TECHNICAL DIRECTORATE

Archaeology
Generic Written Scheme of Investigation

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Contents

1 Introduction

1.1 Context

1.1.1 Crossrail will deliver a high frequency, high capacity service to 37 stations linking Maidenhead and Heathrow in the west, to Shenfield and Abbey Wood in the east via 21 km of new twin-bore tunnels under central London (Figure 1.1).

1.1.2 Its main objectives are to relieve congestion and the shortage of capacity on the existing network, to support London's role as a leading financial and commercial centre, and to help kick-start regeneration and renewal in several key geographical areas. Crossrail will connect services on the Great Eastern, Great Western and North Kent mainlines with central London.

1.1.3 The delivery of Crossrail is in two distinct parts: central and surface sections.

1.1.4 The central section (Figure 1.2) proposes eight new stations at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel, Canary Wharf and Woolwich. A surface station at Custom House shall also be constructed. Main construction worksites shall be established at seven tunnel portal sites at Royal Oak (west of Paddington), Pudding Mill Lane (west of Stratford), Victoria Dock (west of Custom House), the two existing Connaught Tunnel portals, North Woolwich (east of Silvertown) and Plumstead (east of Woolwich). Shafts are also to be constructed at Fisher Street, Stepney Green, Limmo Peninsula, Mile End and Eleanor Street.

1.1.5 Network Rail is responsible for the design, development and delivery of the surface sections of Crossrail that are on the existing network, covering 90km of track and 28 stations from Maidenhead in the west to Abbey Wood and Shenfield in the east.

1.1.6 Improvements include platform extensions to allow longer trains to run, step-free access at the majority of the stations, refurbishment of station buildings and ticketing facilities, as well as other steps to improvement train reliability such as turnback facilities. Several bridges near stations on the route will also be redesigned to allow for over-head electrical cables. A rail underpass west of Acton Yard and a flyover structure at Stockley will allow Crossrail trains to access Heathrow.

1.1.7 New train maintenance facilities shall be constructed.

1.1.8 More detailed information on the proposed scheme is included in the Crossrail Environmental Statement (ES)[1].

Figure 1.1: Crossrail route

[1] See Section 9 for full references relating to the Crossrail Environmental Statement.

Figure 1.2: Overview of the Crossrail Central Section: portals, stations and shafts

1.2 Archaeological works to date

1.2.1 The ES and supporting Specialist Technical Report (STR): Assessment of Archaeology Impacts present the outcomes of the archaeological studies undertaken as part of the Environmental Impact Assessment and the results are not repeated in detail here.

1.2.2 The ES and STR set out the archaeological resources (i.e. the baseline conditions) that have been identified through desk-based studies. The archaeological assessment has included evaluation of the likelihood of archaeological resources being present in land affected by the project, their importance and the extent to which they will be physically affected by the construction and operation of Crossrail. The significance of impacts has been assessed by evaluating the magnitude of the predicted impact in the context of the importance or sensitivity of the potential resource and as a result, mitigation measures to reduce the significance of impacts were identified.

1.2.3 Relevant statutory bodies have been consulted on the findings of the archaeological assessment and their views on appropriate mitigation measures have been taken into account in the ES (see Section 8.1).

2 Legislation & policy background

2.1 The Crossrail Act

2.1.1 The Crossrail Hybrid Bill was introduced to the House of Commons on 22 February 2005 and, following parliamentary scrutiny, the Crossrail Act received Royal Assent on 22 July 2008. The Bill was accompanied by an ES[1] which present the outcomes of the archaeological studies undertaken as part of the Environmental Impact Assessment (see Section 1.2.2).

2.1.2 The Crossrail Act disapplies various legislative provisions (see Information Paper B1, Disapplication of Legislation). Matters relating to archaeology and built heritage are set out in Schedules 9, 10 and 15 of the Crossrail Act. A non-technical explanation of the arrangements contained within these schedules is set out below, and information on the alternative provisions that have been made where legislation has been disapplied is provided in Table 2.1.

2.1.3 Schedule 9 to the Crossrail Act disapplies the listed building consent regime in respect of listed buildings, buildings in conservation areas and ancient monuments that might be affected by certain works required to construct the railway (as specified in the table in Schedule 9). For those specified works to listed buildings for which Schedule 9 removes the need for listed building consent, the Secretary of State has required the nominated undertaker to enter into agreements known as Heritage Deeds with local planning authorities and English Heritage.

2.1.4 Under a Heritage Deed, a method statement will need to be submitted for the specified works to the local planning authority for its approval, as well as to the national amenity societies and English Heritage for their comment. In the language of a Deed, the works are termed a 'works specification'. The method statement will describe how the works specification will be undertaken. If the local authority deems that the works details set out in the method statement do not fall within the works specification, or if the method statement is inadequate, or if they do not have regard for the heritage value of the buildings, it may either refuse approval or grant it subject to reasonable amendments or requirements.

[1] See Section 9 for full references relating to the Crossrail Environmental Statement.

2.1.5 Agreements setting out the detail of the works and requiring relevant consultations and approvals of detail and of mitigation arrangements have been entered into by the nominated undertaker with the relevant local planning authorities and English Heritage in relation to listed buildings and with the Department of Culture, Media and Sport (DCMS) and English Heritage in relation to Scheduled Ancient Monuments (SAMs).

2.1.6 Schedule 10 to the Crossrail Act provides certain targeted rights of entry to English Heritage (i.e. specifically tailored to the circumstances of Crossrail), given that their traditional rights of entry are, in effect, disapplied or qualified by virtue of paragraph 5 of Schedule 9.

2.1.7 Clause 50 of the Act disapplies existing ecclesiastical and other law in relation to any burial ground required to be used for the Crossrail works. In relation to any such land in which human remains are interred, this disapplication is conditional on the removal and reinterral or cremation of those remains in accordance with a bespoke regime set out in Schedule 15 of the Act which is designed to ensure that any such remains and monuments are dealt with in an appropriate manner. This regime is identical to that provided in the Channel Tunnel Rail Link Act 1996, which in turn draws, where relevant, on earlier burials legislation of wider application.

2.1.8 In relation to disturbance of human remains or monuments on land which does not have the appearance of a burial ground, Crossrail will follow the Ministry of Justice Statement on burial law and archaeology (2008) and any subsequent advice issued by that department or successor.

2.1.9 Unless a piece of legislation is expressly or impliedly disapplied or modified by the Crossrail Act it will continue to apply as normal to the design and construction of Crossrail. For example, legislation which remains in place includes the Treasure Act 1996.

