C261 ARCHAEOLOGY EARLY EAST

Method Statement

Targeted and General Watching Briefs at Limmo Shaft (XRW10)

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		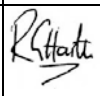		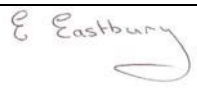	

2a. Stakeholder (Principal Contractor) review required? YES ☒ NO ☐

(If NO, strike out sections 2a & 2b and go to section 3)

This document has been reviewed by B. GUILLAUME in the capacity of ENVIRONMENTAL MANAGER for coordination, compliance, integration, and acceptance as a safe system of work, output, control, sequence. This document is acceptable for transmittal to BBV for no objection to the works being executed as described.

Sign: [signature] Name: B. GUILLAUME Date: 20/01/2012

2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					☐
					☐
					☐

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2a. Stakeholder (Principal Contractor) review required? YES ☒ NO ☐

(If NO, strike out sections 2a & 2b and go to section 3)

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2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					☐
					☐
					☐

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Reviewed/Accepted by:(signature)		Print Name: L. MUZIKANIS	Position: PROJ. MGR	Date: 20 JAN-12
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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 22
Health, Safety, & Environment	15 17 21 22
Contractual	1.1 2 4 7 8 10 14 18 19 20
Archaeological methodology	1 3 5 6 9 10 11 12 13

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Figure

(At back of document)

Fig 1 Location of Shafts

1 Introduction

Following a phase of Archaeological evaluation and watching brief carried out between August and December 2010, the impact of the Crossrail Limmo Peninsula shafts (Access and Auxiliary) is to be mitigated by a targeted watching brief during the initial phases of construction/excavation and a general watching brief on These are to be carried out on this site by C261 Museum of London Archaeology (MOLA). The requirements are set out in a Crossrail Site-specific Written Scheme of Investigation (SS-WSI – Crossrail, April 2011, Document No C123 JUL-T1-TPL-CR144_SH011_Z-00001 Revision 9.1).

The task which this method statement covers is:

Task	**Principal Contractor**	**Provisional Programme** (see also section 4.6)
• **Main and Auxiliary Shafts** at Limmo Peninsula (Mitigation) **– Targeted Watching Brief**	C305 Dragados Sisk jv (DSJV)	w/c 09 Jan 2012, for approximately 20 days
• Auxiliary Shaft at Limmo Peninsula – General Watching Brief on removal of obstructions for pile line	As above	w.c. 23 Jan 2012 for approximately 5 days

Table 1 Task information

This Method Statement has been developed in conjunction with the Principal Contractor, who will be responsible for ensuring that the archaeological works may be carried out as specified. It has been prepared incorporating information from the C305 DSJV method statement for these works (DSJV, November 2011, *Method Statement, Central Section Project, Excavation of Limmo Shaft, Doc. No. C305-DSJ-C-GMS-CR144_SH011-50011 v1*, 16.11.11). The targeted watching brief comprises only Stage 1 of the main shaft excavation (105.0m to 95.0m) and has been expanded to include the excavation of the auxiliary shaft. A general watching brief will also be undertaken on the removal of obstructions from the pile line on the auxiliary shaft.

The purpose of the Watching Brief is to mitigate the impact of the specified development works upon archaeological remains, by making an adequate record of them during the construction ground works (a mitigation strategy of *preservation by record* in line with Crossrail requirements).

If the project design or scope/method of working 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 Limmo Peninsula shaft site lies east of the lower part of the River Lea, and west of Victoria Dock Road/Silvertown Way/Dock Road, National Grid Reference 539480 180980. It consists of two main areas, a storage/treatment compound for excavated material from tunnelling from the Limmo Peninsula shaft, and a conveyor for

excavated material leading south to a barge loading facility at Instone Wharf at the mouth of the Lea. The internal diameter of the shaft is approximately 20m.

1.2 Geological and Topographical setting

The geological and topographical setting was covered in detail in the WSI (Crossrail 2011, See 3.2) and is summarised below.

The site lies within the alluvial floodplain of the River Lea and within the wider alluvial floodplain of the River Thames.

Modern ground level on the Limmo Peninsula shaft has been raised by about 5m with excavated material from the construction of the Docklands Light Railway (DLR).

1.3 Archaeological, Geoarchaeological, and Historic Background

The overall archaeological and historic background was covered in detail in the WSI (see section 1 above), and only the archaeological potential of the site, as demonstrated by the evaluation and watching brief, is summarised below.

The evaluation and watching results are reported on in:

- Crossrail, C261 Archaeology Early East, Fieldwork Report, Archaeological Evaluation and Watching Briefs, Limmo Peninsula Shaft (XRW10), C261-MLA-X-RGN-CR140-5003, v1, 18.01.11

The investigations have demonstrated that the site contains:

Deposits	**Surface Level**	**Notes**
Modern/20th-century overburden/made ground (DLR waste and post-war dumping)	*c* 110.4 to 110.7m ATD (pre-Crossrail works)	No archaeological interest
Remains of the **Thames Ironworks** (1846–1912) including consolidation dumping/land raising	*c* 103.5m ATD	Archaeology
Prehistoric and historic **alluvium**	*c* 101.3 to 101.6m ATD	Archaeology
Early **Holocene gravels**	*c* 95.1m ATD	Archaeology (only limited recording required)
Possible **Allerod deposits *within*** the gravels	*c* 94.6m ATD	Significant archaeology
Pleistocene gravels	*c* 94.5m to 94.9 ATD	No archaeological interest, TWB ceases after recording surface levels

2 Interfaces and Communication Plan

2.1 Interface with Project Archaeologist

The Method Statement will be submitted to the Crossrail Project Archaeologist and Crossrail Safety/CDM Advisor for approval. Any comments will be 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 C263 Contract Administrator

MOLA shall submit costings and timesheet reports in accordance with the C263 Contract to the Contract Administrator.

2.3 Interface with Principal Contractor

MOLA has liaised with the Principal Contractors (C305–DSJV) to prepare this Method Statement. MOLA has also received a copy of the principal contractors Method Statement (DSJV November 2011, doc ref: C305-DSJ-C-GMS-CR144_SH011-50011). The archaeological investigations take place during main works and will be undertaken under the auspices and supervision of the Principal Contractor. This interface extends to joint Health and Safety planning under CDM requirements. MOLA will provide the Principal Contractor with all necessary information to support site start-up (eg names of staff for inductions), health and safety planning; and (if required) to support the Principal Contractor's 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 Contractor shall give MOLA 4 weeks notice of the start date.

2.4 Interface with the Project Design Team

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

2.5 Interface with External Consultees

The project archaeologist shall liaise with GLAAS/English Heritage to inform them of the archaeological works.

3 Scope of Works

3.1 Planned Fieldwork Events

This Method Statement sets out the methodology and health and safety requirements for archaeological mitigation work to be carried out in advance of construction of the Crossrail Limmo Peninsula Access Shaft and Auxilliary Shaft.

The mitigation strategy for the site is *preservation by record*, in the form of a Targeted Watching Brief on excavation of the shaft down to *c* 95m ATD.

3.2 Confirmation of Methods and Standards

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

- Crossrail Environmental Minimum Requirements (Crossrail 2008)
- Crossrail Archaeology Generic Written Scheme of Investigation (draft July 2009)
- Crossrail, June 2009, Archaeology Specification for Evaluation & Mitigation (including Watching Brief) (Document Number: CR-PN-LWS-EN-SP-00001)
- Crossrail C123 Intermediate Shafts Limmo Peninsula Shaft Site-Specific Written Scheme of Investigation C123-JUL-T1-TPL-CR086_SH003_Z-00001 Revision 7.0 (draft 2010)
- English Heritage, July 2009, Standards for Archaeological Work, London Region, External Consultation Draft
- 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 objective of the archaeological investigations is mitigation by means of *preservation by record*, in the form of archaeological Targeted Watching Brief to excavate and record archaeological deposits for analysis and dissemination.

