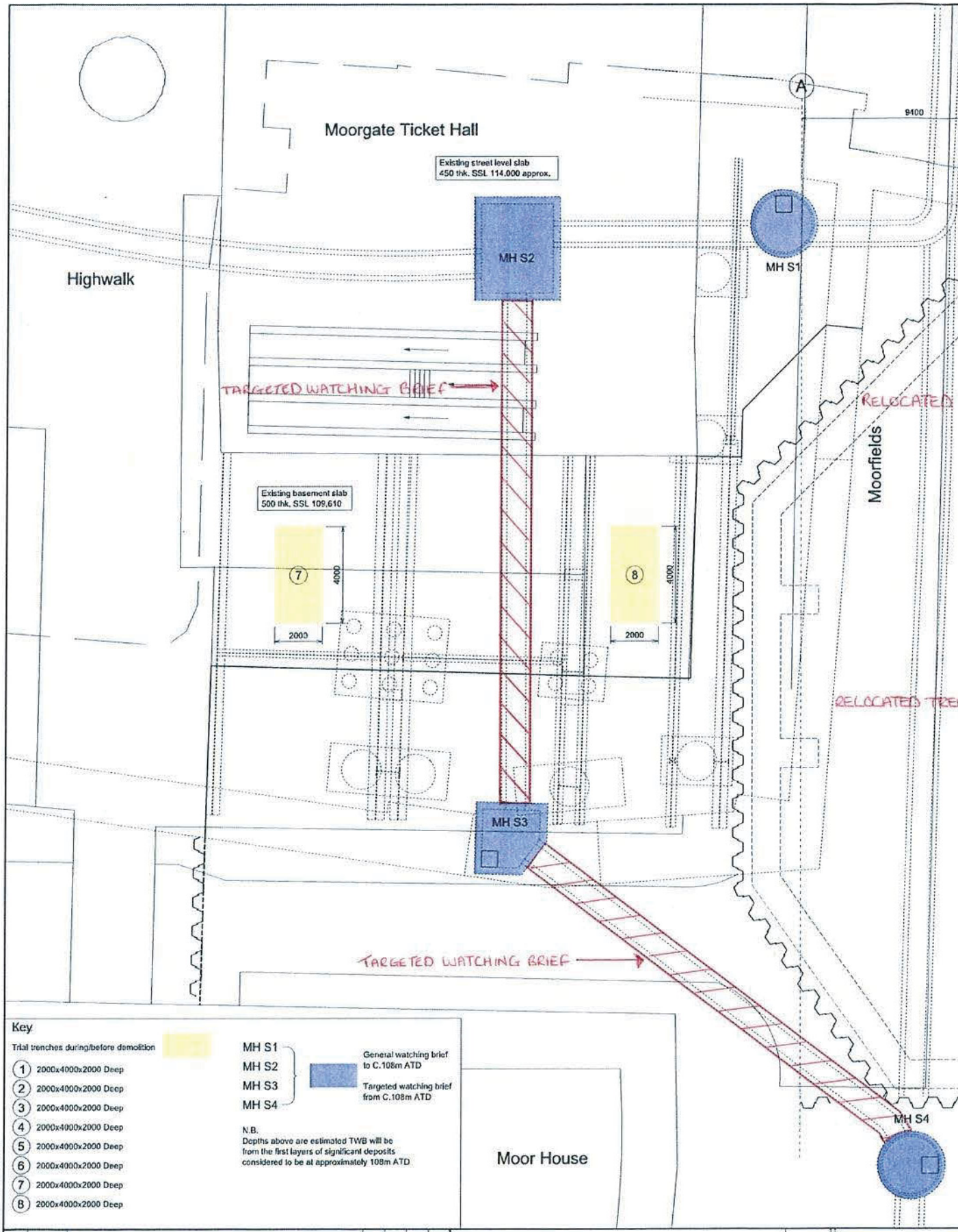
The MOLA supervisor will dial 999 for fire, ambulance and police in the case of an emergency if the Principal Contractor's Site Manager or his deputy is not present on site.

15. 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.

