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TECHNICAL DIRECTORATE

Archaeology

Specification for Evaluation & Mitigation (including Watching Brief)

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1 Introduction

- 1.1.1 This document sets out the specification for archaeological evaluation, mitigation and watching brief. For the purposes of this document the term 'archaeology' is restricted to resources below-ground (including remains of archaeological, palaeo-environmental and quaternary geological importance). The wider definition of archaeology set out in the Crossrail Generic Written Scheme of Investigation (WSI) (Document CR-XRL-T1-GST-CR001-00003) includes important above-ground non-listed historic features and structural elements of historic interest. Evaluation and mitigation for the above ground archaeology (e.g. building appraisal and recording) is excluded from the scope of this document since it is dealt with separately in the Crossrail Procedure for Non-listed Built Heritage Recording (Document CRL1-XRL-T1-GPD-CR001-00001). Statutorily listed historic buildings and Scheduled Ancient Monuments are also excluded from the scope of this document since they are the subject of separate agreements with the local planning authorities/English Heritage and a Scheduled Monument Agreement with the Department of Culture, Media and Sport and English Heritage.
- 1.1.2 It is intended that the specifications in this document shall be incorporated within each of the Crossrail Site-Specific archaeological WSI's (SS-WSI's) during the detailed design phase. Text from this document (modified where necessary) will be inserted, as appropriate in the relevant sections of the SS-WSI (notably in sections 5 (Scope of the Investigation), 6 (Programme), 7 (Specification for the investigation), 8 (Description of required deliverables), 9 (Results of consultation and site monitoring), 10 (Personnel requirements) and 11 (References and glossary of terms). Further information regarding this is given in section 3 of this document.
- 1.1.3 The Generic WSI sets out the range of evaluation and mitigation methods (referred to later in this document as *event types*) which may need to be implemented in order to address the archaeological (and geo-archaeological) assessment and recording requirements of a particular site. These include:
- Topographic survey
 - Geophysical survey
 - Metal detector survey
 - Geo-archaeological investigation (boreholes and coring)
 - Watching brief
 - General watching brief
 - Targeted watching brief
 - Archaeological Investigation (i.e. trial trench evaluation (trial pits or trenches) and archaeological excavation)
- 1.1.4 This document may be revised and reissued as necessary during the detailed design and construction phases of the project.

2 Terms of Reference

2.1.1 The following meanings are applied to specific terms used in this document:

Archaeological Contractors – the archaeological framework contractor commissioned to undertake the works.

Archaeology Design Consultants -Working under instruction from, and reporting to, the relevant Project Archaeologist, Archaeology Design Consultants (ADCs) will be responsible for the design of a particular work package (i.e. design contract) during the detailed design phase.

Principal Contractor – the construction contractor responsible for the site on which archaeological works are being undertaken. Archaeological requirements will apply equally to any sub-contractor(s) employed by the Principal Contractor.

The Works – the specific archaeological assessment, evaluation and mitigation works as described in the relevant SS-WSI.

Project Archaeologists – the archaeologist assigned by Crossrail to design and/or supervise a particular work package.

The Project Manager – the manager assigned by Crossrail as responsible for the design and delivery of construction works within which archaeological works are taking place or proposed.

The Employer: *Crossrail Limited (CRL Ltd)* – or other novated organisation responsible for project delivery.

Crossrail – refers to where an instruction or information is provided by the Crossrail Limited (i.e. the Employer) or their agents (this is likely to be issued by the Project Archaeologist or Project Manager).

Site – A specific Crossrail worksite or group of worksites that together are being addressed as a combined archaeological mitigation programme of assessment, evaluation and mitigation.

Fieldwork event type – a specific archaeological assessment, evaluation or mitigation action (as listed in section 1.1.3).

Intervention – Any exploratory hole (e.g. borehole, core), trial pit, evaluation trench, or area excavated for archaeological purposes

2.1.2 Please refer to the Generic WSI for a glossary of other common terms.

3 Guidance on using this Specification

3.1.1 The SS-WSIs have been produced in accordance with a standard Crossrail template (set out in the Crossrail Specification for Site-Specific WSIs (Document CRL1-XRL-Z1-RSP-CRG03-50001)). As a minimum, site-specific WSIs will contain the following main sections:

Section 1: One page Executive Summary

Section 2: Project background for worksite (or group of worksites)

Site location – including map and description

Geology and topographic setting

Archaeological and historical development of the site – including a summary of relevant previous studies (e.g. Crossrail Environmental Statement and Supporting Technical Reports, DDBA, description of existing deposit models for the site) with particular focus on evidence of previous disturbance (density and layout of previous piling, foundations, services and basements etc.)

Section 3: Construction impact summary and outline mitigation design – identifying the likely impacts on the deposit sequence from the enabling and main construction works and description of suggested mitigation (in outline terms)

Section 4: General and specific aims of the fieldwork - including research design objectives of the investigation and research aims

Section 5: Scope of the investigation & field methodology

Type of mitigation survey/investigation required and quantification – description of the type of proposed investigation(s), the sequence of works, any decision making milestones and the quantity of deposits to be investigated or assets surveyed or other action (for non-listed built heritage assets).

Section 6: Programme for the investigation – description of the order and sequence of works and outline programme

Section 7: Specification for the investigation – referring to the standards set out in the Generic WSI and Specification for Evaluation & Mitigation (i.e. this document), identifying any variations or additional specification required to undertake the works.

Generic standards (collection and disposal strategy for artefacts and ecofacts, arrangements for immediate conservation of artefacts, post-fieldwork methodology, report preparation (method), publication and dissemination proposals, copyright, archive deposition)

Spatial survey setting out and recording requirements

Use of plant and materials

Hand excavation and recording (drawn, written, photographic records)

Required attendances

Nb. This section may need to be updated during the course of the works to include any additional archaeological requirements which are identified e.g. extending the scope of a fieldwork event to resolve the full mitigation of the site.

Section 8: Description of required deliverables

Archaeological Contractor's Method Statement (including specific strategies for finds, environmental and human remains procedures and information management)

Archaeological Contractors Health and Safety documents

Programme, Programme Risk Assessment, Cost Plan & Resource Plan

Survey Report, Interim Statement, Summary Report, OASIS Summary Sheet, Fieldwork Report

Digital Datasets & Site Archive

Site Condition Photographs, Progress Photographs and Reports

Publication and Dissemination requirements

Section 9: Site monitoring & progress reports

Section 10: Personnel requirements (staff roles, resource profile and required qualifications)

Section 11: References

- 3.1.2 This document does not provide any further guidance with regards to the completion of Sections 1, 2, 4 and 6 of each SS-WSI.
- 3.1.3 Text from Sections 5, 7, 8, 9, 10 and 11 of this document is designed to be inserted, as appropriate, into the equivalent sections of each SS-WSI.
- 3.1.4 For some sections, the model text can be inserted with minimal alteration. Paragraphs in normal text are designed to be exported straight into SS-WSI's with minimal need for amendment.
- 3.1.5 For other sections, text is provided in *italics*. Such paragraphs are for information only and provide guidance on the issues and standards to be considered. They are not designed to be inserted wholesale into the SS-WSI but it is expected that such text will form the basis of the site specific statements and requirements.
- 3.1.6 Archaeology Design Consultants will be required to modify the guidance text to suit particular event types and specific site or sub-site conditions. For example, in Section 7 of the SS-WSI, it may be necessary to describe the specification for several event types. As a result, the sub-section numbering used in this document will not be replicated exactly in each SS-WSI.