Table 2.1: Heritage Provisions in the Crossrail Act

Schedule 9	**Heritage: Disapplication and modification of controls**
Paragraph 1	Lists in a table the buildings affected where listed building or conservation area consent would be required under the Planning (Listed Buildings and Conservation Areas) Act 1990 but is disapplied in relation to Crossrail. It is proposed (in the Planning and Heritage Memorandum) that an agreement will be made with each affected local planning authority and English Heritage as appropriate, covering the site-specific arrangements for each of the listed buildings affected by the Crossrail works and set out in the Table in paragraph 1 of Schedule 9 to the Act.
Paragraph 2	Lists in a table the listed buildings for which protective works may be required (e.g. to protect the building in relation to ground settlement). In relation to these buildings similar disapplications as those above apply, save that the disapplication of section 7 of the 1990 Act would only apply to works for the alteration or extension of the building which are carried out in exercise of powers conferred by the Act for the purpose of maintaining or restoring its character as a building of special architectural or historical interest. The agreements referred to under Paragraph 1 above will also deal with mitigation provisions for these buildings.
Paragraph 4	Disapplies certain sections of the Ancient Monuments and Archaeological Areas Act 1979 in respect of Crossrail works, most notably those relating to powers of entry and the requirement to secure consent for any works affecting a scheduled monument. The Planning and Heritage Memorandum states that it is proposed that an agreement will be made with the DCMS and English Heritage in relation to Scheduled Ancient Monuments (SAMs) and, should the works be of a type that would normally require scheduled monument consent this agreement will be the process by which they are approved.
Paragraph 5	Modifies the powers of entry (to obtain information about ancient monuments and historic buildings of records kept by English Heritage) under section 36 of the National Heritage Act 1983.
Schedule 10	**Heritage: Rights of entry**
Paragraph 1	Provides for anyone authorised by the Historic Buildings and Monuments Commission ("the Commission" i.e. English Heritage) to enter land on which a scheduled monument is situated to inspect, advise and observe as appropriate. Anyone authorised by the Commission may also enter any land in Greater London for the purpose of inspecting or observing the works in respect of any building that would, but for Schedule 9, require listed building consent or conservation area consent.

Schedule 15	Burial grounds: removal of human remains and monuments
Paragraph 1	Requires the nominated undertaker to publish and display notice of intent to remove any human remains or monument before any such removal, and sets out what such a notice should include. No notice is to be required in cases where the Secretary of State has notified the nominated undertaker that he is satisfied that the remains are more than a hundred years old, and that no relative or representative of the deceased is likely to object. Nor is a notice to be required in cases where the nominated undertaker already holds a licence to remove human remains under section 25 of the Burial Act 1857 ("the 1857 Act").
Paragraph 2	Sets out the circumstances in which the nominated undertaker may issue a licence, allowing for the removal and reinterment or cremation of human remains, to a qualifying relative or representative of the deceased, upon written request within the required period. The reasonable costs of removal and reinterment or cremation will be paid by the nominated undertaker.
Paragraph 3	Allows the nominated undertaker to remove human remains where no written request by a relative or representative is received, or where a licence has been issued but the remains have not been removed after 28 days. Such remains are to be reinterred in a burial ground or cremated in a crematorium.
Paragraph 4	Sets out the arrangements to apply to the removal of any monument associated with any human remains removed under the Schedule. Where a licence has been issued, the relative or representative of the deceased may also remove the monument associated with it, to re-erect it elsewhere or to dispose of it. The reasonable costs of so doing will be paid by the nominated undertaker.
Paragraph 5	Allows the nominated undertaker to remove any monument associated with any human remains he removes, or, where a licence has been granted, a monument has not been removed within 28 days. The nominated undertaker can also remove any monument associated with any human remains the subject of a licence held under the 1857 Act. Monuments removed may be re-erected where the remains are re-interred, or at some other appropriate place, or, failing that, are to be broken up and defaced.
Paragraph 6	Sets out the.records required to be kept by the nominated undertaker in respect of any human remains or monuments removed under the Schedule. There are requirements on the nominated undertaker to provide, within two months of their removal, a certificate containing certain particulars in respect of any removal of remains to the Registrar General and a record in respect of any monument removed to the relevant local authority and Registrar General.

2.2 Provisions outside the Crossrail Act

2.2.1 There are a variety of control mechanisms and mitigation strategies which fall outside of the Act. The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail[2]. The EMR consists of the 'General Principles', the Crossrail Construction Code, the Planning and Heritage Memorandum, and the Environmental Memorandum and the Register of Undertakings and Assurances and commitments given to Parliament and to petitioners during the passage of the Bill through parliament.

2.2.2 The controls contained in the EMR are a key element of the strategy for ensuring that, subject to certain qualifications, the impacts of the design and construction of Crossrail are as assessed in the Crossrail ES. Any nominated undertaker is and will be contractually bound to comply with the controls set out in the EMR.

2.2.3 The Planning and Heritage Memorandum (Annex 2 of the EMR) sets out the strategy for dealing with heritage issues and includes reference to the production of a Generic Written Scheme of Investigation (WSI) (i.e. this document). *Figure 2.1* illustrates the inter-relationships between these key documents. The Planning and Heritage Memorandum has been established in consultation with the relevant statutory bodies through the Crossrail Planning Forum and the former Heritage and Design Sub-Group[3].

[2] Crossrail Environmental Minimum Requirements for Design and Construction (3rd draft published November 2007). This will provide controls which contractors and others working to build the railway will work under and is being developed with the Local Authorities and Statutory Agencies. It will be finalised before the Crossrail Bill receives Royal Assent.

[3] The Heritage and Design Sub-Group sits under the Crossrail Planning Forum and High Level Forum which, together, act as the focus for Crossrail consultation with local planning authorities and statutory authorities. Specifically, the Heritage and Design Sub-Group is the main place for discussion with local authorities and heritage organisations regarding Crossrail powers on heritage matters.