RELOCATED ARCHAEOLOGICAL TRIAL TRENCHES AND TARGETED WATCHI

AUGUST 2011



Key

Trial trenches during/before demolition

1. 2000x4000x2000 Deep
2. 2000x4000x2000 Deep
3. 2000x4000x2000 Deep
4. 2000x4000x2000 Deep
5. 2000x4000x2000 Deep
6. 2000x4000x2000 Deep
7. 2000x4000x2000 Deep
8. 2000x4000x2000 Deep

MH S1
MH S2
MH S3
MH S4

General watching brief to C.108m ATD

Targeted watching brief from C.108m ATD

N.B.
Depths above are estimated TWB will be from the first layers of significant deposits considered to be at approximately 108m ATD

Rev.	Date	Description	By	Chkd	App	Auth
P01	30/07/2010	First issue	DP	MD	SA	

Key

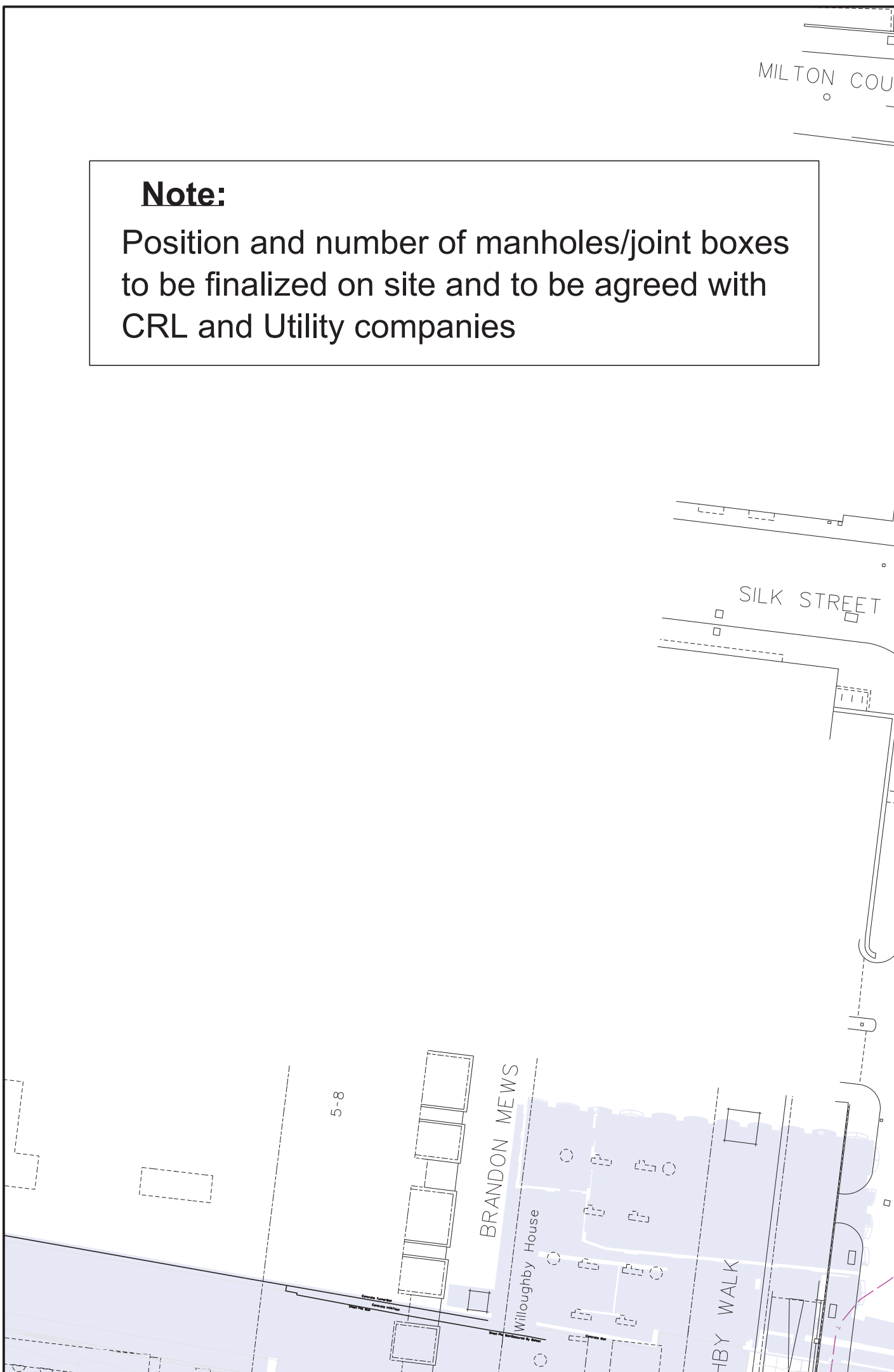
~~TRENCHES IN 9 & 10A MOORGATE TO BE CARRIED OUT AFTER DEMOLITION~~

Moorgate Shaft

Key

Note:

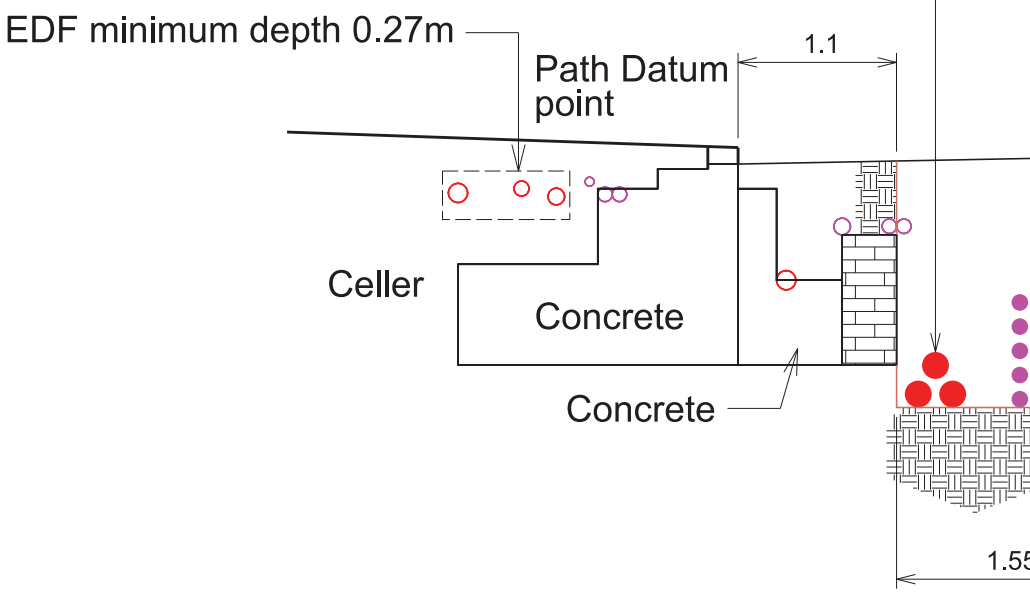
Position and number of manholes/joint boxes to be finalized on site and to be agreed with CRL and Utility companies