[NUMBERED SECTIONS FOLLOW, FOR INCLUSION IN SITE SPECIFIC WSI'S]

5 Scope of the investigation and field methodology

5.1 Scope

5.1.1 The Works shall comprise a [insert event types as set out in Section 1.1.3 - e.g. trial trench evaluation (trial pits or trenches); Topographic survey, Geophysical survey] of [xx No. describe scope, i.e. 0.5m of radar survey, 5 mechanically excavated trial pits etc] . The survey design and location of the sampling points are shown on drawing number xxxxxxxxxx (Add Ref).

5.2 Event Data

5.2.1 *A unique number site code for each event shall be provided by the Project Archaeologist as agreed with the Museum of London Archaeological Archive and Research Centre (LAARC) or other museum depository outside of the Greater London area, before fieldwork commences. For the Greater London area, Crossrail has previously agreed a project series prefixed XR. For other museums or local authority areas any specific requirements shall be provided by the Project Archaeologist.*

5.2.2 The event data for the works is detailed in Table 1 below. The Archaeology Contractor shall not vary this data unless agreed with the Project Archaeologist in writing.

[Table 1 Example]

Contract Area/Site	Event Name	Event Type	Drawing Number (s)	Event Code
MDC3 Pudding Mill Lane	PML borehole survey	Evaluation (Boreholes)	Xxxxxxxxxxxx	XR-PML08
	<i>Add events as required.....</i>			

Table 1: Event Data



6 Programme

6.A.1 *Archaeology Design Consultants to insert archaeology programme details in SS-WSI accordance with the Generic WSI and the project construction programme.*

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7 Specification for Evaluation & Mitigation (including Watching Brief)

7.1 Generic Standards

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

- Crossrail strategies and procedures;
- IFA Standards and Guidance (*state as required*);
- Museum of London collections and archive policies and guidance;
- English Heritage –Geoarchaeology, 2007;
- English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003;
- GLAAS Archaeological Guidance Papers 1999;
- Corporation of London archaeology guidance – Planning Advice Note 3, 2004;
- Museum of London Archaeology Service site recording manual (MOLAS 1994);
- English Heritage – Understanding Historic Buildings – A guide to good recording practice 1996;
- [*Add others as required*]

Potentially nationally important remains

- 7.1.2 Where unexpected, potentially nationally important archaeological remains (as defined in the Crossrail Environmental Minimum Requirements and Generic WSI) are identified during the works, the Archaeology Contractor shall undertake works in accordance with the Environmental Requirements (archaeology) section of the relevant package Works Information and shall adhere to procedures as set out in the SS-WSI.
- 7.1.3 The Archaeology Contractor shall submit details of their procedure for excavating and recording potentially nationally important remains in the Archaeology Contractor's Method Statement.
- 7.1.4 *Archaeology Design Consultants to insert the procedure (or reference to the procedure) to be followed in the SS-WSI, identifying any specific individual roles or circumstances that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised by the Archaeology Contractor in the assessment of the significance of such discoveries and the timescales to be adhered to.*
- 7.1.5 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Archaeology Design Consultants to incorporate any additional specific primary fieldwork event aims.

Human Remains

- 7.1.6 Certain aspects of the normal legal procedure for the removal of human remains (and associated monuments) from burial grounds has been modified by Schedule 15 to the Crossrail Act 2008. However for other aspects, normal legislation applies.
- 7.1.7 Where human remains are identified, all subsequent works must be undertaken in accordance with relevant legislative and environmental health requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information Volume 2B Part 21.
- 7.1.8 *Archaeology Design Consultants to insert the procedure (or reference to the procedure) to be followed in the SS-WSI, identifying any specific individual roles or circumstances that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries, the application process for licences and the timescales to be adhered to.*
- 7.1.9 The Archaeology Contractor shall confirm how the requirements set out in the SS-WSI will be implemented as part of their procedure for excavating and recording human remains in the Archaeology Contractor's Method Statement. This should incorporate best practice guidance e.g. Council for the Care of Churches (1999) and English Heritage (2002 and 2002a).
- 7.1.10 At sites known in advance to have a high risk of encountering human remains, provision shall be made by the Archaeology Contractor for site inspection by a recognised specialist.
- 7.1.11 Should human remains be discovered, the Archaeology Contractor shall notify the Project Archaeologist immediately so that these procedures can be implemented. This notification may be initially made personally or by telephone but shall be confirmed in writing within 24 hours of discovery. The Project Archaeologist shall notify the Project Manager.
- 7.1.12 The Principal Contractor will be required to cease all works at that location until further instruction is provided by the Project Manager. The Archaeology Contractor shall undertake an initial in situ observation and assessment of the remains and shall advise the Project Archaeologist of the course of action required.
- 7.1.13 Lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation or excavation. Notwithstanding this, the Archaeological Contractor shall ensure that all burials are planned/photographed in-situ and that appropriate samples have been recovered prior to any lifting.
- 7.1.14 Visible grave goods and other obvious artefacts, shall be recorded and lifted before the end of the working day to avoid the risk of vandalism and theft. Where this is not feasible or appropriate, the Archaeology Contractor shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor. As a minimum, this will require a 24 hour comprehensive security regime until sensitive remains have been recorded and lifted.

Treasure Act

7.1.15 The Treasure Act 1996 defines 'Treasure' as:

- Any object at least 300 years old when found which is: not a coin, but has metallic content of which at least 10% is precious metal; or
- One of at least two coins with at least 10% precious metal content;
- One of at least 10 coins;
- Any object at least 200 years old designated as treasure by the Secretary of State;
- Any object which would have been 'Treasure Trove';
- Any object found with any of the above.

7.1.16 The Treasure (Designation) Order 2002 extends the definition of treasure to include:

- Finds of at least two base metal objects (other than coins) of prehistoric date; and
- Any object (other than a coin) of prehistoric date with any precious metal content.

7.1.17 All finds falling within the definitions of treasure shall be reported immediately to the Project Archaeologist and all subsequent works must be undertaken in accordance with the relevant legislative requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information Volume 2B Part 21.

7.1.18 *Archaeology Design Consultants to insert the procedure (or reference to the procedure) to be followed in the SS-WSI, identifying any specific individual roles or circumstances that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries and the timescales to be adhered to.*

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

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

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

7.2 Health and safety

- 7.2.1 *[The Archaeology Contractor shall undertake the works in accordance with the Employer's Health and Safety requirements and the Principal Contractor's Health and Safety Plan. Where specific health and safety constraints or requirements for the Archaeology Contractor's method of work are required, these shall be set out in this section and detailed in the Archaeology Contractor's Method Statement (in the Health and Safety Plan)].*
- 7.2.2 No ground intervention or other survey shall be made without approval of the Archaeology Contractor's Health and Safety Plan, Method Statement and Risk Assessment by the Project Manager.
- 7.2.3 Hand excavation or other remote sensing method may be required prior to any mechanical excavation in the first instance to locate any known or suspected below ground hazards. The Archaeology Contractor's Method Statement and Risk Assessment shall take account of any design information (including the Designer's and Principal Contractor's Risk Assessment) pertaining to above ground hazards such as buildings and other structures or public rights of way and below ground hazards such as services, utilities and infrastructure and shall contain a site specific Risk Assessment for unknown below ground hazards such as contaminants including unexploded ordnance. All appropriate mitigation measures shall be in place prior to commencement of any ground intervention or other survey.
- 7.2.4 Trial trench excavation method and earthworks support design, shall conform to Health and Safety legislation and safety standards as well as incorporating current engineering best practice, where appropriate.