The aim of the watching brief will be to record the presence of any archaeological activity identified during the excavation of the temporary shaft. The following objectives have been devised by MOLA to guide the fieldwork:

- Identify and record any remains of the Thames Ironworks exposed during the relevant groundworks.
- Record the extent and nature of the floodplain sequence, with particular emphasis on the Allerod peat deposits.

The Aims and Objectives below, updated from the evaluation results, are specified in the WSI.

3.3.1 Site Specific Research Aims

The following site specific research aims can be outlined for the investigations at the Limmo Peninsula shaft:

- Where possible, characterise the sedimentary sequence at the site in terms of lithology, agents of deposition, preservational environment and age of deposition.
- Where possible, sample and characterise the preservational environment within bodies of sediment for the recovery of palaeoenvironmental remains.
- Where possible, develop from the boreholes and previous geotechnical work, a first order sedimentary model for the site.
- Where possible, on the basis of assessment of palaeoenvironmental remains, if recovered, develop a first order model for palaeoenvironmental development at the site.
- What is the development of the local landscape and topography of the junction of the Lea and Thames floodplains from prehistory to the medieval period? Are any peat deposits present? If so, at what level(s) and at what date did they form? Is there evidence for river scour removing prehistoric alluvial deposits, or conversely, do they survive ?
- Is there any evidence for prehistoric activity that has survived later river scouring? If prehistoric remains are present, what is their character and what can be learned about the exploitation of the floodplain by prehistoric groups? In particular, is there any evidence for Mesolithic activity at the base of the Alluvium/surface of the sands? Is there any evidence for timber trackways or other structures of later prehistoric date ?
- Is there any evidence for Roman activity, in particular for reclamation or flood defences, and marine transgression and regression ?
- What can be learned about the process of land reclamation and management of the area from the medieval period until the construction of the shipyards and wharves in the mid nineteenth Century ?
- What is the evidence for the development of the area in connection with the Thames Ironworks and other shipyards and wharves during the nineteenth century ?

- Is there any below-ground or above-ground evidence for the nineteenth century Thames Ironworks, and other shipyards and wharves? In particular, is there evidence for the internal railway systems, dock structures, or slipways ?

3.3.2 Relevant Regional Research Aims

In addition to the site specific research aims, the site has potential to address several regional research aims identified in the regional research agenda 'A Research Framework for London Archaeology', Museum of London, 2002. The regional research themes considered relevant to achieving an understanding are as follows (page numbers in brackets):

- The significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetation and faunal development, on human lives (p 79);
- London's hydrology, river systems and tributaries particularly the role of the River Thames, as boundary, communication route, resource, ritual focus etc, in shaping London's history, and the relationships between rivers and floodplains (p 79);
- The relationship between landscape, river and settlement, and the influences of the River Thames in particular on communications and social interaction (p 79); and
- The development of London's Docklands and Waterways (p 82).

3.4 Event Codes

The sitecode is **XRW10**

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 21.8.2 for details.

4.2 Training and Certification

MOLA provides Safety Training for its staff as follows

- Induction Training for all staff (undertaken on joining MOLA, and as appropriate on individual projects).
- General H&S Training for supervisory staff (an H&S awareness course General 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 (see 4.3).

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, apart from Confined Spaces, it is not anticipated that this will be required on this site.

MOLA staff who need to enter the shaft area will have confined spaces training, and hold a current certificate.

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

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

4.3 Site Monitoring

The MOLA supervisor (Grade 4 or 5) 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.

4.4 Progress Reporting

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

4.5 Resource Plan

General Watching Briefs

- The watching briefs will be supervised by a MOLA Supervisor (Grade 4 or 5) assisted by members of the MOLA field team (Grade 6 – currently envisaged as 1–2 people) with support from MOLA Geomatics and Photographic team members when required. Other archaeological specialists (Grade 8, eg geoarchaeologists or osteologists), may be called in if necessary.

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. Other staff to be assigned when required.

For the watching briefs

- Sam Pfizenmaier, BA (Hons) [*to be confirmed when a firm start date is known*], Senior Archaeologist, overall responsibility for site supervision and conduct of the fieldwork.

  Direct Line (office)

  020 7410 2231

  Mobile

  077 38 883 738

And/or

- Robert Hartle, BA (Hons), MA [*to be confirmed when a firm start date is known*], Senior Archaeologist, overall responsibility for site supervision and conduct of the fieldwork.

  Direct Line (office)

  020 7410 2238

  Mobile

  07730 646060

- Graham Spurr, BSc (Hons), MSc [*to be confirmed when a firm start date is known, will change during project*], Senior Geoarchaeologist, responsibility for Geoarchaeology and environmental recording and sampling, and specialist advice to the Senior Archaeologist, via visits as required.

Direct Line (office)

020 7410 2232

Mobile

07939659057

Other staff and specialists are to be determined when required.

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

4.6 Programme

The programme is shown in Table 1 in section 1.

4.7 Working Hours

The working hours on this site, as specified in the DSJV method statement (November 2011), will be:

- Monday to Thursday: 08:00 to 18:00
- Friday: 08:00 to 17:00

MOLA was informed by the Principal Contractor (20/01/12) that they had been given consent to excavate the shafts in extended hours (07:00 – 22:00 Monday to Friday).

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.

5 Fieldwork Methodology

5.1 Targeted Watching Brief on Shafts

The mitigation fieldwork for the Shafts will consist of a Targeted Watching Brief (TWB) from the ground level at *c* 105m ATD down to *approximately* 95m ATD. It should be stressed that whilst these levels and those elsewhere in this method statement are based on the information from the evaluation (within the shaft footprint), actual archaeological remains are likely to vary locally across the shaft area.

The archaeological work will be intermittent to varying degrees, in that parts of the programme will be occupied by construction works such as installing rings, jacking down the cutting edge, spoil removal, etc which do not require an archaeological presence.

5.1.1 Targeted Watching Brief on Shafts

From ground level to 105m ATD the Principal Contractor will excavate the deposits by a 30 ton long reach machine. This will be done in spits of *c* 200mm to 500mm under close archaeological supervision by C261 MOLA. At shaft excavation level 12 ton excavators with a flat bladed bucket will be used to excavate in spits of *c* 200mm to 500mm to 95m ATD under close archaeological supervision by C261 MOLA.

MOLA will inspect the surface of the deposits as each spit is removed to determine if any features, finds or structures are present. If so, machine excavation will cease in that area (it may be localised, or more extensive) and the area will be cleaned, recorded, and sampled/excavated as appropriate. Following this, the Principal Contractor can continue the excavation (until further sampling/excavation is required, as above, or the TWB ceases).

The bulk of the natural floodplain deposit sequence will not require geoarchaeological recording, this having been done in the evaluation. A geoarchaeologist will be present to inspect the natural sequence, to identify whether there are any variations in the deposits. Any such different deposits will be recorded and sampled as necessary.

A particular focus of the Targeted Watching Brief is the potential Allerod deposits at *c* 94.5m ATD.

This process will be repeated until the Targeted Watching Brief ceases, at the surface of the Pleistocene terrace gravels (below the potential Allerod deposits), at *c* 94.5m to 94.9 ATD.

Except as specified above, the Targeted Watching Brief will be conducted using the general methodology in section 5.2, developed according to site conditions in liaison with the Principal Contractor.

5.2 Generic 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 will be developed and discussed in conjunction with DSJV Daily site coordination meetings will be held at the end of shift to facilitate the coordination of the archaeological watching brief. Constraints imposed will be developed in conjunction with DSJV to maximise construction progress whilst fulfilling archaeological watching brief requirements. 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 (Specification for Evaluation and Mitigation

Crossrail 2009 (see 3.2), section 7.A2 and section 14.2 of this document).