Unknown steel 5" 0.82 d
Unknown steel 3" 0.54 dee

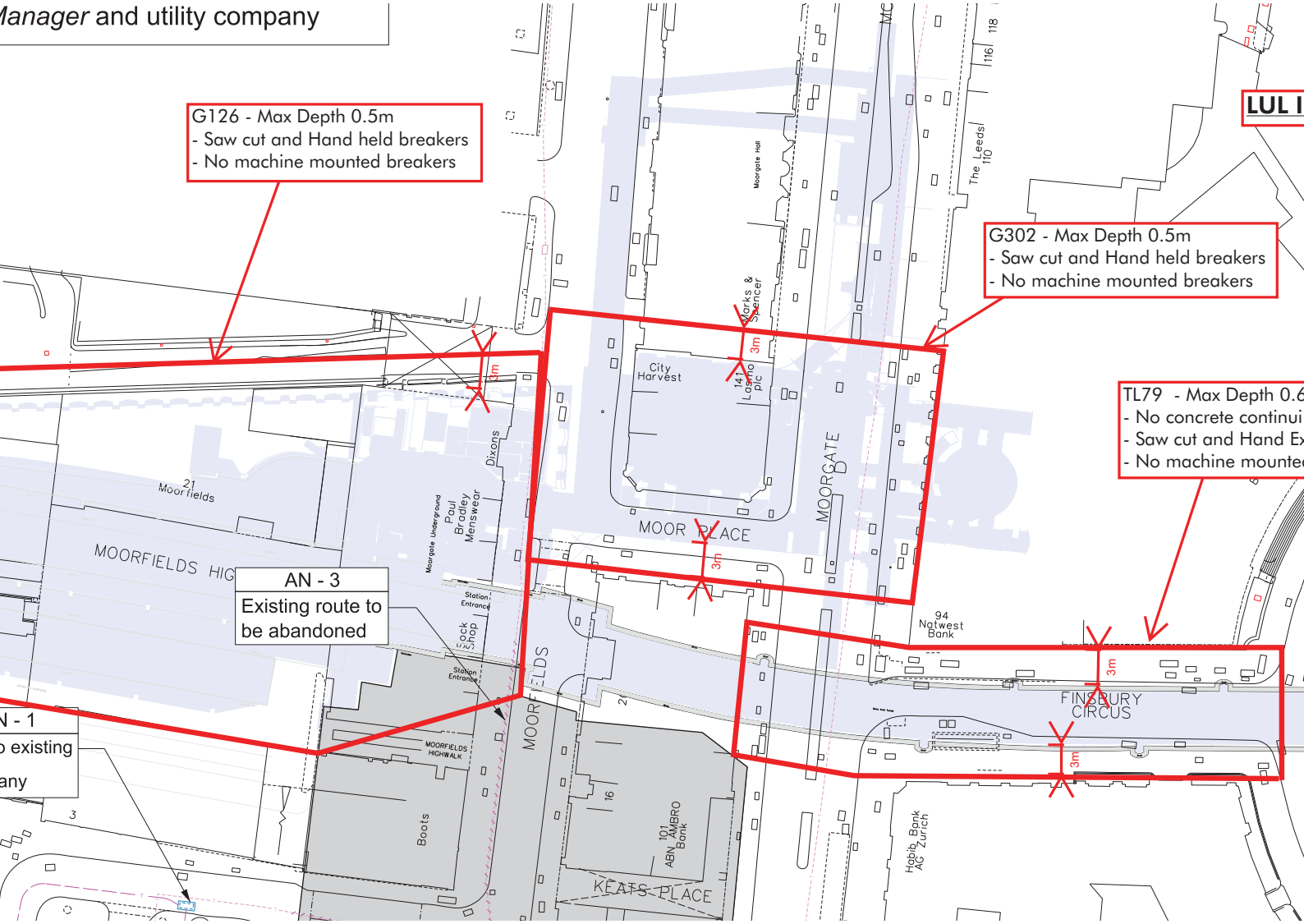
New Telecoms ducts 14 ducts within proposed service trench