7.3 Location and ground elevation of interventions and survey grids

- 7.3.1 The spatial extent of the investigation(s) shall be set out in accordance with the setting out co-ordinates supplied by the Archaeology Design Consultant. All spatial setting out and recording shall be in accordance with Crossrail standard CR-STD-005 and other standards referenced in that document.
- 7.3.2 Interventions shall be located to a horizontal accuracy of +/-500mm in relation to the detail illustrated in the contract drawing(s). The corner points of each excavation or the centre point of each soil core location shall be set out with a Total Station Theodolite or other suitable automated equipment referenced from approved Permanent Ground Markers (PGM). The positions of the trenches and survey points shall be verified by the Archaeology Contractor taking additional check measurements to additional known-location points of detail.
- 7.3.3 Surface heights shall be recorded and related to PGMs or approved Ordnance Survey Bench Marks (OSBM). The full descriptions and locations of PGMs and OSBMs known to the Employer will be supplied to the Archaeology Contractor by the Project Archaeologist. Levelling accuracy between OSBMs/PGMs and site TBMs shall be within $10 \text{ mm} \sqrt{k}$: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved OSBMs or Crossrail PGMs. Where more than one TBM is required per site the Archaeology Contractor shall establish the TBMs as part of the same closed loop.
- 7.3.4 The Archaeology Contractor shall include details of their surveying methodology within their Method Statement (see Section 8), including the setting out of the grid and how they intend to provide the project grid co-ordinates to the Project Archaeologist with the Survey Report.
- 7.3.5 The Archaeology Contractor shall ensure that all trench or excavation limits, and significant archaeology detail are surveyed 'as dug' in relation to the project grid before leaving the site. Ground level height data shall be recorded for each intervention. Survey methodology and a detailed survey record shall be provided to the Project Archaeologist within the Survey Report.

7.4 Specification for topographic survey

7.4.1 Topographic survey may be an appropriate method of recording extant earthworks as part of, or prior to, a scheme of archaeological fieldwork, or repair to a monument, or alternatively as the only record where the remains are to be presented to the public. Survey may be achieved with digital or traditional methods, but the format of the interpretative drawings generated from the survey shall be agreed with the Project Archaeologist before commencement of site work. Topographic survey specifications shall be set out in the SS-WSI in accordance with IFA and EH best practice guidelines.

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7.5 Specification for geophysical survey

- 7.5.1 Geophysical methods of prospection may be appropriate for the first stage of an evaluation process, or at subsequent stages. The particular methodologies (including intended data enhancement techniques), equipment and objectives of each type of survey shall be set out in the SS-WSI.*
- 7.5.2 Due to the widely varying applications and context of proposed geophysical surveys, the site specific methodology (including equipment, technical criteria such as data enhancement techniques and objectives of the geophysical survey to be undertaken, either as part of initial evaluation or coincident with other investigations) shall be set out within each SS-WSI in accordance with current EH guidance.*
- 7.5.3 The specification shall include as a minimum: the scope of the survey (survey types), the programme for the survey, the co-ordinate system to be used, the instrumentation required, the applied field methodology, the sample interval and density of data collection, the report and archive specification, and the future data access statement.*

7.6 Specification for metal detector survey

- 7.6.1 Definition of metal detecting: Searching for metal artefacts with a metal detector, or similar equipment, on land or underwater, irrespective of whether or not the material is recovered.*
- 7.6.2 Where proposed, the SS-WSI shall set out the scope, specification and objectives for metal detector survey in accordance with the Code of Practice for Responsible Metal-Detecting in England and Wales (English Heritage 2006 Our Portable Past) or other standard subsequently published..*
- 7.6.3 Specifications as a minimum shall identify non-pick up strategies, standards for recording, survey resolution, need for specialist artefact advice, spatial location recording standards, retention and disposal strategies and reporting and project archive requirements.*

7.7 Specification for geo-archaeological investigation (coring and boreholes)

- 7.7.1 *Specification for geo-archaeology investigation shall be in accordance with English Heritage published guidance and, where instructed by the Project Archaeologist, advice from the English Heritage regional scientific advisor.*
- 7.7.2 *The scope of any required laboratory analysis and proposed presentation of results shall be agreed with the Project Archaeologist, as appropriate to the context and scope of the investigation. Where required, laboratory analysis shall be addressed in the Archaeology Contractor's Method Statement.*
- 7.7.3 *A soil core sampler (window sampler/gouge auger/hand auger with sampling tube or similar), hand or power assisted (percussion or rotary), shall be used at each survey location to establish a measured stratigraphic profile, soil descriptions, and recover sediment samples for on- or off-site processing (according to the requirements of each SS-WSI). The proposed methodology and equipment type to be used to fulfil the aims of the investigation shall be set out in the SS-WSI and specified in the Archaeology Contractor's Method Statement. Hand excavation shall precede power assisted methods where specified in the approved Archaeology Contractor's Method Statement and/or Risk Assessment.*
- 7.7.4 Each soil core sample hole shall be assigned a unique number by the Archaeology Contractor.
- 7.7.5 Soil core sample holes shall be drilled and reinstated in accordance with the SS WSI, Works information, or other instruction from the Project Manager to protect the groundwater, minimise contamination pathways and/or address any other residual hazards. Each worksite location shall be reinstated in full prior to leaving the site.
- 7.7.6 Soil cores shall be drilled to sufficient depth to record the surface of the recorded floodplain gravels [*or other level defined in the SS-WSI*]. Should significant obstruction be encountered within the predicted depth to impenetrable deposits, an additional hole shall be drilled at a distance of 1.0m from the survey point in a direction at the discretion of the event supervisor. Should the additional hole encounter an obstruction of a similar nature the circumstances shall be recorded and the holes ceased.
- 7.7.7 Sample diameter shall be selected in consideration of local ground conditions but should be in the range of 50mm to 100mm depending on strata. Sampling tube length should be capable of retrieving minimum sample length of 400mm and maximum of 2000mm.
- 7.7.8 The Archaeology Contractor shall log the stratigraphic sequence in the field through close observation of sample contents. The logging is to follow conventional standards and include colour (Munsell colour coding), grain size, sorting, roundness/angularity, composition, fabrics, structure, compaction, fossil content (including archaeological artefacts), visible floral/faunal inclusions, secondary characteristics, unit contacts, and general observations. The sedimentary record shall be recorded through use of graphic logs and written description by the Archaeology Contractor's suitably qualified geo-archaeologist.

- 7.7.9 Wherever practicable, soil samples shall be processed and recorded on-site by the Archaeology Contractor's suitably qualified environmental archaeologist to enable identification of archaeological remains, palaeo-environmental content and potential. Any such works shall be undertaken in accordance with the Principal Contractor's environmental requirements for the site (in particular any relevant consents relating to discharge of water). In cases where on-site sample processing is not practicable, samples shall be investigated and recorded by the Archaeology Contractor at their own premises.
- 7.7.10 Samples judged by the environmental specialist to contain palaeo-environmental indicators or cultural remains shall be retained for off-site (or further) processing. Samples shall be wet-sieved through 5mm and 1mm mesh sequentially. Results shall be reported at the weekly progress reports and shall inform the survey strategy.
- 7.7.11 Each (sub)sample shall be recorded with a unique sample record number, cross-referenced to a unique soil core sample number, and a written description of the processing record made on a standard environmental recording pro-forma. Sample flots shall be recovered for further analysis at the discretion of the Contractor's environmental archaeologist. Sample residues shall be retained for further off-site processing if showing significant potential for further analysis.
- 7.7.12 Soil profile data shall be entered into a field computer for daily mapping of sub-surface topography, utilising topographic survey software. On-site interpretation of contiguous deposits shall be made to provide a sub-surface site plan to inform the survey strategy and weekly progress reports.
- 7.7.13 A colour photographic record utilising 35mm film or digital format shall be made of the site survey works whilst they are in progress to graphically demonstrate each activity. Significant soil core samples shall be photographically recorded (in colour), prior to processing. These may include significant contacts revealed in the sample window or deposits containing significant palaeo-environmental or cultural assemblages. All records shall be cross-referenced to the unique soil core sample number.
- 7.7.14 The Archaeology Contractor shall provide a detailed methodology for stratigraphic recording and presentation of results, sample recovery, sample processing and recording within their Method Statement.