5.3 Watching Brief Survey and setting out method

MOLA will obtain from either the design archaeologist, the Principal Contractor or Crossrail's survey department the locations and values of the project datums in the area of the site.

MOLA surveyors will normally survey to LSG grid local baselines, or the features, as appropriate to the remains encountered. In some circumstances, eg during the

Targeted Watching Brief on the Limmo Shaft, it may be appropriate and more efficient for the Principal Contractor's surveyors (if they are available) to survey MOLA temporary baselines within the shaft. This will be determined by liaison between MOLA and the Principal Contractor.

MOLA will obtain from the Principal Contractor or design archaeologist CAD plans to London Survey Grid of the shaft as-dug. See also 13.

5.4 Watching Brief 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).

5.5 General watching brief methodology

- A general watching brief will be carried out on the removal of obstructions for the auxiliary shaft. Concrete is expected at approximately 2m depth and brickwork at approximately 6m depth. The Senior Archaeologist will not enter the trenches but will observe from the top and record and photograph the brickwork removed by machine.

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.

At the Limmo shaft site there will be a geoarchaeological component to the work. However, much of this work was conducted during the evaluation by means of Window Samples (but not bulk samples of the geoarchaeology), and further investigation, recording and sampling will be focussed on any variations in the base of the sequence (approx. the lower *c* 5m, between 100m ATD and 95m ATD), where/if the underlying deposits vary from those seen in the evaluation.

At Limmo Peninsula, this work, *if required*, is currently predicted to include:

- Sampling of the Allerod organic deposits, and Holocene alluvium 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 Limmo site.

6.1 Sampling strategy for Limmo Peninsula

The most likely methods required within the sampling strategy of Limmo Peninsula include sampling of the Allerod deposits, and the overlying Holocene peats and estuarine clays by bulk sample and monolith tin.

If required (see above), a profile/section through the basal floodplain deposits will be investigated by a Geoarchaeologist, paying particular attention to the interface of the Allerod deposits with the Pleistocene gravels. The deposits will be characterised according to standard geoarchaeological criteria to ascertain the mode of deposition. Radiocarbon samples may be taken from key stratigraphic horizons.

General Methodology

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.

7 Deliverables and Submission Programme

MOLA shall provide the following reports in accordance with the C261 Contract to 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.
- A survey report within 2 weeks of the completion of fieldwork
- A Fieldwork Report will be prepared within 6 weeks if required. In this case it may be necessary to incorporate the results after other fieldwork on the Limmo Peninsula site has been completed.
- MOLA will complete an SMR (OASIS) Summary Sheet for the works (i.e. one per fieldwork event). The 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 London Archaeologist.

8 Document Control and Record Keeping

MOLA will access the Crossrail document control system for transmitting reports and other deliverables. The primary report deliverables (as per **Error! Reference source not found.**) 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 the document control system accompanied with the appropriate Checklist with Contractor's responses.

9 Artefact Recovery and Conservation

Sampling strategies will be developed on a site specific basis to meet the objectives stated in the Crossrail Site-specific WSI (see 3.3); 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)

9.1 Finds

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.

9.1.1 Retention and Disposal

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

10 Treasure

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

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

11 Archaeological Science Strategy

Where necessary, the strategy for sampling archaeological and environmental deposits and structures (which can include soils, timbers, animal bone and human

burials) will be developed by MOLA in accordance with English Heritage and IFA guidelines. Advice will be sought from appropriate MOLA specialists and if additionally required from English Heritage. Subsequent on-site work and assessment of the processed samples and remains will be undertaken by MOLA Specialists.

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

See 6.1 for the site-specific sampling strategy.

11.1 Specialist Strategy

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

11.2 Excavation and Recording of Human Remains

The required methodology for human remains is set out in detail in the SS-WSI and the MOLA Framework Method Statement (Technical Submission 2.4, section 4.6) and is not repeated here.

It is not likely that human remains will be present in this part of the Limmo site. If human remains are found, the Project Archaeologist will be contacted, and if instructed them, a Ministry of Justice licence obtained by MOLA.

Any *in situ* human remains will be recorded to watching brief standard (cleaned, location recorded and photographed), and lifted, in accordance with the standards in section 3.2. Any re-deposited, disarticulated human bones will be collected, examined briefly by the Osteologist, bagged, labelled and removed with the articulated bone (it is not predicted that there would be large quantities of such remains; if there were, a different strategy would be agreed with the Project Archaeologist). The advice of a MOLA Osteologist will be sought where the nature of a deposit containing human remains is ambiguous.

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 post-excavation, 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 C261 Contract and project standard survey requirements.

- See section 5.3 for general survey methodology.
- For General 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 (not possible in the Shaft), 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 the 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, however, for the Shaft, it is likely that such archaeological works would delay sinking the shaft. *However, the mitigation strategy for the shaft is intended to remove the need for such additional archaeological interventions, which are therefore unlikely to be required.*

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 C261 contract.

14.4 Management of Consents

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

In general separate consents for archaeological works are unlikely to be required, the possible exception being human remains. In the event of the unexpected discovery of human remains on site, MOLA will obtain a Burial Licence from the Ministry of Justice, if so instructed by the Project Archaeologist.

15 Health and Safety

15.1 CDM Responsibilities and Reporting

- MOLA will be supporting and reporting to the Principal Contractor 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 (*in addition to the Principal Contractor's Accident book*), and copies of Public and Employers Liability Insurance. The Supervisory Archaeologist is responsible for ensuring that this information is made available.
- Compliance with current legislation and HSE guidance; including the Construction Design and Management Regulations (CDM) 2007 as a Designer; and the Principal Contractor's Health and Safety Policy, safety inductions and fire and emergency procedures.
- Field staff qualified to operative level (or higher) of the CITB Health and Safety test and therefore eligible to carry a Construction Related Organisation (CRO) White Card for Archaeological Technician (Code 5363).
- Services of a Contract Manager, Project Officer/Assistant Contract Manager, 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, in addition to the MOLA H&S Compliance Manager; 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, and training, including tool box talks and safety inductions for new staff.
- Attendance at PC daily briefings for all staff on site.
- Personal protective equipment (PPE) as listed in 21.8.3, but not additional PPE required by the Principal Contractor's method of work or Health and Safety plans (see the section below).
- Review and compliance with the Principal Contractor's Construction Phase Plan under the CDM Regulations 2007.
- Trained First Aiders (as appropriate to a watching brief situation), '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 and first aiders 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 handrails, shoring, ladders, and any equipment required for confined spaces. These requirements are listed in detail in separate documents.
- Construction Phase Plan.

The CDM Co-ordinator will provide

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

15.2 Rail Sites

The shaft watching brief area is not a designated rail site.

15.3 Highway Sites

The shaft watching brief area is not on a highway.

15.4 Health and Safety Reporting

Adherence to health and safety procedures will be monitored by the MOLA Health and Safety Compliance Manager, supplemented when required by the MOLA H&S Consultant (Hascom), Contract Manager, Project Officer and Site Supervisor. The H&S Compliance Manager, and if required 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 project management team as needed.

15.5.1 C261 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: 07872 127296

15.6 Behavioural Safety BMOS

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

16 Emergency Response

16.1 Emergency Preparedness & Response Plan

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

MOLA staff will comply with the Principal Contractor's Emergency Plan.

16.2 Training

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

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

16.3 Emergency & Accident Equipment

- MOLA Archaeologists when working singly on the watching brief tasks will carry a single person First Aid Kit and mobile phone.
- 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 Safety Manager (Ernie Donnel, 07725 752001), 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. In critical situations, MOLA staff will call for an ambulance immediately, and then inform the site emergency controller/site manager.