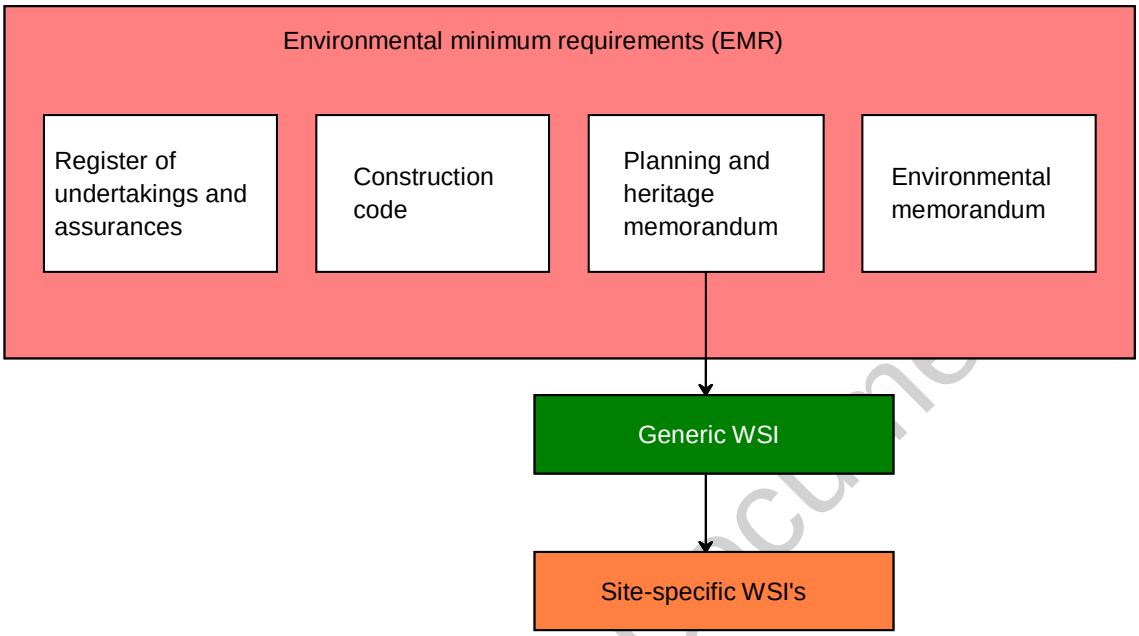

Figure 2.1: Policy Framework relating to the Generic WSI

2.2.4 In addition, a series of Information Papers set out Crossrail policies relating to the control of environmental impacts and include provisions for archaeology and heritage. These include:

- Information Paper D2 Control of Environmental Impacts;
- Information Paper D18 Listed Buildings and Conservation Areas; and
- Information Paper D22 Archaeology.

3 Objectives & scope of the Crossrail Generic Written Scheme of Investigation

3.1 Objectives

3.1.1 This document forms the Crossrail Generic WSI and sets out the project strategy for archaeology design, evaluation, mitigation, analysis, dissemination and archive deposition that will be adopted for the design and construction of Crossrail. It presents a general statement of objectives, standards and structure for the planning and implementation of archaeological works, including an explanation of technical terms and generic specification for the principal evaluation and mitigation strategies (including analysis, dissemination and archive deposition) to be used (see Table 5.1 and 6.1).

3.1.2 Although bespoke archaeological programmes will need to be produced for individual sites (to address local variation in the importance of the archaeological resources, site conditions and constraints), this document provides a structured model and guidance for ensuring that a consistent approach is applied to the design and management of archaeology across the entire Crossrail route and throughout the life of the project

3.1.3 The main objectives of the document are to:

- Outline how the arrangements and controls for managing archaeology, as referred to in the Environmental Minimum Requirements (EMR) for Crossrail including the Register of Undertakings and Assurances given by the Secretary of State, will be met in designing and constructing Crossrail; and
- Provide a common framework for archaeology which will ensure that, although mitigation design is bespoke for individual sites, works will conform to a common project standard in terms of content, format and quality of information.

3.2 Scope

3.2.1 The Generic WSI applies to all works being undertaken under the powers of the Crossrail Act, including enabling works, main works and systems and rolling stock works.

3.2.2 For the purposes of this document (and following the approach taken in the ES), the term 'archaeology' is taken to include both resources below-ground (including remains of archaeological, palaeo-environmental and quaternary geological

importance) and important above-ground non-listed historic features and structural elements of historic interest[4]. Statutorily listed historic buildings and Scheduled Ancient Monuments are excluded from the scope of this document since, for the specified works to listed buildings and monuments for which Schedule 9 and 15 remove the needs for listed building and scheduled monument consent, the Secretary of State has required Crossrail to enter into agreements knows as Heritage Deeds with the local planning authorities and English Heritage and a Scheduled Monument Agreement with DCMS and English Heritage (see Section 2.1). Notwithstanding this, mitigation for direct impacts on buildings and features that have either been listed since 2004 or where the proposed works are not as specified in Schedule 9 of the Crossrail Act is within the scope of this WSI.

3.2.3 In terms of temporal scope, this document covers the whole of the design, construction and post-excavation phases. The following section provides further information on the main phases of the project.

[4] This reflects Crossrail Policy as set out in Information Paper D22: 'The archaeological mitigation strategy will also include consideration of important above ground historic features and structural elements of historic interest, including for example buildings, structures or standing remains.'

4 Project phasing

4.1 Planning

4.1.1 During the planning phase of the project, the engineering design of the scheme was undertaken to a level sufficient to allow the preparation of the Bill documentation, including an ES.

4.1.2 During the planning phase prior to submission of the Bill a process of initial archaeological data gathering and site assessment work was undertaken as part of the EIA. This comprised scheme wide Desk Based Assessment (DBA) and some limited fieldwork in the form of monitoring geotechnical site investigations. The outcomes are reported in the ES and the Archaeology Specialist Technical Reports (STR)[5].

4.2 Design development

4.2.1 Since the introduction of the Bill in 2005, further engineering design work has taken place and some early site investigation work has been undertaken.

4.2.2 During this design development phase an ongoing archaeological review of the engineering design is being undertaken and the package of mitigation, as identified in the ES, is being updated and revised as appropriate.

4.2.3 Further archaeological data gathering in the form of Detailed Desk Based Assessment (DDBA) and field evaluation is also being undertaken in this phase to inform the design of archaeology mitigation works at selected key sites of potential archaeological significance.

4.3 Construction

4.3.1 The powers to undertake construction works are contained within the Crossrail Act. Following Royal Assent, the initial construction phase of the project comprises Enabling Works (EW) contracts (covering, for example, building demolitions, site remediation, utility and services diversion and protection works, and works to public highways, Network Rail and London Underground infrastructure). This will be followed by packages of civil contracts to build the main Crossrail works.

[5] ES Volume 1 (Paragraphs 3.7.13 to 3.7.18, and Section 5.10) and STR Volume 1 of 6 (Section 1.5).

4.3.2 Throughout construction, the requirements for archaeological evaluation and mitigation will be implemented and delivered in accordance with the programme of works as detailed in site-specific WSIs (see Section 6.3).

4.4 Associated programme of archaeological works

4.4.1 Further information on the relationship between the project phasing described above and the programme of archaeological works is set out in *Table 5.1*.

5 Archaeological works

5.1 Approach

5.1.1 The approach to archaeological mitigation for Crossrail is set out in the ES and Archaeology Specialist Technical Reports. . The archaeological assessment undertaken as part of the EIA process highlights the most sensitive archaeological sites and provides the basis for mitigation to be incorporated into the Crossrail scheme to safeguard archaeological resources. However, since the extent and significance of archaeological remains are difficult to predict (they are generally concealed below ground or by later development), many impacts reported in the ES relate to potential, rather than known resources.

5.1.2 In order to manage this uncertainty (and associated risks to the construction programme), the general approach to archaeological mitigation for Crossrail is set out in the Planning and Heritage Memorandum and Information Paper D22 (which have been established in consultation with the relevant statutory bodies through the Planning Forum and Heritage and Design Sub-Group respectively). Following the principles of Planning Policy Guidance Note on Archaeology and Planning (PPG 16) and Planning and the Historic Environment (PPG15)[6], the key provisions of the Information Paper and Planning and Heritage Memorandum in relation to archaeological mitigation are set out below.