7.8 Specification for watching brief

Scope of Watching Brief

- 7.8.1 *Watching brief, as defined in the Generic WSI, is a programme of archaeological monitoring (i.e. observation, investigation and recording) which is carried out by a suitably qualified archaeologist during site investigations (e.g. geotechnical test pits, boreholes and utilities trial trenches) and construction works. The purpose of a watching brief is to identify the potential of any archaeological remains that are uncovered in the course of the works and record them appropriately (as far as is reasonably practicable). The watching brief shall result in the preparation of an ordered archive which will be incorporated into the post-excavation works and into publication of the project results.*
- 7.8.2 *The Archaeology Contractor shall undertake the watching brief for all areas of ground disturbance which may potentially contain archaeological remains as set out in the SS-WSI. This shall include any activities (including those associated with site set-up and demolition) undertaken by the Principal Contractor that involve the removal of modern material, made ground and topsoil, subsoils, and superficial geological deposits such as alluvium and colluvium.*
- 7.8.3 *Areas that have been previously subject to archaeological excavation and which are known not to contain significant deposits (for example tunnels, cuttings, and areas of known large-scale modern disturbance) shall be excluded from the scope of the watching brief, unless stated otherwise in the SS-WSI. Areas that have been subject to previous assessment and evaluation (e.g. geophysical survey, surface artefact collection, geotechnical survey, trial trenching etc.) shall be included within the watching brief, as appropriate.*
- 7.8.4 *Two classes of watching brief are set out in the Generic WSI:*
- i) *A general watching brief shall comprise observation and recording of the Principal Contractor's works without constraint on their working methods.*
 - ii) *A targeted watching brief shall comprise observation and recording of the Principal Contractor's works with specific operations carried out under the supervision of the Archaeology Contractor. Under targeted watching brief, the Archaeology Contractor may impose constraints on, or require changes to, the Principal Contractors' or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works..*
- 7.8.5 *Targeted watching brief shall be used for areas of known occasional, dispersed features which are either not considered to be of sufficient significance to warrant archaeological investigation in advance of construction, or where access prior to construction has not been possible and where, as a result, there is a possibility of unexpected discoveries*
- 7.8.6 *Except in cases where unexpected, potentially nationally important, archaeological remains are discovered, the targeted watching brief shall be designed and implemented so as to avoid adverse impact on the construction programme, wherever practicable.*
- 7.8.7 *The Principal Contractor shall make allowance in their activity programme for the completion of any targeted or general watching briefs as set out in the SS-WSIs.*
- 7.8.8 *The specification for watching briefs (general and targeted) to be inserted in the SS-WSI's shall include as a minimum the following:*

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

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

Specification for watching brief

7.8.10 The Archaeology Contractor shall undertake a watching brief [*insert targeted or general*] during [*insert specific activities*] in the areas illustrated on the [*attached*] drawings.

7.8.11 The Works to be carried out by the Archaeology Contractor shall consist of two parts:

- a) Watching brief ('observation') following, and without interruption to, the progress of the Principal Contractor by a core team of archaeologists.
- b) Investigation of archaeology and remains of quaternary geological importance undertaken either:
 - by the core team, following the progress of the Principal Contractor; or
 - by additional archaeologists (the 'support team'), to be deployed to investigate unanticipated archaeological remains, where appropriate.

7.8.12 The Archaeology Contractor's core team shall consist of the Archaeology Contractor's key person (the field director) and other appropriately experienced archaeologists commensurate with the scale and nature of the Principal Contractor's works.

7.8.13 The core team shall undertake the observation and any required investigation such as they may reasonably be able to undertake.

7.8.14 The Archaeology Contractor's support team shall consist of additional experienced archaeologist. The size of the support team shall be commensurate with the scale and programme of the Principal Contractor's works. The Archaeology Contractor shall be required to supply teams of 5 and 10 persons within 24 and 48 hours notice respectively.

7.8.15 The Archaeology Contractor's core and support teams shall be advised where necessary by specialists, as appropriate and as agreed with the Project Archaeologist.

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

- The Event Code and chainage/location of the area observed;

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- The date(s) of the observation;
- Personnel employed on site;
- A description of the construction works observed;
- The works (sub) contractor and personnel undertaking and supervising the construction activity;
- Depths and extents of excavation works observed;
- Measure of confidence that any archaeological remains would have been observed and reasons;
- The areas and horizons (both those containing archaeological or remains of quaternary geological importance and those which do not) unaffected by construction activity (with special reference to archaeological sites identified for preservation in situ);
- The reasons why any particular area of the works was not observed, and noting those areas not subject to disturbance from construction;
- Location and description of any archaeological remains; and
- Location and description of any modern remains.

Investigation undertaken during watching brief

7.8.17 An appropriate sample shall be excavated from cut features and other archaeological remains of importance. Sampling of cut features shall include feature inter-sections to establish relative chronologies. The extent of sampling shall be determined by the Archaeology Contractor in liaison with the Project Archaeologist (and as discussed with the relevant local authority and English Heritage, and a quaternary specialist, if necessary) but may, for instance, include the sample excavation of a selected number of deposits (both layers and negative, cut features), recording of structural remains, drawn sections and profiles, and/or be aimed at recovering sufficient information to determine function, form, and date. Any specific variations from this specification shall be indicated in The Archaeology Contractor's Method Statement.

7.8.18 Heights for all deposits shall be related to approved Permanent Ground Markers (PGMs) or approved Ordnance Survey Bench Marks (OSBM), where reasonably accessible. Levelling accuracy between OSBMs/PGMs and site Temporary Bench Marks (TBMs) shall be within 10 mm ± k: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved OSBMs or URL PGMs. Where more than one TBM is required per site, the Archaeology Contractor shall establish the TBMs as part of the same closed loop. The Archaeology Contractor shall prepare a record of their surveying methodology for inclusion in the archive.

7.8.19 *It may not be possible to clean and record the archaeological profile of geotechnical test pits, due to health and safety or access constraints. Every effort shall be made to establish the presence or absence of archaeological deposits by establishing the absolute ordnance datum (AOD) for the height of significant deposits, including the depth of modern intrusions, key stratigraphic components and natural deposits.*

Recording standards

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

7.8.21 The recording is to include as a minimum:

- The written record of individual context descriptions on appropriate pro-forma.
- The drawn record shall normally include, plans and section drawings of appropriate features, structures and individual contexts (1:50 1:20 or 1:10). Isolated archaeological remains (artefacts) may be spot located in plan and a height provided where possible. Deposits which are regular in plan (pits and ditches) may be located though co-ordinates, annotated with dimensions, and may be recorded digitally.
- Other appropriate drawn and written records shall also be produced (for environmental sampling etc.).
- The photographic record shall be consistent with current guidance on use of digital images for archaeological records and/or consist of monochrome prints/negatives and colour transparencies. Each photograph and/or transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the event code and context/feature number. In addition, the Archaeology Contractor shall take appropriate record photographs to also illustrate the works in progress.