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

- Linda Muzikants, PDP Project Manager, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ

  DD 0203 197 5854

  Mobile 0758 020 1733

- Jay Carver, PDP Project Archaeologist, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ

  DD 0203 229 9258, Int 2258

Mobile 07870 191 705

- Nick Dyball, CDM Advisor, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ

  Mobile 07718 861941

- George Dennis, Senior Contracts Manager, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED

  DD 0207 410 2200, Int 2256

- Ian Grainger, 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 21.8.1). In addition an updated MOLA corporate Environmental Management Plan is currently being prepared for submission to Crossrail.

The nominated environmental person is

Alison Telfer, atelfer@museumoflondon.org.uk, 020 7410 2276.

17.1 Contamination

MOLA will comply with the Principal Contractor's requirements in relation to any contamination issues. Soil testing has been undertaken and classes material as non hazardous (doc ref: C350-DSJ-C-GMS-CR144_SH011-50011).

17.2 Water Disposal

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

17.3 Site Waste Management Plan

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

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

17.4 Vehicles/Motorised Equipment

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

Once shaft sinking begins, there will be little or no parking on site. Private vehicles are not permitted to enter site. The Principal Contractor has said that they will endeavour to provide a space if possible for occasional visits.

NAME	VEHICLE REG NO
M Cox	KC54 XTZ & DY59 YWB
A Chopping	KC54 XTZ & DY59 YWB
G Spurr	KC54 XTZ & DY59 YWB
H Matthews	EA55 NBJ
S Jones	KC54 XTZ & DY59 YWB
C Drew	KC54 XTZ & DY59 YWB
M Burch	KC54 XTZ & DY59 YWB
V Yendell	KC54 XTZ & DY59 YWB
G Simons	KC54 XTZ & DY59 YWB
CONTACT (All)	**020 7410 2200**

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 C261 contract. Records will be kept and supplied to Crossrail in accordance with procedures set out in Crossrail Specification CR-PN-LWS-EN-SP-00001, as amplified by the SS-WSI. The MOLA responsible procurement representative is Dawn Jackson, who is a member of the Senior Management Group.

19 Community Relations

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

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

20 Responsible Procurement

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

21 Health and Safety Method Statement

21.1 Introduction and Purpose

21.1.1 Project Background

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

- SS-WSI – Crossrail, April 2011, Document No C123 JUL-T1-TPL-CR144_SH011_Z-00001 Revision 9.1

21.2 Scope of Document

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

- Targeted Watching Brief (Limmo Peninsula Shaft)

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

21.3 Responsible Persons and Site Management

21.3.1 Site Management

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

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

21.4 Scope of Works

21.4.1 Proposed archaeological works

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

21.5 Methodology, Programme and Sequence

The programme is set out in Table 1 in section 1 of the method statement, above.

The Targeted Watching Brief on the Shaft is currently expected to start in w/c 10th January 2011.

21.6 Health and Safety Control Measures

21.6.1 Site Access/Vehicle Movements

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

Safe access routes from the site gate to work Areas and any offices and/or facilities will be erected and maintained at all times throughout the course of the archaeological monitoring of the works by the Principal Contractor.

Access to the shaft will be via a Haki Stair Tower, whose depth will be increased as the depth of the shaft is excavated. At intermittent points prior to the addition of a new section of stairway, a tied and footed ladder will be used (although it may be unnecessary for C261 MOLA staff to use this).

21.6.2 Services

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

21.7 Safety of Excavations

21.7.1 Entering the trench

- Daily inspections will be carried out by the Principal Contractor before works commence.
- The MOLA site supervisor will check daily that a valid Permit to Enter is in place, before commencing work.
- 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.
- MOLA Staff will not enter a trench if it is declared unsafe by the Principal Contractor.
- The Principal Contractor will supply attendances as required in 21.8.1.

21.7.2 Shoring

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

21.7.3 Confined Spaces

- The Principal Contractor has told C261 MOLA that the shaft is **not** a confined space.

21.7.4 Tunnel Safety Course

- As the Tunnel Academy is fully booked before fieldwork can start the Prinicpal Contractor has agreed an exemption for MOLA staff under these circumstances pending availability for MOLA to attend the TSC Course. E-mail dated 31.1.12 from E Donnell, Constructions and Tunnels Safety Manager.

21.7.5 Machine Excavation

- All machining described in section 5, as specified in the Addendum to the WSI, will be monitored by MOLA Senior Archaeologist/Site Supervisor, but will at all times be under the control of the Principal Contractor.

21.7.6 Hand Excavation during Watching Briefs and Evaluation

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

21.7.7 Lone Working

- 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 conducting single person watching briefs, which works are to be monitored. The MOLA Supervisor will only be providing an attendance to observe, monitor and record the defined Principal Contractors works and therefore will not be working alone.
- In particular the MOLA Supervisor will not attend works or enter excavations when the Principal Contractor is not present.

21.7.8 Contamination

- The Principal Contractor has stated in their method statement that soil testing has been undertaken and classed the material as non-hazardous (DSJV November 2011, p 12 section 33), but PPE is to be worn when excavating. The PPE requirements (DSJV November 2011, p 9 section 19) are stated in section 21.8.3 of this document.
- MOLA will comply with the Principal Contractor's requirements if these conditions change.

21.7.9 Unexploded Ordnance

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

21.7.10 Site Rules

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

21.8 Planning and Resources

21.8.1 Principal Contractor's Supply of Attendances

The site specific requirements for services, facilities and attendances to be provided by the Principal Contractor, to enable MOLA to undertake the defined archaeological works are set out above. Those items in **bold (21.8.1.1) will be required** for this site – others may be required (□), depending on site conditions, which will be reviewed on site by the MOLA Supervisor in conjunction with the Principal Contractor's nominated Site Manager (these requirements will be communicated to the Principal Contractor in the event that they are needed):

21.8.1.1 Likely to be required

- ***site accommodation*** **and welfare facilities with electricity and water.** To include furnished main base cabin as office/work space; separate male/female changing areas, toilets and washing facilities with water; drying 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. It is provisionally estimated that accommodation etc for up to 1 to 3 people will be required for the watching briefs.
- ***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.
- ***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.
- ***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.
- ***supply of plant and equipment***; principally a 360 degree tracked mechanical excavator of minimum 12 ton size; supplied with driver, breaker, toothed digging bucket (if required/permitted by services) and flat-bladed ditching bucket. 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.
- ***transport/mounding/storage of spoil*** from archaeological investigation areas. This includes removal from site, if necessary.
- ***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 principally be via the initial concrete ring and installation of subsequent ring segments forming the shaft, but locally within the shaft area may be via benching/battering back and/or shoring, depending on a depth and ground conditions.
- **adequate *ventilation*** and protection from noise, fumes and dust where plant is in use, especially within confined spaces or standing buildings
- ***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 watching briefs with small numbers of staff, MOLA may not be able to supply a qualified first aider. In that case, the services of the Principal Contractor's qualified first aider(s) may be required.
- ***Secure storage*** for finds, and for tools and equipment.
- ***managerial services*** – nominated points of contact for Principal Contractor and other key members of development team.
- ***technical advice*** to be available if required (eg via client or Principal Contractor's consulting engineer) re protection of adjacent streets and buildings, removal of obstructions, depth of excavation, live services etc.
- ***pumping-out (dewatering/drainage)***: a suitable method to keep the trenches dry, eg pumping into a previously investigated trench, to create a sump.

21.8.1.2 Unlikely to be required

- *specific site security*: it may be necessary to separately secure individual archaeological working areas via a physical barrier (such as Heras fencing) eg if there are public areas nearby or human remains are encountered.
- other safety measures in deep excavations, including monitoring of air quality and provision of rescue facilities and equipment in any areas defined by the Principal Contractor or MOLA as a Confined Space.
- *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).