- Prior to works commencing, the archaeological assessments documented in the ES will be reviewed. Where appropriate, additional detailed archaeological assessment will be undertaken in order to determine the need for site mitigation

[6] Subsequently replaced by Planning Policy Statement 5: Planning for the Historic Environment (PPS5).

works. Such assessment may include both desk-based research and field evaluation.

- In the event that intact and important archaeological remains are identified at Crossrail worksites through this process, it may be preferable, where practicable, to preserve these where they are found (i.e. preservation in situ).
- In all other cases archaeological remains shall be investigated and recorded (i.e. preservation by record).
- Appropriate mitigation measures will be scoped and specified in detail in individual project designs (site-specific WSIs) which will be prepared in accordance with the principles set out in this generic WSI and developed in consultation with the relevant statutory authorities.
- Archaeological information that is gained from fieldwork will be followed by analysis and publication of the results and will be transferred to an approved public receiving body (see Section 7.2).

5.1.3 This Generic WSI explains in further detail how these provisions will be implemented in practice. It is intended that a sequential process will be followed throughout the project phases (as described in Section 4) starting with detailed desk based assessment and/or field evaluation, followed by archaeological excavation and/or watching brief, and where practicable, preservation in situ. The programme of archaeological mitigation will be completed by analysis and publication of the results commensurate with their importance, and deposition of the finds and records in a public archive. This generic sequence of activities is set out in *Table 5.1* in relation to the project phasing described in Section 4. More detailed information regarding the stages of data gathering, field investigation and post-excavation analysis, reporting and archive deposition are given in Section 6.

Table 5.1: Scope and sequence of archaeological activities by project phase

Project phase	**Archaeological activity**	**Objective**
Planning[7]	Desk Based Assessment (as part of the environmental assessment).	Identify likely significant impacts and broad requirements for mitigation.

[7] This phase was completed on Act and main ES submission (February 2005).

Project phase	Archaeological activity	Objective
	Monitoring of geotechnical fieldwork. Prepare Environmental Statement (ES) & Specialist Technical Report (STR).	
Design Development	Review outline mitigation design in ES & STR to identify need for Detailed Desk Based Assessment (DDBA) and/or field evaluation at specific sites. DDBA. Prepare site-specific WSIs. Consult relevant statutory authorities on site-specific WSIs. Ongoing field evaluation.	Refine extent and significance of archaeological resource. Ground truthing of ES assessment (confirming date, character, significance of any remains). Define scope of any final mitigation.
Construction (including enabling works)	Update site-specific WSIs. Consult relevant statutory authorities on updates to site-specific WSIs. Carry out further archaeological works (e.g. appropriate excavation, recording, assessment & analysis of remains and/or watching brief). Consult relevant statutory authorities on the proposed programme of post excavation works.	Ongoing consultation. To excavate and record archaeological remains.
Post-construction	Appropriate post excavation assessment. Updated project designs for analysis of the archaeological results. Publication/dissemination of results. Archive deposition.	Determine the significance of any findings. Provide appropriate academic and public publication outputs. Dissemination of the results. Long term secure storage of any artefacts and records to allow display and future analysis.

5.2 Site-specific WSIs

5.2.1 The outcomes of the DBA/DDBA and any field monitoring works undertaken) will be used to design a package of archaeological mitigation for each Crossrail construction site which will be set out in a site-specific WSI. Each site-specific WSI will describe the local archaeological conditions, the proposed construction works and interface issues and will specify in detail the mitigation measures required for the site, including the priority order and timing of the archaeological works within the overall construction programme.

5.2.2 Site-specific WSIs will evolve as 'living documents' as the project progresses. Where appropriate, the documents will be updated periodically to reflect detailed changes in engineering design and ongoing fieldwork results e.g. from evaluations.

5.2.3 Site-specific WSIs will be written taking account of accepted industry practice and national guidelines (see Section 10). This will provide, as a minimum, the information set out in *Table 5.2*.

Table 5.2: Scope of site-specific WSIs

Content
• Introduction and background to the work. • Site-specific aims and research objectives. • Scope of the investigation. • Methodology and specification for the investigation. • Required deliverables from the investigation. • Requirements for site attendances. • Resource requirements. • Requirements for post-excavation assessment and analysis. • Options for publication and dissemination.

5.3 Research agendas

5.3.1 Excavations and other construction works provide an opportunity to increase knowledge as a result of the recording, analysis and publication of archaeological remains carried out as part of the mitigation strategy. Research agendas are designed in order to ensure that archaeological investigation is driven by identifiable and justifiable objectives and will generate properly considered research based outputs for dissemination and archiving.

5.3.2 The Specialist Technical Reports[8] (Volume 2 of 6 - 'Route Overviews') identify relevant existing research themes for 5 broad landscape zones across the Crossrail central route section (see Appendix 2). The zones were defined on topographic, archaeological and historical grounds and the research themes were selected from the appropriate published objectives contained with the relevant research framework e.g. A Research Framework for London Archaeology (2002), for the Greater London area.

5.3.3 The selected research themes highlight broad archaeological priorities across the route. However, the majority of these themes are inevitably generalised, because they are dealing with issues at a regional level. More focussed research objectives will need to be defined by Crossrail to inform the design of an appropriate mitigation strategy for individual sites or groups of sites (taking account of practicability and weighing up the relative importance of the archaeology concerned against other factors). These focused research objectives will be set out in the site-specific WSIs.

5.3.4 For key sites (as identified from DDBA and/or field evaluation), specific research objectives will be designed that reflect the relevant zone based research themes from the ES and are appropriate to the particular archaeological characteristics and potential of the site. The site-specific research objectives will be used to assist in scoping the archaeological works (including sampling strategies and the need for any specialist design or fieldwork inputs) and will be reviewed at key stages of the project e.g. as fieldwork and post-excavation assessment results become available.

5.3.5 Where appropriate, research agendas will be adapted to take into account any revised or new archaeological priorities published during the course of the project.

[8] See Section 9 for further details of the Crossrail Specialist Technical Reports: Assessment of Archaeology Impacts.

5.4 Professional codes, standards & guidance

5.4.1 Archaeological work will be undertaken by professional archaeologists who are suitably qualified and competent. Organisations undertaking fieldwork will ordinarily be expected to have Institute for Archaeologists (IFA) accreditation as Registered Archaeological Organisations and their supervisory staff to have an appropriate level of experience for the specific site in question (i.e. full members of the (IFA) or equivalent professional standing).

5.4.2 All archaeological work will be undertaken by organisations with appropriate systems for quality management to help ensure acceptable archaeological standards are achieved across the project.

5.4.3 All archaeological work will be undertaken taking into account the relevant legislation[9], published standards, accepted industry practice, national guidelines and codes of practice appropriate to Crossrail (e.g. those issued by the Institute of Field Archaeologists (IFA) and the Greater London Archaeology Advisory Service (GLAAS)). Examples of the current codes, standards and policies are included in Section 10.

[9] Where this has not been disapplied by the Crossrail Act (as explained in Section 2).