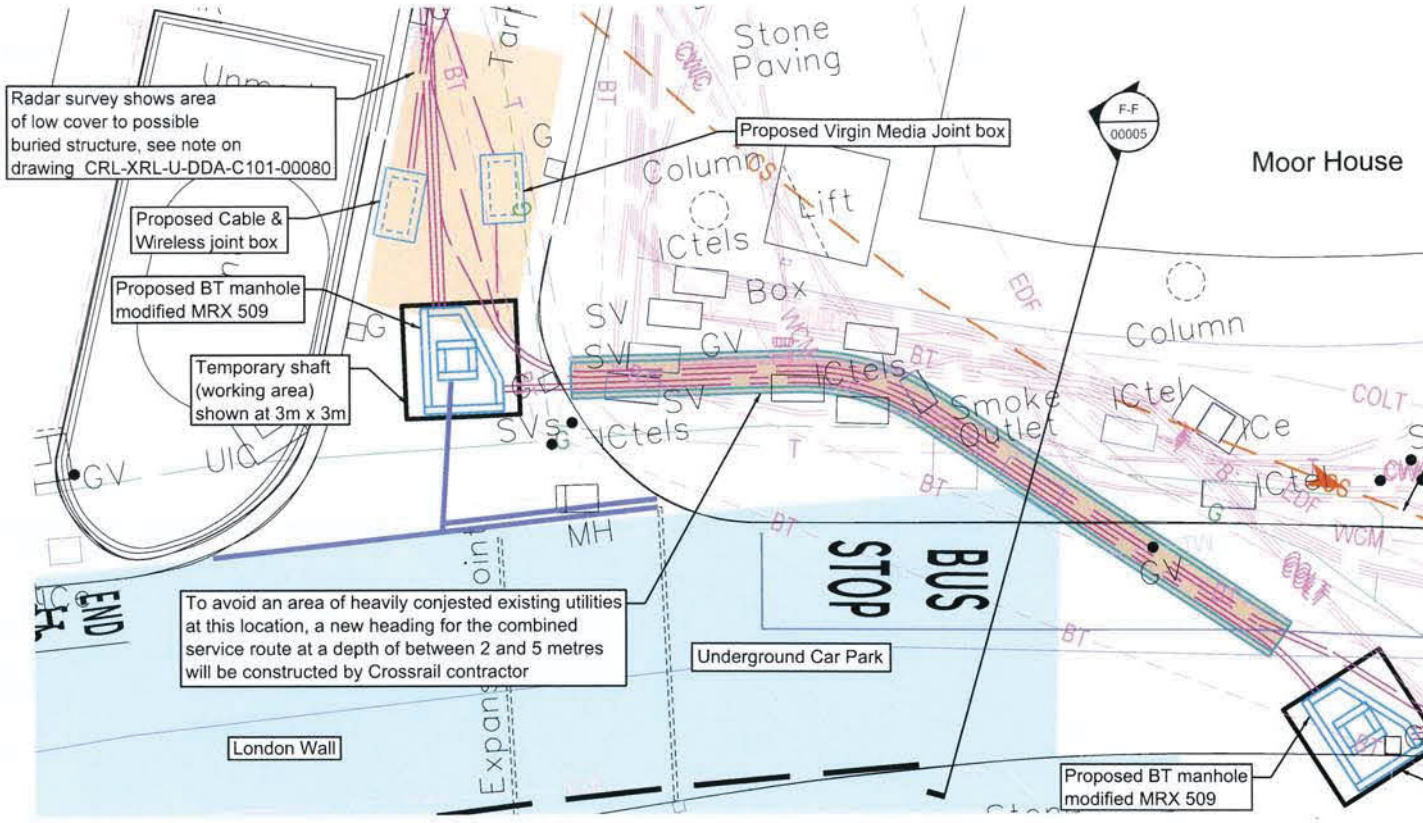
New EDF 3 x 150mmØ ducts within proposed service trench