7.9 Specification for archaeological investigation

[This section to be provided for trial trench investigations and full excavation specifications as required]

- 7.9.1 A sufficient sample of the archaeological features and deposits revealed must be sampled/or fully excavated to allow the resolution of the aims and objectives of the work. Structures, features, or finds which might reasonably be considered to merit preservation in-situ shall not be unduly damaged.
- 7.9.2 Where modern foundations are likely to be present, the SS-WSI shall identify whether they should be left in-situ for the purposes of the evaluation or removed. Where it is clear that modern foundations have truncated certain archaeological levels they should be removed to assess lower archaeological levels. The Archaeology Contractor shall take all reasonable care to ensure that any damage is limited as far as practicable. If significant damage is likely to occur the work shall be suspended and the Project Archaeologist informed so that a technical solution can be agreed with the Project Manager.
- 7.9.3 The location and objectives of the trial excavations set out in Section 5 of the SS-WSIs have been established in consultation with the projects' statutory consultees.
- 7.9.4 Each trial excavation area will be assigned a unique ID number by the Archaeology Design Consultant. The Archaeology Contractor shall not vary this number unless agreed by the Project Archaeologist in writing.
- 7.9.5 The dimensions of each trial excavation in plan, inclusive of the trench support system employed (if required) to secure personnel entry to the excavation, shall be set out in the SS-WSI. Trial excavations shall be excavated to the base of the alluvial sequence or to a depth specified in the SS-WSI (Section 5). This shall be dependent on the agreed objectives of the excavation.
- 7.9.6 Temporary works and any required hand investigation to address below ground hazards shall be carried out by the Principal Contractor under supervision by the Archaeology Contractor in accordance with their approved Method Statement and Risk Assessment. All subsequent trial excavations shall be excavated by the Principal Contractor under supervision by the Archaeology Contractor using a mechanical excavator with toothless ditching bucket, except where the nature of the made ground or surface of the pits is such that an alternative bucket or means of breaking out prior to excavation is required (and the Project Archaeologist has agreed an alternative method).
- 7.9.7 All machine work and demolition of below-ground obstructions (e.g. removal of basement slabs) shall be carried out by the Principal Contractor under supervision by the Archaeology Contractor. The Principal Contractor shall cease work when archaeological evidence is revealed and allow the Archaeology Contractor to undertake investigation, as appropriate. An excavator shall not be used to cut arbitrary trial trenches down to natural deposits without regard to the archaeological stratification.
- 7.9.8 All undifferentiated topsoil, or overburden of recent origin, shall be removed down to the first archaeological layer. An exception to this would be where a focused soil-

sampling strategy is proposed to record and collect data from reworked soil contexts above recognisable stratified archaeological contexts. If a mechanical excavator is to be used to remove modern overburden, such as floor slabs or recent levelling layers, this shall be undertaken in spits of 0.20m-0.5m depth (dependant on specific site conditions), moving along the length of the trench or area. The Archaeology Contractor's supervising archaeologist shall use their professional judgement to determine the appropriate depth of each spit and will advise the Principal Contractor accordingly. Any variations to the excavation methodology shall be at the discretion of the supervising archaeologist and recorded in writing for inclusion in the final report to the Project Archaeologist.

- 7.9.9 Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machining.
- 7.9.10 The archaeological level shall be cleaned in plan by the Principal Contractor using a wide blade, ditching bucket or similar, with no teeth. If the machine has to re-enter the trench care will need to be taken to ensure that it does not damage underlying remains.
- 7.9.11 The Archaeology Contractor shall undertake hand excavation and cleaning of any archaeologically significant horizons, to fulfil the aims of the work. Within alluvial sequences the Archaeology Contractor shall pay particular attention to establishing the vertical extent of layers of archaeological potential and shall be aware that horizons of cultural activity may be interdigitated with horizons of sterile alluvium. The Archaeology Contractor shall supervise the excavation of each test pit in such a manner so as to allow a cumulative or continuous section to be recorded.
- 7.9.12 The Archaeology Contractor's excavation, sampling and recording policy shall be included in the Archaeology Contractor's Method Statement. This is to include, as a minimum:
- The recording of individual contexts on appropriate pro-formas;
 - Excavation plans at 1:50 scale; planning and section drawing of appropriate single contexts and features (usually at 1:20 scale for plans and 1:10 scale for inhumations and sections);
 - Photographs; and other appropriate drawn and written records; and
 - Permanent Ground Markers (PGM's), any temporary benchmarks and approved OS benchmarks shall be indicated on the relevant plans.
- 7.9.13 The Archaeology Contractor's survey and recording policy shall meet the following requirements:
- All levels shall be recorded to London Grid standards and reduced to OS datum;
 - All trial pit locations shall be electronically surveyed with reference to the London Grid and Crossrail PGM's upon the completion of fieldwork by the Archaeology Contractor;
 - The locations of trial pits shall be plotted on appropriate scale plans related to the London Grid and labelled with six figure eastings and northings; and

- The electronic survey record shall be retained with the project archive.

7.9.14 In alluvial sequences, each trial excavation shall be excavated to the base of the alluvial sequence, and shall be appropriately shored and kept free of water by the Principal Contractor to allow 'person entry' to the excavations i.e. to allow the Archaeology Contractor to undertake investigation and recording to fulfil the aims of the work.

7.9.15 The Archaeology Contractor shall identify any temporary works and dewatering requirements associated with the archaeological investigation in the Archaeology Contractor's Method Statement and shall agree the detailed arrangements for such with the Principal Contractor. The Archaeology Contractor will be required to undertake works in accordance with the Principal Contractor's arrangements for matters such as off site-spoil disposal or storage, on-site facilities and services. Relevant requirements shall be incorporated in the Archaeology Contractor's Method Statement.

7.9.16 Where areas of extensive archaeological stratification are encountered, trial trenches shall not be fully excavated. However, the horizontal and vertical extent of archaeological stratification shall be assessed by the Archaeology Contractor through implementation of an appropriate strategy including, either the excavation of features cut into horizontal stratification, limited test pitting or auguring. The aim shall be to recover suitable stratigraphic, finds and environmental samples from the full, intended depth of the trench, as far as is practicable. The exact methodology may need to be determined by the Archaeology Contractor during the excavation of individual trenches and agreed with the Project Archaeologist.

7.9.17 A sufficient sample shall be excavated from cut features and other archaeological deposits to fulfil the aims of the work. Sampling of cut features shall include feature intersections to establish relative chronologies.

Recording systems

7.9.18 The trial excavations shall be recorded by the Archaeological Contractor to the standards of current best practice. The recording systems adopted during the investigations must be fully compatible with those published by the Museum of London Archaeology Service (MoLAS 1994 3rd ED) and Museum of London (MoL 1998).

7.9.19 The recording is to include, as a minimum:

- At least one representative section at (1:10 or 1:20 scale) of each trial excavation from ground level to the base of the excavation;
- The written record of individual context descriptions on appropriate pro-forma;
- Plans at appropriate scales (1:10 or 1:20);
- Single context planning if appropriate; and
- Photographs and other appropriate drawn and written records.
- Other sections, including the half-sections of individual layers or features shall be drawn as appropriate to 1:10 or 1:20.