6 Site assessment, evaluation and mitigation procedures

6.1 Desk Based Assessment (DBA)

6.1.1 Archaeological DBA was carried out in 2003/4 during the planning phase of the project and the outcomes were used to establish the archaeological baseline for the scheme as set out in the Crossrail ES. The assessment involved the analysis of readily available data sources in order to identify potential archaeological resources, and the likely significant impacts of the scheme upon them.

6.1.2 For some sites, DBA will provide enough information about the importance of the resource and potential impacts upon it to enable mitigation strategies to be prepared. For other sites, further DDBA will be required.

6.2 Detailed Desk-Based Assessment (DDBA)

6.2.1 DDBA will principally be undertaken during the design development phase of the project, taking account of the following standards and guidance where relevant:

- Institute of Field Archaeologists, 2008. Standard and Guidance for Desk Based Assessment.
- Greater London Archaeology Advisory Service: Standards for Archaeological Work London Region, English Heritage External Consultation Draft July 2009.
- Corporation of London Department of Planning and Transportation, 2004 Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance, London.

6.2.2 DDBA will be targeted to sites where additional information is considered necessary to inform decisions regarding an appropriate mitigation strategy. A judgement will be made on the need for DDBA at a particular site based on:

- The importance of the known or potential archaeological resource;
- The nature of the proposed construction works; and
- Any gaps in the existing archaeology information gathered to date (for the ES and from subsequent archaeological work).

6.2.3 DDBA builds upon the information gathered previously for the archaeological assessment (i.e. undertaken for the DBA), but involves more focused and extensive research of both archaeological and non-archaeological sources of written, graphic, photographic and electronic information. The DDBA will seek to:

- Further define the potential significance and survival of resources at a given site or area (i.e. identifying the character, extent, quality and worth of the known or potential archaeological resource e.g. through deposit mapping); and
- Take into account the more detailed engineering design.

6.2.4 The outcomes of DDBA will be used to focus and refine the proposed evaluation and mitigation measures for works at a particular site to be set out in the site-specific WSIs. Field evaluation will be completed where this is appropriate and reasonably practicable, for example, where concealed archaeological resources cannot be adequately quantified without exploratory investigation.

6.3 Site-based assessment, evaluation & mitigation

Scope

6.3.1 Prior to Royal Assent, site-based archaeological work could only be undertaken subject to the agreement of the relevant landowner. Following Royal Assent the purchase of the land, or other rights as appropriate, site-based archaeological work will be undertaken as set out below.

6.3.2 There are a variety of methods which may be used for site-based assessment, evaluation and/or mitigation. *Table 6.1* highlights a range of these methods which may be appropriate for implementation as part of the Crossrail works and indicates the relevant project stage where they may be employed.

6.3.3 The outcomes of DBA and DDBA will be used to determine which of the assessment, evaluation and/or mitigation methods are appropriate for a given site and the extent of any work that is required. Detailed specifications for the archaeological assessment, evaluation and/or mitigation work will be set out in site-specific WSIs.

Table 6.1: Typical Archaeological Assessment and Mitigation Methods (to be applied on a site-specific basis as appropriate)

Recording Method	Timing		Description
	Enabling works	Construction	
Trial Trench Evaluation	✓		A targeted or sample-based mechanical or hand excavated trial trench based investigation used to record the character and /or extent of known or potential archaeological remains identified through DBA/DDBA.
Topographic Survey	✓		An archaeological site survey undertaken to record the surface topography and detail of any relevant features, including feature profiles and a photographic record where appropriate.
Walkover Survey & Field Investigation (Buildings)	✓		Non-intrusive survey techniques involving exploratory site reconnaissance (once site access is available) to examine the site configuration and former or present uses in order to identify opportunities for (or constraints on) fieldwork, examine any potentially significant structures that may merit recording (e.g. prior to demolition), identify any access constraints and to provide a photographic record.
Geophysical Survey	✓		A non-intrusive archaeological survey technique (such as Electro-magnetic conductivity or Ground Probing Radar) used to record the presence or absence of sub-surface archaeological features by scanning the soil surface, identifying areas of local variation and interpreting specific anomalies and fluctuations indicative of below ground archaeological activity.
Metal-detector Survey	✓		A non-intrusive archaeological survey technique used to record the position and distribution of metal objects recovered from a rapid survey of the topsoil with a metal-detector.
Archaeological Excavation	✓	✓	Archaeological excavation is the process of exposure, recording and recovery of archaeological remains. This may be targeted at specific locations or a sample range of locations (e.g. specific investigation trenches).
Geo-archaeological Investigation	✓	✓	A programme of sample recovery and analysis undertaken to investigate palaeo-environmental conditions and soil sediment development that may be relevant to the research of archaeological remains recovered within the vicinity. Achieved through trial pit excavations or other geotechnical soil sample retrieval methods (such as coring, CPT surveys or boreholes).
Building Recording (EH Level 1, 2, 3, 4)	✓	✓	Pre-demolition drawn, written and photographic record made to an appropriate level, as set out in English Heritage standards for historic building recording and analysis.

Recording Method	Timing		Description
	Enabling works	Construction	
General Watching Brief (GWB)		✓	A programme of observation, investigation and recording during construction utilised where remains have not been identified by DBA/DDBA or field evaluation but where there remains a realistic potential for archaeological discoveries. The main contractor's method of working would not be directly controlled for archaeological purposes, unless important archaeological discoveries are found (in which case the site method may change to Targeted Watching Brief (see below)).
Targeted Watching Brief (TWB)		✓	A programme of observation, investigation and recording of archaeological remains during construction utilised in specific cases where the likely extent of the remains has been demonstrated but where detailed investigation prior to the main construction programme is impracticable or inappropriate (e.g. due to safety or logistical considerations or environmental or engineering constraints). The main contractors preferred method of working would be controlled as necessary to allow archaeological recording to take place to the required standard.

Field evaluation

6.3.4 Field evaluation is a phase of archaeological site assessment, usually carried out in advance of the main construction works, to gather data in order to further inform the mitigation design. Evaluation will aim to minimise damage to the archaeological resource. Although there is generally a need to examine the full archaeological sequence, field evaluation will be done selectively and significant remains will normally be left in situ at this stage (so as not to prejudice any subsequent mitigation that may be required).

6.3.5 Typical field evaluation methods include non-intrusive surveys (e.g. fieldwalking, geo-archaeological investigation, geo-physical survey, standing building appraisal) and small-scale intrusive surveys (e.g. observation and recording works integrated with geotechnical site investigations, drilling of geo-archaeological boreholes and excavation of archaeological trial trenches). *Table 6.1* provides further information regarding typical field evaluation techniques that may be implemented for Crossrail.

6.3.6 Field evaluation is a selective sampling exercise, targeted to specific sites where there are significant gaps in knowledge regarding the nature, significance and extent of the archaeological resource and/or the severity of the potential impacts upon them. Where the requirement for field evaluation has been identified through DBA/DDBA, the specifications for that assessment (including survey requirements, methodology,

programme and reporting requirements) will be set out within the site-specific WSIs. The results of fieldwork will be set out in site-specific factual fieldwork reports.