Note:
Deep trenches will p
area to gain access

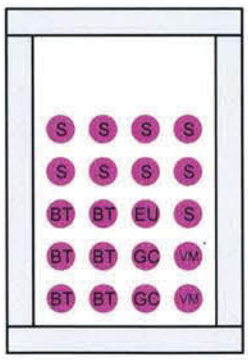
Manager and utility company





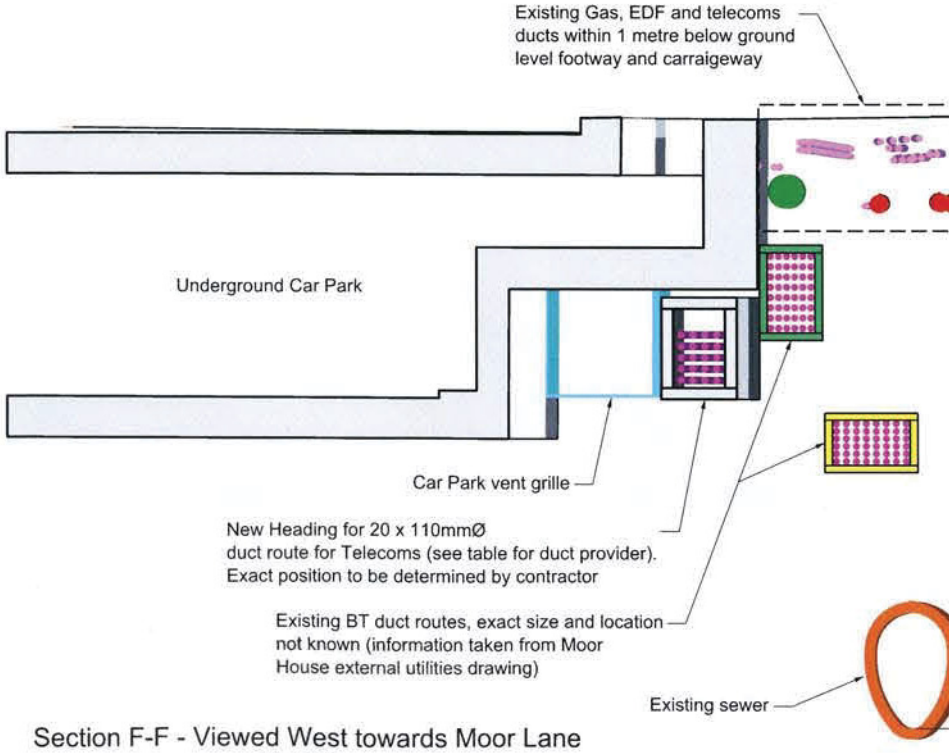
Plan View - Heading

Scale 1:100



London Wall Heading new duct configuration

Not to scale



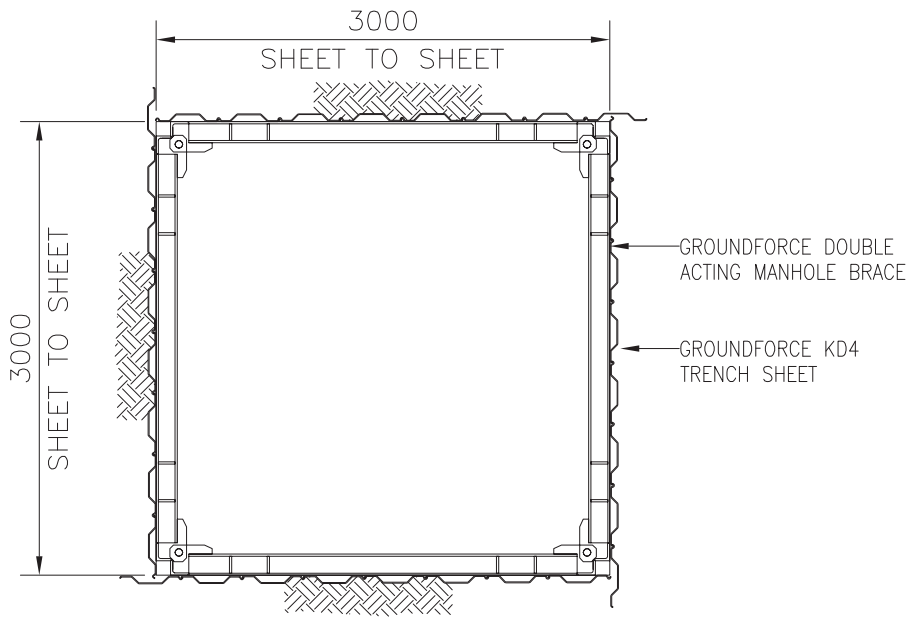
Section F-F - Viewed West towards Moor Lane