- 7.9.20 Site plans shall identify both London Grid and OS co-ordinates. A 'site location plan', indicating site north shall be prepared at 1:1250. Individual 'trench plans' or 'excavation area plans' at 1:200 (or 1:100) shall be prepared which show the location of archaeology investigated in relation to the investigation area.
- 7.9.21 Section drawings shall be located on the relevant plan and both London Grid and OS co-ordinates recorded. The locations of the OSBM or PGM bench markers used and any site TBM shall also be indicated.
- 7.9.22 A record of the full extent in plan of all archaeological deposits as revealed in the investigation shall be made; these plans shall be on polyester based drawing film, and be at a scale of 1:10 or 1:20 unless otherwise agreed with the Project Archaeologist. 'Single context planning' shall be used on deeply stratified sites. Drawing information shall be digitised for eventual CAD applications. The GLSMR will accept Autocad DXF or .DWG format of extent of site and location of major features with the completed Sites and Monuments Report Form.
- 7.9.23 A 'Harris matrix' stratification diagram shall be employed to record stratigraphic relationships (Harris 1993). This record shall be compiled and fully checked by the Archaeological Contractor during the course of the excavations. Spot dating shall be incorporated onto this diagram during the course of excavations.
- 7.9.24 Recording of structural evidence revealed below ground level will vary according to the level of special interest of the structure and its relationship to below-ground archaeology. Structures of little or no significance shall be noted on a site plan. Detailed element detail drawings of important features revealed in investigations may be required in accordance with the aims and objectives of the investigation.
- 7.9.25 The Archaeology Contractor shall agree the appropriate level of recording and analysis for discovered standing structures with the Project Archaeologist, in accordance with the Crossrail procedure for non-listed built heritage recording (Document CRL1-XRL-T1-GPD-CR001-00001). The Archaeology Contractor shall revise the Archaeological Contractor's Method Statement to reflect any additional requirements for built heritage recording.
- 7.9.26 The photographic record shall be consistent with current guidance on use of digital images for archaeological records and/or consist of monochrome prints/negatives and colour transparencies. In addition, the Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.
- 7.9.27 Video recording may be appropriate in some circumstances and the Archaeology Contractor shall set out proposals for such recording in the Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 7.9.28 Where appropriate a photogrammetric record or laser scan record shall be made of complex structures, features and horizons, liable to be damaged in the course of the investigation, such as buildings or parts of buildings. Appropriate technical specification and scales shall be specified in the SS-WSI and addressed in the Archaeology Contractor's Method Statement.

7.10 Specific Requirements for the excavation of trial trenches or pits

[This section shall be provided in SS-WSI's as required and altered to reflect and particular requirements or conditions at a particular worksite or package].

- 7.10.1 The Archaeology Contractor shall ensure that water is discharged and arisings from archaeological excavations are stored in accordance with the Principal Contractor's environmental protection requirements (as set out in the package Works Information and their Environmental Management Plan) and any relevant consents for the worksite. The Project Manager shall monitor discharge rates and if necessary conductivity of discharge waters to ensure compliance.
- 7.10.2 Should any material be excavated that is deemed to be contaminated or potentially contaminated it shall be investigated, controlled (e.g. placed separately from clean material) and removed from the site in accordance with the Principal Contractor's environmental protection requirements (as set out in their Environmental Management Plan).
- 7.10.3 The Archaeology Contractor shall ensure, in liaison with the Project Archaeologist that adequate protection is provided for any archaeological remains. Any specific archaeological requirements relating to backfilling shall be included by the Archaeology Contractor in their Method Statement.
- 7.10.4 The trenches shall be pumped dry by the Principal Contractor and any necessary protection measures for archaeological remains (in addition to those for below ground infrastructure, services or utilities) shall be completed prior to backfilling. Backfilling and reinstatement shall be undertaken by the Principal Contractor as specified in the package works information and in accordance with the approved Archaeology Contractor's Method Statement or other instruction from the Project Archaeologist and/or Project Manager. Generally, all backfill material shall consist of non-toxic, uncontaminated, non-putrescible, natural and inert material which shall be compacted and (if necessary) tested (dynamic compaction test or other) in accordance with a specification provided by the Project Manager. Surface conditions shall be reinstated to the required standard.
- 7.10.5 In order to protect any waterlogged remains during the works, the Archaeology Contractor may identify a requirement for trial excavations to be allowed to refill with water overnight. In such cases, the Archaeology Contractor shall request approval from the Project Manager and shall ensure that any hazards to staff or 3rd parties are minimised.

7.11 Archaeological science

[This section shall be provided in SS-WSI's as required and altered to reflect and particular requirements or conditions at a particular worksite or package].

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

possible, to permit variation of sampling strategies if necessary. Sampling strategies for wooden structures shall follow the methodologies presented in Brunning (1996).

- 7.11.7 Artefacts, biological samples and soils shall be assessed for evidence of site and deposit formation processes and taphonomy and especially for evidence of recent changes that may have been caused by alterations in the site environment.
- 7.11.8 Assessment of finds assemblages shall include x-radiography of all iron objects (after initial screening to exclude obviously recent debris) and, where appropriate, non-ferrous artefacts (including all coins). Where necessary, active stabilisation /consolidation shall be carried out to ensure long-term survival of the material, but with due consideration to possible future investigations.
- 7.11.9 Once assessed, all material shall be packed and stored in optimum conditions, as described in First Aid for Finds (Watkinson and Neal 1998). Waterlogged organic materials shall be processed in accordance with: Guidelines for the care of waterlogged archaeological leather (English Heritage/Archaeology Leather Group 1995) and Waterlogged wood: the recording, sampling, conservation and curation of structural wood (Brunning 1996).
- 7.11.10 Samples for absolute dating shall be submitted promptly to the supply laboratory proposed by the Archaeology Contractor or other supplier as agreed and instructed by the Project Archaeologist. Delivery times shall be agreed to ensure that the results are available to aid development of specifications for subsequent mitigation strategies in the SS-WSI. Where it is proposed to date human remains, the time limits for reburial imposed by Schedule 15 of the Crossrail Act (for remains removed from burial grounds) or set out in the relevant burial licence under the Burial Act 1857 (in all other cases) shall be adhered to.
- 7.11.11 Processing of all soil samples collected for biological assessment, or sub-samples of them, shall be completed as soon as reasonably practicable. The preservation state, density and significance of material retrieved shall be assessed by the Archaeology Contractor's recognised specialist. Special consideration shall be given to any evidence for recent changes in preservation conditions that may have been caused by alterations in the site environment. Unprocessed sub-samples shall be stored in appropriate conditions in accordance with the Archaeology Contractor's Method Statement.
- 7.11.12 Samples collected for geo-archaeological assessment shall be processed promptly by the Archaeology Contractor's specialist, particularly where storage of unprocessed samples is thought likely to result in deterioration. Appropriate assessment shall be undertaken as agreed with the Project Archaeologist. Where preservation in situ is a viable option, consideration shall be given to minimising the possible effects of compression and loading on the physical integrity of the site and any hydrological or chemical impacts of the proposed construction works (English Heritage 2002).
- 7.11.13 Animal bone assemblages, or sub-samples of them, shall be assessed by the Archaeology Contractor's specialist with reference to English Heritage guidance (English Heritage 2002).

7.11.14 The results from any specific investigations in Archaeological Science shall be included in the Site Archive and presented in the evaluation report or final fieldwork report. Reports shall include sufficient detail to permit assessment of potential for analysis. They shall include tabulations of data in relation to site phasing and contexts, and include non-technical summaries. The objective presentation of data shall be clearly separated from interpretation i.e. recommendations for further investigations, (both on samples already collected, and at future excavations), shall be clearly separated from the results and interpretation.

Generic specification for Environmental Sampling

7.11.15 Appropriate features and deposits shall be sampled to retrieve palaeo-environmental and economic indicators. The Archaeology Contractor shall make provision for the sampling of a wide range of contexts for potential assessment and analysis for plant and animal micro/macro fossils and soils/sediments in order to fulfil the aims set out in the SS-WSI.

7.11.16 The Archaeology Contractor shall use ten litre plastic buckets (with lids and handles), or strong polythene bags (double bagged) secured at the neck, for the recovery of bulk 'disturbed' environmental samples. An adhesive label recording the project event code, context number and sample information shall be securely fixed to a vertical face of the bucket only or attached to the neck of the bag. Labels shall be completed with an indelible ink pen. A duplicate non-adhesive label shall be inserted within the bucket or between the polythene bags.