Further archaeological work

6.3.7 In the event that intact and important archaeological remains are identified at Crossrail worksites through DBA/DDBA and/or field evaluation (or it is indicated strongly that they are present), consideration will be given as to whether it is preferable and practicable to preserve these resources where they are found (i.e. preservation in situ). Scope for this approach will be limited in practice and will be determined by practicability and the need to weigh up the relative importance of the archaeology concerned against other factors. Engineering solutions which may be employed to achieve this include the sympathetic design of foundations and groundworks, artificially raising ground levels over the remains using suitable materials and the maintenance of hydrological regimes. Where such an approach is adopted, the solutions will be incorporated during the design development phase and details of the requirements will be set out in the site-specific WSIs.

6.3.8 Where preservation in situ is not preferable or practicable, experience of other similar projects suggests that preservation by record is usually the most appropriate method of dealing with archaeological finds. Preservation by record requires that any archaeological information that is gained e,g, from evaluation, excavation, watching brief, recording of above ground structures, etc, be followed by analysis and publication of the results and their deposition in a public archive.

6.3.9 The level of archaeological intervention for preservation by record will vary, depending upon the nature and significance of the remains and the severity and extent of the impacts. In some cases, archaeological evaluation or limited sample-based investigation may constitute an adequate record, whereas for particularly significant remains, full archaeological excavation and removal of material may be required. The site-specific WSIs will set out requirements for mitigation to achieve preservation by record.

6.3.10 Particular consideration will be given to site sampling strategies and the physical extent of the archaeological works required. For example, it is not always necessary to excavate a whole site or to excavate all elements of a site to an equal level of completeness in order to gain sufficient understanding of it for preservation by record. Conversely there may be a requirement to excavate more extensively or more deeply than the disturbance caused by the main construction works in order to ensure that the site is adequately understood in archaeological terms.

Watching brief

6.3.11 A watching brief, involving a programme of archaeological monitoring (i.e. observation, investigation and recording) of elements of the construction works is undertaken for two main purposes:

- To observe and undertake minor recording actions during the construction works and/or,

- As a method for managing the discovery of unexpected remains (see Section 6.5).

6.3.12 This mitigation method is not intended to replace the programme of archaeological assessment, evaluation and further archaeological works outlined above. Rather, it will be applied to sites or areas where archaeological remains have not been identified by DBA/DDBA or field evaluation but where there is still uncertainty and a realistic potential for archaeological discoveries, and to sites (or parts of sites) of low archaeological potential or impact.

6.3.13 Site-specific WSIs will set out the detailed requirements for two types of watching brief to be implemented (see also *Table 6.1*). General (routine) watching brief, involving an archaeologist monitoring the relevant construction works, will be used for low potential sites where no significant discoveries have previously been made. Depending on the archaeological potential, local site conditions and scale of the works, monitoring work may be undertaken full-time (for the duration of a particular phase of construction work) or as part of periodic site visits. If archaeological discoveries are found during general watching brief, the site will be upgraded to 'targeted' watching brief status.

6.3.14 More specific 'targeted' watching brief will be used for sites where there is a possibility of unexpected discoveries (e.g. areas of occasional, dispersed features identified at the field evaluation stage but not selected for further archaeological works; the periphery of more significant sites that have already been archaeologically excavated; and areas of potential where logistical constraints have prevented access at an earlier stage). Due to the greater potential for discoveries, a more controlled methodology will be adopted as part of the construction works. This may include archaeological supervision during the initial removal of overburden, topsoil or subsoil followed, if necessary, by localised hand inspection, assessment and recording by archaeologists. If no significant remains are discovered, the site will return to 'general' watching brief status.

6.4 Non-listed built heritage assessment & recording

6.4.1 As noted in Section 3.2.2, the scope of the archaeological mitigation strategy for Crossrail includes important above-ground non-listed historic features and structural elements of historical interest (which may include, for example, buildings, structures or standing remains) that will be, or have the potential to be, totally or partially

demolished or damaged or, permanently or temporarily removed as a result of Crossrail works[10]. The main groups are:

- Important non-listed buildings of historic interest proposed for demolition in conservation areas (as set out in Information Paper D18, Listed Buildings and Conservation Areas);
- Important non-listed historic street furniture and materials[11],
- Other important non-listed buildings and structures of historic interest outside conservation areas, for example the standing walls at Stepney Green, locally listed station buildings and railway structures and any industrial and defence archaeology of significance.

[10] This does not cover protective measures to be implemented in relation to potential damage from vibration or settlement which are dealt with elsewhere.
[11] The definition of 'furniture' is taken to include all fixtures to the roads, pavements, buildings and any other structures or features on land affected by the Crossrail works.

6.4.2 The requirement for assessment, recording and mitigation of non-listed built heritage will be set out in the site-specific WSIs.

6.4.3 Site-specific WSIs will also include mitigation for direct impacts on listed buildings and features that have either been scheduled since 2004 or where the proposed works are not as specified in Schedule 9 of the Crossrail Act.

6.4.4 Any mitigation measures required will, where relevant, be implemented prior to the commencement of the specific Crossrail works (i.e. demolition or alteration) which will impact upon them. The types of mitigation likely to be employed include inspections to check for any unexpected features of historic interest, detailed recording of the structure and/or storage of items for reuse either within the site or elsewhere.

6.5 Managing unexpected discoveries

6.5.1 Unexpected finds may be discovered either in the course of carrying out archaeological work for mitigation purposes or during the construction works themselves. The approach to archaeological mitigation set out in this document has been designed in order to reduce the probability of discovering unexpected finds. The purpose of the archaeological assessment process is to identify as many potential archaeological resources that are likely to be impacted upon by the Crossrail works as practicable in order that appropriate mitigation can be designed and programmed (within the site-specific WSIs).

6.5.2 Wherever practicable, any required field evaluation (as described in paragraphs 6.3.4 to 6.3.6) will be undertaken at an early stage (preferably prior to the commencement of the main construction contract) in order to gain greater certainty over potential impacts and to manage the risk of discovering unexpected finds.

6.5.3 Notwithstanding this approach, there is always an inherent risk of unexpected archaeological discoveries (including sites, artefacts, monuments and features) occurring during the construction works. As described in paragraphs 6.3.11 to 6.3.14, a watching brief will be implemented during construction, where appropriate, as the contingency arrangement for managing occasional unexpected discoveries.

6.5.4 The Crossrail construction contracts will specify the requirements for how the discovery of unexpected remains will be managed.