Scale 1:50

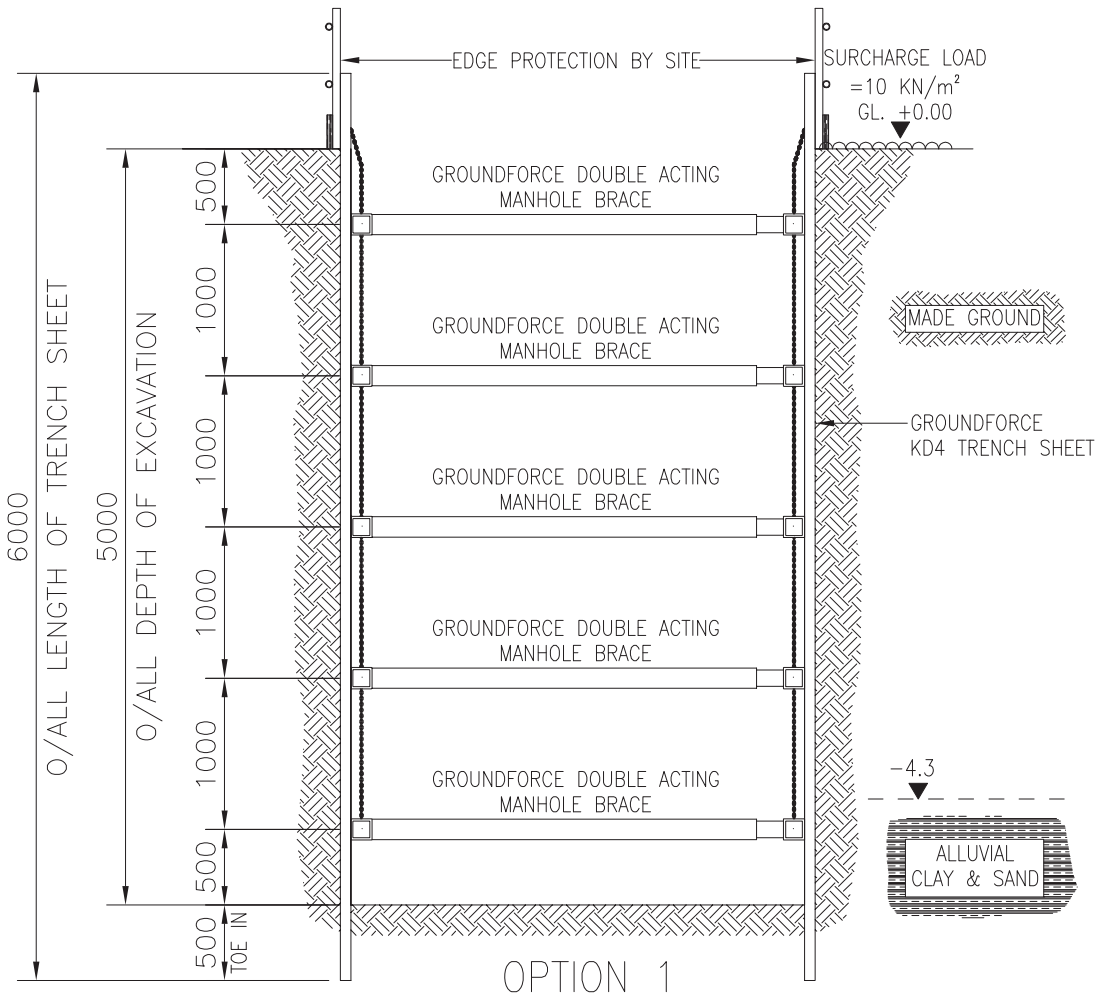
Rev	Date	Description	By	Chkd	App	Auth
P01	16/06/2010	Issue for tender	MH	KWW	WD	---

Notes

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



PLAN VIEW OPTION 1



OPTION 1
TYPICAL SECTION

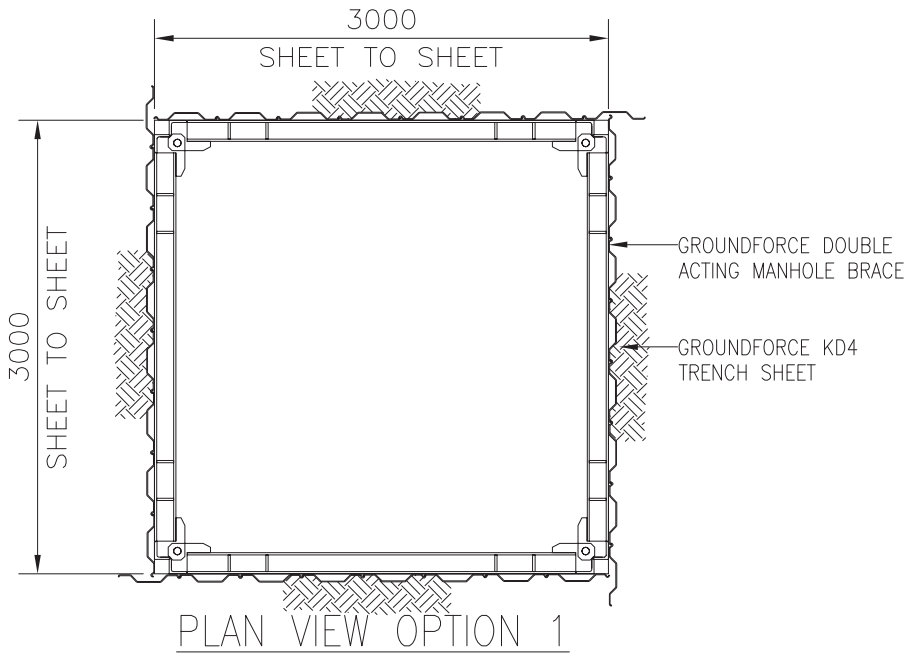
NOTES:
1). THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF LAING O'ROURKE.
2). ALL DIMENSIONS TO BE CHECKED BEFORE COMMENCEMENT OF WORK ON SITE.