- *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 shaft or standing building.
- *filling back and reinstatement* upon completion (trenches are normally backfilled, for safety reasons, unless there are client instructions to the contrary).

21.8.2 Equipment

Equipment will be supplied by the MOLA equipment central store

- First Aid Kit
- Hand tools, dumpy levels, stationary, grid pegs, digital camera, etc.

Any specialised equipment (such as power augers – *not required or permitted within the Shaft*) will have certification of maintenance kept at MOLA headquarters.

21.8.3 PPE

The PPE requirements are stated in the DSJV method statement (November 2011, p 9 section 19).

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)

Hi-visibility vests (EN471) – orange

Safety footwear - steel toecap and mid-sole boots and Wellingtons EN345-47 (No riggers are allowed)

Gloves Nitrile, PVC, EN374

Safety spectacles – low impact (EN166)

If required: Dust masks plain and valved (EN149 2001)

Additional PPE to the above will need to be supplied by the Principal Contractor

21.8.4 Staff

The timing and overall duration of the watching brief tasks listed earlier will be determined by the contractor's programme and the nature and extent of any surviving

remains. It is envisaged that the Watching Briefs will be initially carried out by one MOLA Supervisor, with further archaeologists and/or specialists when required. In particular, a geoarchaeologist will be required during the excavation of the alluvium to Allerod deposits (when a Senior Geoarchaeologist may take over supervision of the site from the Senior Archaeologist).

It is *provisionally* estimated that 1 to 2 archaeologists and specialists might generally be required on site, rising to 1 to 6 if required. MOLA will notify the Principal Contractor if more staff are required.

21.9 Briefing Arrangements

21.9.1 MOLA Staff Induction – New Starters

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

21.9.2 Site Specific Inductions, Tool Box Talks, and Daily Briefings

- 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.
- The C305 Principal Contractor will present a daily briefing, before the start of work each day, to all personnel working on site. This will outline the key risks and mitigations identified for the tasks that are planned, and serve to receive feedback on any such issues.
- Irrespective of whether the site is controlled by MOLA or a Principal Contractor, on larger projects eg those with more than 2–3 staff and of a week or longer duration, regular toolbox talks will be given by the MOLA Supervisor or other suitable member of staff using the CITB
- construction site safety tool box talks manual. As a minimum requirement these talks will occur 1–2 times per week and be of 10–15 minutes duration.

21.10 First Aid

21.10.1 Trained First-Aid Personnel

Where possible with the small numbers of MOLA staff during watching briefs and small evaluations, there will be at least one MOLA Archaeologist who is a qualified First Aider (ie 3 day FA at work course) on site. If not, the Principal Contractor's first aider(s) responsible for the watching brief task(s) will be identified by MOLA at the Principal Contractor's Induction, and their services used if required.

21.10.2 First Aid Documents

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

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

21.10.3 First Aid Equipment

For 1 to 2 person watching briefs, a 'bum bag' will be carried by the MOLA Senior Archaeologist at all times. During larger scale work, a MOLA First Aid kit, of an appropriate size for the site, will be located in the site office/mess hut/canteen.

21.11 Accident, Incident, Near Miss and Environmental Incident Reporting

21.11.1 Reporting of Accidents/Incidents and Dangerous Occurrences

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

21.11.2 Documentation

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

Principal Contractor's Site Manager

MOLA supervisor

MOLA H&S Compliance Manager

MOLA Senior/Contracts Manager

Crossrail Project Archaeologist

Crossrail Helpdesk.

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

21.11.3 Investigation of Accidents and Dangerous Occurrences

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

MOLA will also initiate internal procedures as follows

- Initial accident/incident report to MOLA Senior Contract Manager and 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.

21.11.4 Key Project Personnel

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

21.12 Emergency Procedures – Site General

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

21.13 Emergency Services Contact Details

Full A & E at

Newham General Hospital

Glen Road, London Area, London E13 8SL

020 7476 4000

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

21.14 Route to Hospital

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

22 Risk Assessments

22.1 Overall site risk assessment

MUSEUM OF LONDON ARCHAEOLOGY	**SITE RISK ASSESSMENT REGISTER**

For Site: Crossrail, Limmo Peninsula Shaft		**Type: Watching Briefs**	
Persons Affected	**No**	**Classification**	**No**
Employees	1–6	Experienced	1–6
Other workers		Inexperienced	
Public		Disabled	

Known and Suspected Hazards on site (mark as appropriate) and include numbered risk assessment in WSI

1 Access	Y	17 Contaminated Land	y	33 Plant as lifting equipment	
2 Ladders	Y	18 Weil's Disease	Y	34 Human Remains	
3 Plant	Y	19 Psittacosis		35 Public Safety	
4 Dumpers		20 UXO	y	36 Violence (to Staff)	
5 Scaffolding (inc Towers)		21 Asbestos		37 Chainsaw	
6 Excavations	Y	22 Welfare/housekeeping		38 Power Auger	
7 Work at height	Y	23 Lone working		39 Hand Auger	
8 Slips, Trips, falls	Y	24 Manual Handling		40 Foreshore/water	
9 Underground services		25 Fumes/Gas		41 Adverse Weather	
10 Overhead Power Lines		26 Dust		42 Spoil Mounding	
11 Electrical		27 Noise		43 LPG(Butane)	
12 Fire (inc LPG)		28 Deep Excavations	Y	44 Waste	
13 Confined spaces		29 Power Tools		45 Storage	
14 Breaking Out		30 Vibration		46 Animals	
15 Hand Tools	Y	31 Vehicles		47 Ionising and non-ionising radiation	
16 Spray paint		32 Lifting Equipment(Hoists)	Y	48 OTHER	

Assessment Of *Remaining* Risk From Specific Risk Assessments Included in WSI With This Register

	L	M	H		L	M	H		L	M	H
1 Access	**Y**			17 Contaminated Land	**Y**			33 Plant (lifting)			
2 Ladders	**Y**			18 Weil's Disease	**Y**			34 Human Remains			
3 Plant	**Y**			19 Psittacosis				35 Public Safety			
4 Dumpers				20 UXO	Y			36 Violence (to Staff)			
5 Scaffolding (inc Towers)				21 Asbestos				37 Chainsaw			
6 Excavations	**Y**			22 Welfare/housekeeping				38 Power Auger			
7 Work at height	Y			23 Lone working				39 Hand Auger			
8 Slips, Trips, falls	**Y**			24 Manual Handling				40 Foreshore/water			
9 Underground services				25 Fumes/Gas				41 Adverse Weather			
10 Overhead Power Lines				26 Dust				42 Spoil Mounding			
11 Electrical				27 Noise				43 LPG(Butane)			

12 Fire (inc LPG)				28 Deep Excavations	**Y**			44 Waste				
13 Confined spaces				29 Power Tools				45 Storage				
14 Breaking Out				30 Vibration				46 Animals				
15 Hand Tools				31 Vehicles				47 Ionising/non-ionising rad				
16 Spray paint				32 Lifting Equipment	Y			48 OTHER				

General Project Controls

Contracts Manager in over all charge of project is: Elaine Eastbury Tel: 020 7410 2237, m. 07730 646063

Supervisor(s) in daily charge of project is: TBC

Number, training and experience of supervisors will be sufficient for the project.

Supervisor(s) holds IOSH Supervising Safely Cert: TBC – but Probable.

All staff will comply with the: MOLA H&S policy, Principal Contractors site rules, all WSIs, Risk assessments, safe systems of work, Permits to work.

All staff will have sufficient training and experience for the tasks they undertake, or be under close supervision.

All staff will be CITB H&S tested and hold a CSCS card appropriate to their profession.

All staff will be fit to undertake their work.

All staff will be inducted on first day of work, briefed on the WSI and the specific hazards and control measures attendant on their work on site.