7.11.17 The selection, preparation for and methods of taking samples together with their size, presentation and processing shall be in accordance with current best practice (e.g. IFA Standard and Guidance for Artefact and Environmental Study, Collection, Research and Conservation 2008d; English Heritage –Geoarchaeology, 2007; English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003).

7.11.18 The Archaeology Contractor shall be responsible for the protection of all samples and finds and for their transport (including loading and unloading) to the Archaeology Contractor's facilities or other location as agreed with the Project Archaeologist. Samples shall be protected at all times from temperatures below 5 and above 25 degrees Celsius and from wetting and drying out due to weather exposure.

7.11.19 Bulk samples shall normally be in the range of 10-60 litres. The size selected will depend on the likely density of macrofossils in the soil. The lower end of the range (10-20 litres) will be suitable for the recovery of macrofossils from waterlogged deposits. For non-waterlogged deposits the sample volume is likely to be in the middle to higher range (20-40 or 40-60 litres) dependant upon site activity, conditions and preservation. The residue of soil left in the bottom of any inhumations after the removal of human remains shall be retrieved for bulk processing. Vessel or pit fills containing human remains shall be processed as bulk samples to ensure the maximum retrieval of cremated bone. Cremation vessels and deposits of placed human bone within cut features may require excavation in spits. The fill residues from the excavation of these features shall be bulk sampled to ensure maximum retrieval of cremated bone, associated small finds and floral and faunal remains. All work shall be undertaken in

compliance with the generic Crossrail standards for Human Remains (see Section 7A) which may require the reburial of human remains within a specific timeframe.

- 7.11.20 For 'bulk disturbed' samples the limits of the sample zone shall be recorded and identified on plan.
- 7.11.21 The Archaeology Contractor shall use appropriately sized monolith or kubiena boxes for the recovery of 'undisturbed' monolith samples for geo-archaeological study (pollen, other microfossil and micromorphological studies etc). Care shall be taken to ensure that wherever possible only newly exposed sections are sampled to avoid contamination, desiccation and decalcification. This sampling shall be undertaken under supervision of the Archaeology Contractor's environmental specialist. Boxes shall be wrapped neatly and tightly in bin-liners or plastic sacks and secured with rubber bands. A label shall be attached to the outside (in duplicate) with site name and code, feature/context number and depths of sample.
- 7.11.22 The Archaeology Contractor shall record the depth of the 'undisturbed' monolith at the top and the bottom of the sample. There shall be a 50mm overlap between each monolith. This information shall be plotted onto a section drawing at an appropriate scale, with all levels reduced to heights relative to Ordnance Datum. Where the sample crosses archaeological context boundaries these shall be noted on the sample recording pro-forma.
- 7.11.23 Where it is not possible to insert monolith boxes, the Archaeology Contractor shall take a vertical series of small 'spot' samples. Samples shall be at 20mm vertical intervals with no more than 10mm depth being sampled. In the case of deposits with a low organic content it may be necessary to take as much as 5g or even 20g per sample. If so, sampling shall be extended laterally at a given depth in 10mm deep spits.
- 7.11.24 Where appropriate, the Archaeology Contractor shall take contiguous column samples for the retrieval of macrofossils. The individual sub-samples will be of 1-10kg, depending on the nature of the deposit and the category of material to be retrieved. Where several specialists are involved it may be necessary to take separate sub-samples for a range of palaeo-environmental evidence, for example, insects, molluscs and seeds, to ensure that adequate sub-samples are available for specialist assessment.

8 Deliverables

[This section shall be provided in SS-WSI's as required and altered to reflect and particular requirements or conditions at a particular worksite or package].

8.1 Archaeology Contractors Method Statement

The Archaeology Contractor shall provide a detailed Method Statement for the works for the Project Archaeologist's approval. The Method Statement shall be prepared in association with the Principal Contractor, taking account of their Environmental Management Plan and other relevant site information provided by them and requirements for the works set out in the Works Information (e.g. relating to health and safety, security, engineering design requirements and attendances). The Method Statement shall include, as appropriate:

- a) A resource plan and programme and CV's;
- b) The Archaeology Contractor's IT capability and proposed IT plan (including specific survey methods for on-site recording of stratigraphic profiles and sub-surface topographic modelling [*where required*]);
- c) The Archaeology Contractor's approach to Archaeological Science;
- d) The methods for survey and setting out works;
- e) The methods to address the specific event types required (trial trench, area excavation etc);
- f) The safe method of working whilst excavating trenches or pits including any temporary works required;
- g) The method for disposing of water from trenches and test pits in waterlogged ground;
- h) Site management plan to include details of the method for preparing safe access route to the working areas, the proposed site accommodation, services and welfare [*where required*];
- i) The retention and disposal policies for samples and artefacts recovered during the work;
- j) The method for excavating and recording inhumations and cremations in compliance with the generic Crossrail standards for Human Remains (see Section 7A);
- k) The method for preparation of the required reports, archive and all associated deliverables;
- l) The procedures for assessment of potential for analysis (post excavation assessment); analysis and publication proposals;
- m) The method for preparation of the digital dataset, digital drawings, and digital report deliverables;
- n) The Archaeology Contractor's methods and approach for undertaking the site based works and off site processes to completion.

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- o) The Health and Safety Plan and Site-Specific Risk Assessment (including unexploded ordnance);
- p) The Quality Assurance Plan;
- q) The procedures for on- and off- site security and emergency response plan (including environmental incidents);
- r) The method for complying with project generic and site specific environmental and consent requirements; and
- s) The Archaeology Contractor's requirements and specification for services and facilities and attendances required to be supplied by the Principal Contractor or the Employer.

[This outline shall be adapted by the Archaeology Contractor to suit the specific requirements of the works. There is no fixed order in which the information shall be set out but it should be clearly presented using section headings.]

Learning Legacy Document

8.2 Site Archives

[This section shall be provided in SS-WSI's as required and altered to reflect and particular requirements or conditions at a particular worksite or package].

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

8.3 Digital Data

- 8.3.1 The Archaeology Contractor shall produce a digital data archive of all primary field data produced during the works in accordance with ADS guidelines (Richards and Robinson 2001).
- 8.3.2 The Archaeology Contractor shall prepare and provide field and laboratory data, evaluation or excavation trench and phasing plans showing archaeological features recorded, and report text in digital form, as well as in paper form. Consideration should be given to recording electronic plans during fieldwork.
- 8.3.3 The digital archive for each fieldwork event shall be copied to CD-R or DVD (recordable laser disc) and submitted to the Project Archaeologist for archiving in the Employer's document management system.
- 8.3.4 Final reports, site plans and other illustrations shall be prepared in accordance with the Employer's Information Management standards and procedures.
- 8.3.5 All data files submitted shall be scanned by a virus detection programme updated to the most current version. The disk label shall clearly indicate:
- Confirmation that this check has been carried out (including details of the virus checking programme name and version used) and that the submission is virus free.
 - Fieldwork event name and code.
 - Supplier company name, date and QA details (as a minimum, the name, position and signature of the approver).
- 8.3.6 Prior to commencing the works, the Archaeology Contractor shall submit an example hard copy and data output of each of the data formats required (i.e. data, graphic, CAD and text) produced by their current software, for approval by the Project Archaeologist. The Archaeology Contractor shall inform the Project Archaeologist of any changes or upgrades made to approved software prior to processing any works data. The sample disk shall include data from a previous real job or jobs.
- 8.3.7 A sequential numbering of data issues shall be rigorously adhered to so that no data versions are submitted out of sequence. The organisation of the data prior to submission shall be the responsibility of the Archaeology Contractor. The Archaeology Contractor shall ensure that data originating from different sources within the Archaeology Contractor's organisation is compatible with the project requirements. The Archaeology Contractor shall nominate one person to the Project Archaeologist who is the main point of contact for matters relating to the digital data submissions.
- 8.3.8 Where errors or inconsistencies are noted in the data, by either the Project Archaeologist or Archaeological Contractor they shall be corrected by the Archaeology Contractor and a corrected data file issued to the Project Archaeologist. When a change or addition is made to the data within an issue, a complete data group shall be re-issued, not just the changed fields. This may not require complete replacement of the whole data set which includes other previous issues.
- 8.3.9 Where any changes are made to a data record between digital data submissions, the Archaeology Contractor shall record the date of the change and the name of the person carrying out the change. The Archaeology Contractor shall ensure that each data amendment is carried out correctly.
- 8.3.10 The Archaeology Contractor shall make two identical copies of the digital archive. The first copy shall be retained by the Archaeology Contractor until the expiry of the



Contract maintenance period. The second copy shall be issued to the Project Archaeologist.