Major discoveries during construction

6.5.5 The Planning and Heritage Memorandum (Section 7.2) sets out the approach for managing unexpected major discoveries during construction (i.e. potentially nationally important remains which could not have been reasonably predicted):

> *'The approach to mitigation as set out above has been designed to ensure that the potential for discovering unexpected major finds is minimised. However, if potentially nationally important remains not encompassed by the scheme of archaeological works are discovered during the construction, the nominated undertaker will immediately alert the relevant statutory authorities. The nominated undertaker will first examine in consultation with the relevant statutory*

authorities whether preservation in situ is feasible within the limits of deviation of the project and other constraints. If preservation in situ is not feasible, the nominated undertaker will carry out archaeological excavation on the site, to achieve preservation by record. The nominated undertaker will allow a period for archaeological recording and excavation that has been determined in consultation with the relevant statutory authorities, having due regard to the construction programme, but shall not be less than 28 days. At the end of that period the nominated undertaker's works will be able to continue.

Where the Secretary of State for Transport is notified of a decision by the Secretary of State for Culture, Media and Sport, following advice from English Heritage or representations from the authority that remains investigated under these provisions are of exceptional national importance, he may after consulting the nominated undertaker extend the period available for recording and excavation, or require the nominated undertaker to take steps such as are feasible in engineering terms to preserve the remains. In those circumstances, the nominated undertaker shall comply with the Secretary of State for Transport's decision.'

6.6 Discovery of human remains & treasure

6.6.1 Section 2.1 outlines the provisions in Schedule 15 to the Crossrail Act for dealing with human remains or monuments within existing burial grounds (i.e. those which are either still in use or continue to have the appearance of a burial ground even though no burials may have taken place for some time) where the works will disturb human remains or monuments). Paragraph 6(1) of Schedule 15 requires that:

'(1) Where any remains are removed under this Schedule, the nominated undertaker shall, within two months of the removal, provide the Registrar General with a certificate which -

(a) identifies the remains, so far as practicable,
(b) states the date on which, and the place from which, the remains were removed, and
(c) states the date and place of re-interment or cremation.'

6.6.2 It is therefore implicit that any re-interment or cremation must take place within two months of the removal of the remains. The site-specific WSIs will be prepared taking account of this constraint, and also considering the potential for investigation in situ.

6.6.3 In all other cases where the works will disturb human remains or monuments, Crossrail shall follow the Ministry of Justice Statement on burial law and archaeology 2008 and any subsequent advice issued by that department or successor.

6.6.4 The Crossrail contractors will be required to implement a procedure for managing unexpected discoveries, including requirements which will apply where unexpected human remains are discovered (taking account of health and safety measures such as the use of disinfectants; oversight by environmental health officers; preservation of

public decency (e.g. screening of the site); action in the public interest (e.g. scientific examination of remains) or where discoveries are made that are subject to the Treasure Act, 1996.

6.7 Post-excavation works

6.7.1 Following the completion of site-based archaeological works and production of factual fieldwork reports, a programme of post-excavation work will be defined by Crossrail in consultation with the relevant statutory consultees.

6.7.2 Taking account of accepted industry practice and national guidelines e.g. English Heritage (see Section 10), the main stages of the post-excavation programme will be:

- Processing (collating and ordering the site archive[12]).
- Review.
- Post excavation assessment reporting and updated project design.
- Analysis.
- Reporting.
- Dissemination.
- Archive deposition.

[12] Consisting of site records (including written, drawn and photographic/digital plans), samples and finds.

6.7.3 This general programme for post-excavation works will be included in the site-specific WSIs during the design phase. However, the detailed scope of work will depend on the nature, extent and significance of the fieldwork results for each site.

6.7.4 The results of fieldwork will be set out in site-specific factual fieldwork reports, which will be reviewed to assess the need for a formal post-excavation assessment phase. The extent of the assessment may combine several site specific results where these may contribute to an overall research theme. Post excavation assessment will inform the scope of detailed analysis by considering the quality and character of the data, and reviewing the significance and potential of the archive against the objectives set out in the site-specific WSIs.

6.7.5 Post excavation assessments will set out requirements for analysis, reporting and dissemination in an updated project design for a detailed post-excavation programme. Work will be prioritised and focused on clearly defined objectives and final outputs will reflect the value of the data to provide new knowledge to the academic professional and public community.

7 Information management

7.1 Data management

7.1.1 Crossrail will develop an archaeological data management system. Information derived from archaeological evaluation and mitigation in relation to Crossrail will be managed in accordance with national archaeological reporting standards and published guidelines (e.g. Archaeology Data Service (ADS) and others as set out in Section 10).

7.1.2 This will ensure that archaeological reports will be prepared to an appropriate format, content and presentation standard and archaeological records and materials (artefactual, documentary, digital and photographic) will be quantified, ordered, and indexed in a consistent manner. In addition, all information gathered will be stored in suitable secure conditions and locations while in preparation for permanent deposition.

7.1.3 Reporting and dissemination of the outputs from the programme of archaeological works will be standardised to help ensure consistency across the project.

7.1.4 Copyright issues will be managed in accordance with legal requirements (Copyright, Designs and Patents Act, 1988).

7.2 Archive deposition

7.2.1 Site survey files will be created as a repository for all evidence collected as a result of implementing the archaeological assessment and mitigation work set out in the site-specific WSIs during the design, construction phase and post-evaluation phases.

7.2.2 Physical and digital archives will be produced taking account of accepted industry practice guidance and relevant standards (e.g. English Heritage, AHDS Archaeology Data Service (see Section 10) and the Crossrail archaeological data management system.

7.2.3 The archive will be transferred to an approved public receiving body (such as a local museum, national digital archive or other appropriate depository) where it can be permanently conserved and managed and made available for public access and dissemination.

7.2.4 The recipient museums and digital data curators will be contacted in advance to obtain agreement in principle to accept the archive and to determine any specific requirements or policies of the recipient museum(s) or digital archive curators in respect of the archive(s).

7.3 Ownership of finds

7.3.1 The transfer of ownership of finds will depend on who, in any particular case, is the owner of them and whether that is the body managing the Crossrail project or they remain in private ownership. In any case, finds will be managed in accordance with any undertaking and assurances, and common law.

8 Consultation

8.1 Planning phase (Environmental Statement)

8.1.1 During the planning phase for the ES, a programme of consultation was carried out to seek views on the scope and methodologies to be applied to the archaeological assessment (further details are given in ES Volume 1, Sections 3.3 & 3.9). The parties consulted included:

- English Heritage;
- Archaeology officers at local authorities including county archaeologists, and their equivalent within London Boroughs, and English Heritage's Greater London Archaeology Advisory Service (GLAAS); and
- Relevant national and local amenity societies.

8.1.2 Further consultation on the results of the environmental assessment was undertaken with archaeology officers at local authorities, county archaeologists and GLAAS and, where appropriate, site-specific mitigation was discussed.

8.1.3 In addition, the Planning Forum and Heritage and Design Sub-Group were set up as part of the wider consultation strategy for Crossrail to provide ongoing fora for consultation on environmental matters with local authorities and heritage organisations (see Section 2.2.3).