Tool box talks/staff briefing will be conducted on the hazards and control measures on a regular basis (at least weekly or more frequently if circumstances dictate).

Appropriate PPE to be worn.

First Aid kit on site, First aider/appointed person on site. Nearest accident and emergency unit located and contact numbers obtained.

On General Watching Briefs, Archaeologists will not enter the trench(es) but will observe from the top and record and photograph the brickwork removed by machine.

Competent Person(s) appointed to take action:	**All Risk Assessments seen by (initials)**	
Ian Grainger H&S Compliance Manager	**PM**	**Archaeologists**
Contract Manager: Elaine Eastbury	**SA(s)**	
Senior Archaeologist – TBC	**Client**	
Senior Geoarchaeologist – TBC	**Contractor**	
Crossrail site manager – Juan Azofra		
Principal Contractor – DSJV Safety Manager Ernie Donnel	**Other**	

MUSEUM OF LONDON ARCHAEOLOGY	**RISK ASSESSMENT**	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0001**
	PROJECT: CROSSRAIL, LIMMO PENINSULA		
	ACTIVITY/TASK/HAZARD: ACCESS	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 05.09.11**
	TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 05.09.2012**	

Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
	L	M	H					
Fall of persons from height Fall of objects from height Slips Trips falls Collapse of structure ACCESS is Haki stair tower, supplemented by ladder prior to addition of stairway 'lifts' (see separate RA)	 L L	M M		Staff/ Contractors / Visitors	All access routes will be kept clear of debris/obstructions/hazards. All safe access routes will be clearly sign posted. All hazards will be marked and in an exclusion zone. All access routes will be well lit. All stepped access will be maintained in good condition. All sloping access will be at 45 degrees or less and maintained in good condition. All access routes will be inspected daily, after adverse weather, or when it is altered. Pedestrian access routes will be separate from Machine/vehicle access whenever possible	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required
All persons affected by this hazard must be made aware of the contents of this Risk Assessment								

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT** / **REFERENCE NO: 0002**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: LADDERS	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.08.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.08.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Fall of person from ladder Fall of materiel from ladder Collapse/slippage of ladder Injury to persons below Uncertain if MOLA staff will need to use ladder access to shaft between installation of stairway 'lifts'	L	M M M		Staff/ Contractors / Visitors	Ladders will be of correct length and type. Ladders will be subject to daily inspection when in use. Ladders will project at least 1.50m above stepping off point. Ladders will be securely fixed at top and base (where practicable). Ladders will be at an angle of 75 degree (1:4 ratio over length). Ladder will be grounded on firm level ground . Painted ladders will not be used. Damaged ladders will not be used. Aluminium Ladders will be used in preference to timber. Always make sure that any load can be carried comfortably with one hand free for ladder. Large loads to be left in the shaft until the next stairway 'lift' is completed, where practicable.	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY **RISK ASSESSMENT**	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0003**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: PLANT	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.08.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.08.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Persons Struck by Machine Shovel or load dropping Hydraulic fluid spray Overturning of machine Fire/explosion Initially a 45t excavator at ground level, subsequently a 8 to 12t machine within the 20m+ dia shaft If you know what type of machine will be used say so EG 360 degree tracked excavator, 180 degree wheeled (and therefore road legal vehicle) JCB, mini digger, tonnage, breaker?		M M M L		Staff/ Volunteers Contractors/ Visitors/ Public?	MOLA staff not certified or trained to operate plant and will not do so. Plant operator must be trained and certificated and fit to work – uncertificated drivers will not be allowed to operate plant on site Plant must be inspected and certificated as fit for use before work commences. Plant operator must conduct daily inspection of plant. Defective plant must not be used. Service and repair only by qualified contractor. MOLA staff will not work with or near plant operator obviously under influence of drugs/alcohol or otherwise behaving erratically. All plant operations for MOLA to be under supervision of DSJV banksman, and MOLA supervisor where applicable. All staff working near machine to ensure that the operator has seen them and that they are maintaining a safe distance Separate pedestrian areas and routes to be established and barriered where practicable. Plant to be traffic managed on site e.g. Speed restrictions for JCBs, designated routes and work areas. Plant to be switched off and secured when not in use. Particularly overnight/weekends. MOLA staff to briefed on plant operations and changes to those operations. Warning signs to be displayed as appropriate. Ear defenders to be worn with standard PPE when there are high Noise levels e.g. breaking out operations	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY	**RISK ASSESSMENT**	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0006**
PROJECT: CROSSRAIL, LIMMO PENINSULA			
ACTIVITY/TASK/HAZARD: EXCAVATION AREAS & TRENCHES		**COMPLETED BY: I Grainger**	**DATE COMPLETED: 07.09.2011**
TO BE READ IN CONJUNCTION WITH: MS		**OVERALL REVIEW DATE: 07.09.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Collapse of sides Striking existing services Persons falling in Plant, bucket, and materials falling in Flooding hazardous atmosphere	L L	M M M		Staff/ Contractors / Visitors	Service plans will be consulted by DSJV prior to commencement where available and appropriate, and measures put in place to avoid , isolate, or decommission live services. Cable location by competent person will be undertaken prior to commencement. A ground Contamination report has been obtained prior to commencement where available and applicable and measures put in place to reduce the risk to staff. A competent person will determine the depth for the installation of shoring/ battering back, shoring will be installed by competent persons and inspected and maintained by them daily/each shift Edge barriers, Access scaffolding/Ladders, will be erected, maintained and inspected by competent persons – see RA 0001, 0002, 0028. Appropriate warning and information signs will be displayed. All hand tools will be fit for use and visually inspected before use - RA0015 All Plant/lifting equipment/power tools will be inspected and certified as fit for use by competent person before use and inspected daily thereafter. The training and certification of plant operators will be checked, prior to the start of work. Un-certificated plant and plant operatives will not be allowed to operate on site. See RA 0003, 0032. A Pump or pumps will be provided for use by DSJV if flooding is an issue and will be inspected and certified prior to use. A certified and tested gas monitor will be provided and used where required.	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required
All persons affected by this hazard must be made aware of the contents of this Risk Assessment								

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0007**
PROJECT: CROSSRAIL, LIMMO PENINSULA			
ACTIVITY/TASK/HAZARD: WORK AT HEIGHT		**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.09.2011**
TO BE READ IN CONJUNCTION WITH: MS		**OVERALL REVIEW DATE: 23.09.2012**	

Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
	L	M	H					
Falls of Persons Falls of materials and equipment Work is being undertaken in a shaft up to *c* 10m deep – there should be minimal MOLA work adjacent to the head of the shaft, except for access.		**M** **M**		Staff/ Contractors / Visitors	Safe access ensured by: Fixed Ladders (RA 0002) or Haki staircase (see RA 0001) Robust and suitable Edge protection will be provided by the Principal Contractor (double rail, 1.5m high barrier on top of the capping beam). Safety harnesses and lanyards will be provided if required and secured to suitable fixed point Warning signs will be in place Toe-boards/mesh/chutes in place to prevent falling debris where appropriate Workers below will be protected by an exclusion zone if appropriate Staff will be task briefed before commencement Staff will be suitable for work at height and comfortable doing so All equipment will be checked daily/before each shift by competent person Permit to work in operation	**L**	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0008**
	PROJECT: CROSSRAIL, LIMMO PENINSULA		
	ACTIVITY/TASK/HAZARD: SLIPS, TRIPS, FALL (On Level)	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.09.2011**
	TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.09.2012**	

Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
	L	M	H					
Injury to self and others Dropping of equipment/materiel		**M** **M**		Staff/ Contractors / Visitors	All work areas to be kept free of obstruction and debris. All work areas to be well lit. All safe pedestrian routes to be sign posted. Dangerous areas to be sign posted and subject to exclusion zone. All protective barriers to be in place as appropriate. All surfaces to be kept level and dry where practicable. Staff to be physically fit for the conditions on site. All staff to be briefed on safe pedestrian routes and changes thereto. All visitors to be inducted and accompanied by site staff. Supervisor to assess work in adverse weather – eg heavy rain, snow, ice, high winds etc and suspend work if appropriate	**L**	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

RISK ASSESSMENT	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0015**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: HAND TOOLS	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.09.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.09.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Eye Injury Injury to hands, feet limbs and torso Manual handling/Back injury Direct impact from tool Impact from flying debris. **Covers use of: Mattock, Shovel, spade, pick axe, trowel, draw hoe, garden fork, hand shovel, brush, lump hammer, sledge hammer, chisel, bolster and similar simple non mechanical tools**	L	M M M M		Staff/ Contractors / Visitors	All hand tools to be bought from reputable supplier and to industry safety standard? Hand tools to be delivered to site in good condition by equipment officer. Supervisor to inspect tools on delivery. Appropriate PPE to be worn – eg eye protection and gloves as well as standard P. Staff to be task briefed where applicable. Staff to be fit and able to use tools, Staff to be experienced in the use of tools. Adequate training and supervision to be given to inexperienced staff Adequate breaks/rest periods.	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT** / **REFERENCE NO: 0018**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: WEILS DISEASE (LEPTOSPIROSIS)	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.09.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.09.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Leptospirosis: bacteria transmitted by rat faeces and urine surviving in standing water, damp ground Fever like symptoms (leptospirosis) can lead to organ failure/death – Weils Disease Transmission via broken skin or ingestion Site is *c* 40–50m from the River Lea. Rats also cause: • Bites and scratches. • Damage to food and property. Identify and deal with any significant rat presence on site prior to commencement of works where possible.	**L**			Staff/ Contractors / Visitors	All staff to be briefed on hazard at general induction and site induction where applicable. All staff to carry HSE G 406 instruction card All staff will: • wear gloves, • maintain high standard of personal hygiene, • Clean and Cover any cuts or abrasions promptly with a waterproof plaster, and • wash hands before eating or drinking. There will be no eating drinking and smoking outside designated areas. Welfare facilities will be kept dry, tidy and secure. All food will be kept covered and secure all food. Supervisor will maintain basic visual surveillance of staff for flu like symptoms. Staff to report ill health to supervisor Staff should register with their doctor that they work in environments where Weils disease may be a problem	**L**	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0032**
	PROJECT: CROSSRAIL, LIMMO PENINSULA		
	ACTIVITY/TASK/HAZARD: LIFTING EQUIPMENT (HOISTS)	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.10.2011**
	TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.10.2012**	

Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
	L	M	H					
Injury from falling bucket Injury from falling material Injury from lifting mechanism Failure of mechanism Initially, a 30t–45t excavator at ground level will be used without other spoil removal. Following this, a crawler crane will be used, under the lifting plan for each operation to lift a 12m^3 skip/bucket.	L	M M M		Staff/ Contractors / Visitors	The hoist will be installed by trained and competent contractors, **not** MOLA staff. Only trained and certificated contractors will operate the hoist, **not** MOLA staff. The **hoist will be inspected daily** by a person competent to do so and its use not continue if any faults are noted until such time as they corrected and certified as being so. Staff will report any defects (e.g. unusual engine noise, juddering) in the hoist or hoist operation immediately to the supervisor and cease using it until such time as it has been inspected and repaired as necessary by a person competent to do so. The Safe Working Load (SWL) of the hoist will be displayed and not be exceeded. The skip or bucket being used will be of an appropriate size and shape for the task and area it is to be used in. It will display its SWL and will not exceed that of the hoist. Rule 24.17 of MOLA H&S policy will apply and be adhered to: **the area where the hoist is in use will be an exclusion zone** while the skip/bucket is being raised or lowered or in the interval between unless the precautions of rule 24.16 are in place.	**L**	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY **RISK ASSESSMENT**	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0024**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: MANUAL HANDLING	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.10.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.10.2012**	

Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
	L	M	H					
Spinal/back Injury Sprain/ strain injury to other body parts Puncture/abrasions/cuts from dropped loads Falls of person from height and on level – slips trips. Repetitive strain/upper limb disorders	L L L L	M		Staff/ Contractors / Visitors	Remove the need for manual handling where possible by using mechanical aids e.g wheel barrows on site and use hoists and lifts for vertical lifts. Reduce horizontal and vertical distances by delivering load as close to delivery point as possible. Reduce size and weight of individual load items where this will not render task more harmful – e.g. excessively prolong duration. Ensure that team assigned is sufficient in number to avoid overloading individuals – e.g. two people to an object where necessary. Ensure that route is planned well lit, obstruction free, and as dry as possible with the minimum amount of stairs possible. Liaise with other contractors on site to ensure route kept safe, use lookouts as appropriate. Avoid excessive manual handling tasks in poor weather conditions. Assess staff for physical fitness and suitability before commencement. Rotate staff and/or ensure suitable and sufficient breaks for prolonged tasks. Use gloves and other PPE as appropriate. Assess weight before lifting item and stay comfortably within personal lifting capacity. When picking up load. Stand close with feet slightly apart. Crouch do not bend at waist. Keep head up and maintain natural curvature of spine. Thrust/lift through hips. Keep object close to body. Maintain clear field of vision. Do not run. **Use MOLA Manual handling check lists for all significant manual handling tasks 0024a-e :** Planks, ladders and boards Drums/round containers Bags and sacks Finds/irregular shaped objects on site Office work – boxes etc	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required
All persons affected by this hazard must be made aware of the contents of this Risk Assessment								

MUSEUM OF LONDON ARCHAEOLOGY	**RISK ASSESSMENT**	**AREA: LIMMO SHAFT**	**REFERENCE NO: 0017**
PROJECT: CROSSRAIL, LIMMO PENINSULA			
ACTIVITY/TASK/HAZARD: CONTAMINATED LAND		**COMPLETED BY: I Grainger**	**DATE COMPLETED: 05.09.2011**
TO BE READ IN CONJUNCTION WITH: MS		**OVERALL REVIEW DATE: 05.09.2012**	