- 8.3.11 A digital archive for each Crossrail site (incorporating individual event archives) shall be submitted to a regional or national data archive as agreed with the service provider by the Employer.

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8.4 Interim Statement

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

8.5 Survey Report

- 8.5.1 The Archaeology Contractor shall provide a written and graphic survey report for the works upon completion of fieldwork. Evidence shall be provided for check measurements and results of levelling for establishment of TBM's. The survey report shall be submitted by the Archaeology Contractor to the Project Archaeologist within 2 weeks of the completion of fieldwork.
- 8.5.2 The Archaeology Contractor shall prepare and submit 'as excavated' site area outlines and levels in accordance with Crossrail CAD standard CR-SDT-005. Each drawing shall identify the relevant event code and sub-site division, if applicable.

8.6 Fieldwork Report

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

Contents list

Non technical summary

1. Introduction
2. Planning background
3. Previous work(s) relevant to archaeology of site (DBA, DDBA, surveys etc)
4. Geology and topography of site
5. Research objectives and aims
6. Methodology of site-based and off-site work
7. Results and observations including quantitative report, stratigraphic report(including any constraints on site).
8. Assessment of results against original expectations (using criteria for assessing national importance i.e. period, relative completeness, condition, rarity, and group value) and review of evaluation strategy
9. Statement of potential of archaeology
10. Conclusions and recommendations for appropriate mitigation strategy (if at assessment or evaluation stage) or post –excavation assessment (if at mitigation stage)
11. Publication and dissemination proposals (in addition to fieldwork report)
12. Archive deposition
13. Bibliography
14. Acknowledgements
15. Sites & Monuments Record form
16. A3 plans

- 8.6.2 The Fieldwork Report shall provide an illustrated factual statement and statement of importance with associated assessment of potential for further fieldwork and/or analysis of the archive. The Fieldwork Report shall utilise information collected during archaeological fieldwork and from any other appropriate sources agreed with the Project Archaeologist.
- 8.6.3 The Fieldwork Report shall include sections detailing the background to the project, any previous relevant research and investigation, location and topography/geology, a description of the methodology employed and the techniques adopted. Where relevant, thesehis sections shall include location plans with scale and grid co-ordinates.
- 8.6.4 Each component of the works (e.g. stratigraphic/structural, artefactual and environmental/economic) shall be supported by a statement setting out:
- A quantification of the resource (tabulated and cross referenced as appropriate);
 - Provisional dating and evidence for residuality and intrusiveness;

Archaeology: Specification for Evaluation & Mitigation (including Watching Brief)

- The range of material, including sampling and/or taphonomic biases; and
- The condition of the material, including preservation bias.

- 8.6.5 The stratigraphic statement shall include: a description of the geomorphology and sedimentation record of the survey area; a description of the fieldwork results (brief context descriptions supported by plans and sections as necessary, with levels related to Ordnance Datum); a trench summary table indicating depths of all major stratigraphic units, and their boundaries. Photographs shall be included where appropriate.
- 8.6.6 The Archaeology Contractor shall produce a subsurface model(s) and profiles to illustrate the extent, character and depth of the major stratigraphic topology identified. The model shall be correlated with previous works within the survey area in order to inform the mitigation design. The processing software and presentation format of the data shall be included in the Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 8.6.7 The assessment of results and statement of potential shall include the Archaeology Contractor's conclusions based on the recorded data, e.g. the monument/site class represented, site/feature function and relevant parallels. The statement shall also comment on the potential of the data to address the projects' research themes. As appropriate, comment shall be made on the site as a whole and the individual components (e.g. artefactual, palaeo-environmental, economic). The statement shall utilise the criteria laid down by the Secretary of State for Culture, Media and Sport Criteria for Scheduling, to establish importance.
- 8.6.8 In reporting the results of the works, the accuracy of the original expectations and the appropriateness of the methods adopted shall be assessed by the Archaeology Contractor in order to illustrate what level of confidence can be placed on the information. The Project Archaeologist will use that information as the basis for developing any further mitigation strategy and/or further analysis and publication.
- 8.6.9 The report shall be illustrated with a site location plan, survey location plans as appropriate (to include archaeological interpretation of results), and individual trench and area plans identifying archaeological features exposed and investigated.
- 8.6.10 When submitted at evaluation stage, the report shall set out an outline recommendation for mitigation. This may include preservation in situ and/or further investigation and recording of the remains and/or watching brief. The development of a detailed mitigation strategy shall be progressed by the Archaeology Design Consultant in liaison with the Project Manager's engineering design team, the Archaeology Contractor, and the English Heritage Regional Science Advisor (and other statutory authority), as appropriate.
- 8.6.11 Copies of the Fieldwork Report shall be provided by the Project Archaeologist to the relevant English Heritage advisors (and other statutory authorities) for information.
- 8.6.12 The following shall appear in the footer or header of each Fieldwork Report:

8.7 SMR/HER Summary Sheet

- 8.7.1 The Archaeology Contractor shall complete a GLSMR or county HER/SMR Summary Sheet for the works (i.e. one per fieldwork event). The Summary Sheet shall be included in the Fieldwork Report.

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8.8 Summary Report

- 8.8.1 A short summary report of no more than 500 words (the Summary Report) for the works shall be prepared by the Archaeology Contractor for submission to the Project Archaeologist for subsequent publication within London Archaeologist or another local (county) journal or publication outlet specified by the Project Archaeologist.
- 8.8.2 The Archaeology Contractor shall submit the draft Summary Report to the Project Archaeologist for approval within 8 weeks of the completion date of the fieldwork event. The Archaeology Contractor shall allow two weeks in the programme of works for the Project Archaeologist to provide comments. The Archaeology Contractor shall include any amendments required by the Project Archaeologist in the final Summary Report which shall be submitted within one week of receiving the Project Archaeologist's comments on the draft report.

8.9 Post excavation assessment

- 8.9.1 If instructed by the Project Archaeologist, the Archaeology Contractor shall undertake a post-excavation assessment of the site archive and submit a report of their findings to the Project Archaeologist for approval. Assessment of potential for analysis shall be undertaken in accordance with English Heritage guidelines.
- 8.9.2 The Archaeology Contractor shall provide details of its current post excavation assessment procedures with their Method Statement.



9 Site Monitoring & Progress Reports

[This section shall be provided in SS-WSI's]

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

10 Personnel requirements

[This section shall be provided in SS-WSI's]

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

11 References

[This list provides the most commonly cited references and standards. Each SS-WSI shall include any additional references specific to the proposed investigation as required.]

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