Rev.	By.	Comments.	Date.
			Authorised.
C1	SL	ISSUED FOR CONSTRUCTION	23/02/11
	MS		KY

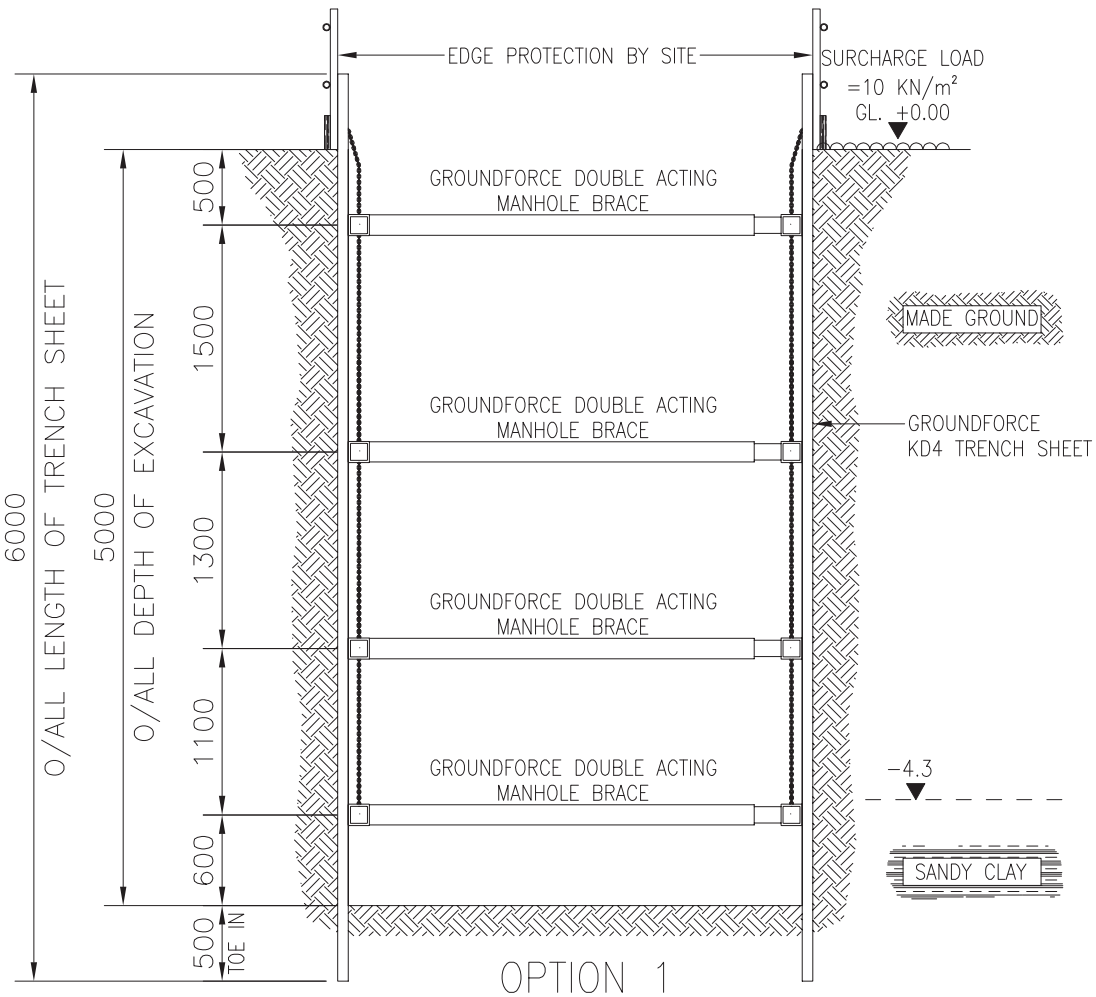
This Drawing Is Based On The Following Information:
(Changes For Subsequent Revisions Noted in Revision Column Above).

LAING

Laing O'Rourke
Bridge Place, Anch
Crossways, Dartfo
Telephone: (01322



PLAN VIEW OPTION 1



OPTION 1
TYPICAL SECTION

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Rev. By. Chkd.	Comments.	Date. Authorised.
C1 SL MS	ISSUED FOR CONSTRUCTION	23/02/11 KY

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LAING

Laing O'Rourke
Bridge Place, Anch
Crossways, Dartfo
Telephone: (01322