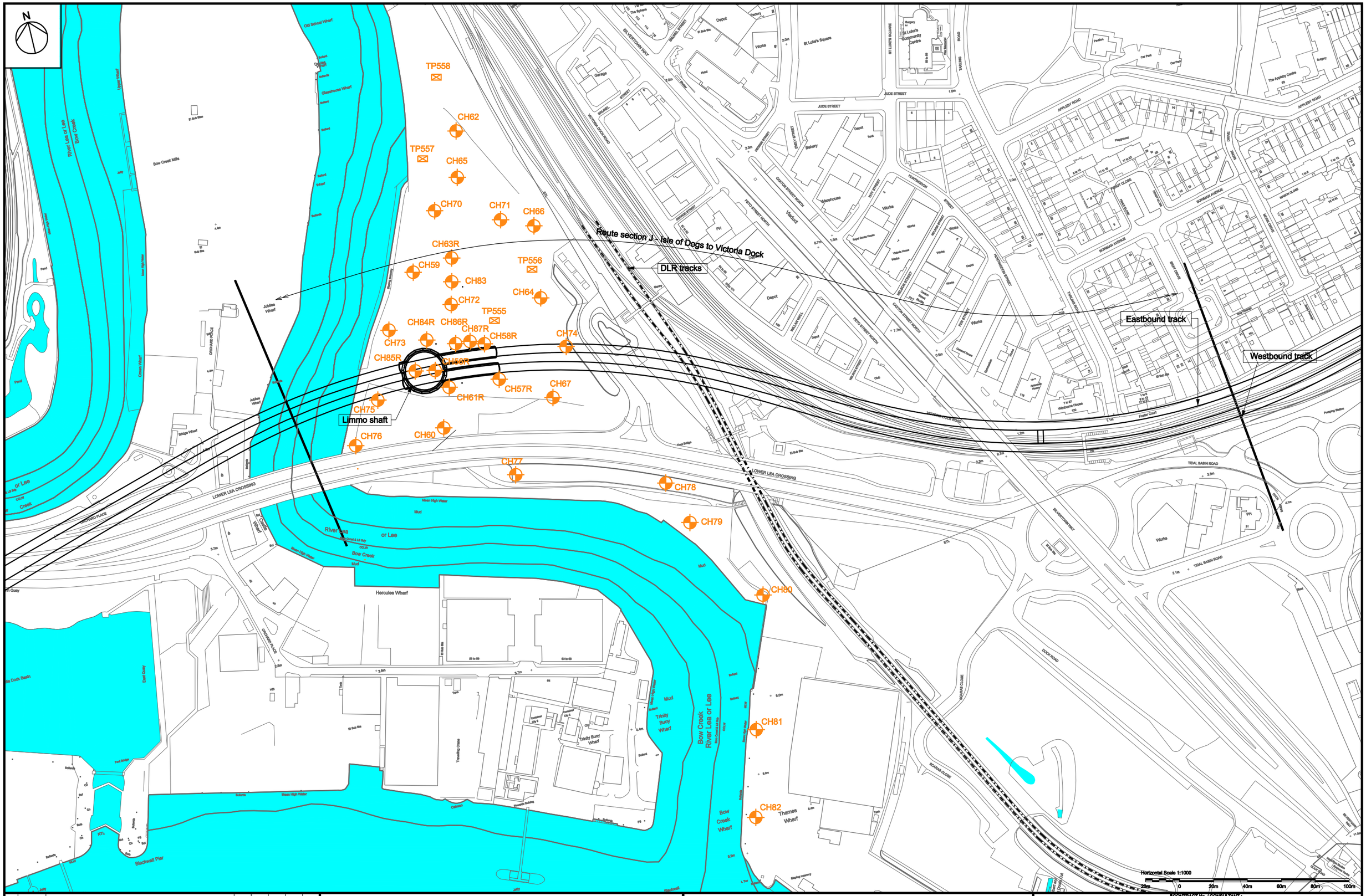
Hazards	Initial Risk Rating			Persons Affected	Control Measures	Remaining Risk	Action By	Reviewed/amended
	L	M	H			L/M/H	(initials)	On site (date &initials)
Presence solid/liquid form of contaminants Gas/fumes/odour/airborne particles Ingestion, inhalation, dermal contact Pollution of water table, drains, water supply Pollution of atmosphere Contamination report for overall Limmo Peninsula site has been obtained (C123 – Intermediate Shafts, Limmo Peninsula Contaminated Land Report, C123-JUL-T1-RST-CR144_SH011_Z-00002. V2 18-03-11), suggesting that suitable (unspecified) PPE will be required, as well as precautions to suppress dust. The localised hotspots for Cyanide and Tar-like substances are more than 50m from the shaft. Other results summaries are: Lead, PAH (primarily benzo(a)pyrene), TPH, arsenic, cyanide and barium exceeding human health criteria in Made Ground across the site; A slightly elevated concentration of metals, (especially copper, in all strata) and in leachate samples from the Made Ground. Ground gas (methane and carbon dioxide) has been detected in … Made Ground and Alluvium. Although gas concentrations (particularly methane) have been high, no flow was measured and as a result the site can be classified as being …low risk. However, the DSJV method statement for the current shaft site states that: Soil testing has been undertaken and classed the material as non hazardous, but PPE to be worn when excavating. Only standard PPE (including gloves) is listed.	L L L L L L			Staff/ Contractors / Visitors	Copy of contamination report for overall Limmo Peninsula site has been obtained. Spoil will be mounded correctly and covered as appropriate by the Principal Contractor Dust levels on site will be controlled by the Principal Contractor Staff will be briefed on the known or suspected contaminants and resulting safe system of work by the Principal Contractor at induction Washing facilities with hot and cold water, soap and towels will be provided by the Principal Contractor . High standard personal hygiene will be required. Wash hands before eating, drinking, smoking. There will be no eating, drinking, smoking, in contaminated areas (or anywhere on site apart from designated areas). Gloves will be worn in the contaminated areas. Supervisor will conduct basic health surveillance of staff. Staff will report all ill health immediately to supervisor. Staff will report all suspected contaminants – strange smells, strange looking deposits, liquids etc to supervisor. Work will cease in that area until the contaminant is identified and a safe system of work in place.	L	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment

MUSEUM OF LONDON ARCHAEOLOGY	***RISK ASSESSMENT***	**AREA: LIMMO SHAFT** / **REFERENCE NO: 0021**
PROJECT: CROSSRAIL, LIMMO PENINSULA		
ACTIVITY/TASK/HAZARD: UXO (Unexploded Ordnance)	**COMPLETED BY: I Grainger**	**DATE COMPLETED: 23.09.2011**
TO BE READ IN CONJUNCTION WITH: MS	**OVERALL REVIEW DATE: 23.09.2012**	

Hazards	Initial Risk Rating L	M	H	Persons Affected	Control Measures	Remaining Risk L/M/H	Action By (initials)	Reviewed/amended On site (date &initials)
Explosion Fire Injury to persons Damage to property No specific UXO hazards appear to be suspected on site, but the East End/Docks area was heavily bombed in WWII, suggesting a Low risk. Note UXO includes Both British and enemy bombs, shells mines, anti-personnel devices, grenades, bullets, ammunition of all sizes, as duds fired, ordnance discarded/dumped and stored, from any period, not just bombs from the two C20 world wars.	L L L L			Staff/ Contractors / Visitors	Project will be planned to avoid areas of known or suspected UXO presence if possible. MOLA will Liaise with/notify MOD, Police, local authority, or others as appropriate before work commences. Follow instructions given by these bodies. Site specific induction will be given to all staff working on project to cover the known or suspected UXO risks. The Induction will include photographs and diagrams of suspected ordnance. Photographs and diagrams of suspected ordnance will be prominent on site notice boards. Tool box talks will be undertaken to remind staff of hazards. Staff will report all discoveries of UXO to supervisor. Staff will Vacate area immediately and it will be cordoned off. Supervisor will Inform UXO specialist contractor if on site. Supervisor will if possible from visibly inspect device from safe distance to make sure its not a known object like a gas cylinder or fire extinguisher Supervisor will inform police, contract manager, and Hand S Manager. Supervisor will not to instruct staff to re-enter area until given all clear by competent authority. No staff will re-enter area until told it is safe to do so by supervisor.	**L**	CM Elaine Eastbury ACM Nick Elsden SA/Sen Geoarch DSJV Crossrail site mgr	Weekly review required on project by PO/SA or HSM, amend control measures when circumstances change if required

All persons affected by this hazard must be made aware of the contents of this Risk Assessment



REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A01	$$date	FOR ISSUE	NM	$$a	$$v		

Key

- Existing Boreholes

Package 19a

- Proposed boreholes
- Proposed trial pit

CROSSRAIL LIMITED
25 CANADA SQUARE
CANARY WHARF
LONDON E14 5LQ
TEL : 020 3229 9100
www.crossrail.co.uk

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.

CONTRACT No. / CONSULTANT :
C122 ATKINS ARUP DESIGN TEAM

TITLE :
PROPOSED BOREHOLE LOCATION PLAN CROSSRAIL GROUND INVESTIGATION PACKAGE 19A SHEET 1 OF 2

SCALE :	DRAWING AND CAD FILE No :	REV :
1:1250 @ A1	P40401-C1M00-G00-D-05025	A01

RESTRICTED