8.1.4 Since deposit of the Bill, the Department for Transport invited comments on the Environmental Statement and the responses were presented to both Houses of Parliament.

8.2 Design development phase

8.2.1 Paragraph 26 of Schedule 7 to the Crossrail Act requires that where a local authority considers a request for planning approval to relate to matters which may affect a site of archaeological or historical importance it consults English Heritage. The criteria in paragraph 8(2) of Circular 01/01: Arrangements for Handling Heritage Applications within Greater London and paragraph 8(3) of Circular 01/01: Arrangements for Handling Heritage Applications outside Greater London and PPG16 paragraph 23 provide guidance on when a request for approval should be considered to be of archaeological or historical importance.

8.2.2 The Planning and Heritage Memorandum (Section 7.2) sets out the requirement for site-specific WSIs to be prepared "in consultation with the relevant statutory authorities". For the purposes of this document, relevant statutory authorities will include the local planning authority archaeological advisor[13] and English Heritage Inspector of Ancient Monuments and/or English Heritage Regional Science Advisor as appropriate to the site.

8.2.3 Supporting detailed desk based assessments will also be circulated for information to the relevant statutory authorities with the site-specific WSIs.

8.3 Construction and post-excavation phases

8.3.1 During the construction and post-excavation phases, discussions with the relevant statutory authorities will continue as the site-specific WSIs are developed. This will include discussions relating to the design of site evaluation, mitigation and post-excavation works and may include requests for specific information. In preparing revisions of the site-specific WSIs, account will be taken of their observations.

8.3.2 In addition, the relevant statutory authorities will be invited to monitor the archaeological evaluation and mitigation works on site, subject to normal safety and logistical constraints.

[13] Local Planning Authorities (LPAs) obtain their archaeological advice from a variety of sources, depending upon their geographical location. For LPAs outside Greater London the County Archaeologist provides advice whilst for London Boroughs the Greater London Archaeology Advisory Service (GLAAS) provides this service (with the exception of the City of London who directly employ an Archaeology Officer).

9 References

The Crossrail Act and its accompanying Explanatory Notes (introduced to the House of Commons in February 2005 and as subsequently re-introduced and amended in the Crossrail Committees).
http://www.publications.parliament.uk/pa/cm200708/cmActs/010/08010.i-iii.html

Crossrail Environmental Minimum Requirements (comprising General Principles (2008), The Construction Code (2008), The Planning and Heritage Memorandum (2007) and The Environmental Memorandum (2008)), Cross London Rail Links Ltd, London.
http://www.crossrail.co.uk/railway/getting-approval/environmental-minimum-requirements-including-crossrail-construction-code

Crossrail Environmental Statement (Volumes 1 – 9), (February 2005) and Supplementary Environmental Statements and Amendment of Provisions Environmental Statements published subsequently (see below for full details).[14]

Crossrail Environmental Statement Document	Deposit date
Environmental Statement (ES) with Addendum and accompanying Non-Technical Summary (NTS)	22 February 2005
Supplementary Environmental Statement (SES1) and accompanying NTS	26 May 2005
Supplementary Environmental Statement 2 (SES2) and accompanying NTS	18 January 2006
Amendment of Provisions Environmental Statement (APES 1) and accompanying NTS	18 January 06
Amendment of Provisions Environmental Statement 2 (APES 2) and accompanying NTS	9 May 2006
Amendment of Provisions Environmental Statement 3 (APES 3) and accompanying NTS	7 November 2006
Supplementary Environmental Statement 3 (SES3) and	7 November 2006

[14] Unless the context otherwise requires, in this paper the term Environmental Statement ("ES") is used to refer to the totality of the environmental assessment material referred to.

Crossrail Environmental Statement Document	Deposit date
accompanying NTS	
An SES3 errata	25 January 2007
Supplementary Environmental Statement 4 (SES4) and accompanying NTS	16 May 2007
Amendment of Provisions Environmental Statement 4 (APES 4) and accompanying NTS	16 May 2007

Crossrail Information Paper B1 – Disapplication of Legislation (Version 2 published November 2007), Cross London Rail Links Ltd, London.

Crossrail Information Paper D2 – Control of Environmental Impacts (Version 3 published November 2007), Cross London Rail Links Ltd, London.

Crossrail Information Paper D18 – Listed Buildings and Conservation Areas (Version 3 published November 2007), Cross London Rail Links Ltd, London.

Crossrail Information Paper D22 – Archaeology (Version 2 published July 2006), Cross London Rail Links Ltd, London.

Crossrail Specialist Technical Reports: Assessment of Archaeology Impacts (Parts 1 to 6)[15] (February 2005), Museum of London Archaeology Service.

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Department of the Environment[17], 1994, Planning and the Historic Environment PPG15)

[15] Part 1 summarises the archaeological baseline, potential impacts, proposed mitigation and residual impacts for the whole Crossrail route. These subjects are covered in greater detail in Parts 2 to 5, which comprise detailed archaeological impact assessments for each Crossrail route section. Part 6 consists of figures illustrating the archaeological assessments in Parts 1 to 5. They show the distribution of baseline resources within the route windows (Sites and Monuments Records, excavated sites, burial grounds, Scheduled Ancient Monuments, etc).

[16] Responsibility for this guidance transferred on 5th May 2006 to the Department for Communities and Local Government and was subsequently replaced by PPS5 in 2010.

[17] Responsibility for this guidance transferred on 5th May 2006 to the Department for Communities and Local Government and was subsequently replaced by PPS5 in 2010.

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10 Standards & guidance

Crossrail design and mitigation works will be undertaken taking into account the relevant guidelines, including but not limited to the following:

AHDS Guides to Good Practice for digital archiving: http://ads.ahds.ac.uk/project/goodguides/g2gp.html

Association of Local Government Archaeological Officers, 2003 Standards for Field Archaeology in the East of England, East Anglian Archaeology occasional paper 14.

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Institute of Field Archaeologists, 2008. Standard and Guidance for Archaeological Excavation (and subsequent revisions).

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Institute of Field Archaeologists, 2008. Standard and Guidance for Archaeological Investigation and Recording of Standing Buildings or Structures (and subsequent revisions).

Institute of Field Archaeologists, 2008. Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials (and subsequent revisions).

Institute of Field Archaeologists, 2004. Guidelines to the Standards for recording Human Remains, (IFA Paper No 7).

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APPENDIX 1: Glossary of terms

ADS	Archaeology Data Service
AHDS	Arts and Humanities Data Service
DBA	Desk Based Assessment
DCMS	Department of Culture, Media and Sport
DDBA	Detailed Desk Based Assessment
EIA	Environmental Impact Assessment
EMR	Environmental Minimum Requirements
ES	Crossrail Environmental Statement
GLAAS	Greater London Archaeological Advisory Service
IFA	Institute of Field Archaeologists
PPG	Planning Policy Guidance
SAM	Scheduled Ancient Monument
STR	Specialist Technical Report
WSI	Written Scheme of Investigation

APPENDIX 2: Research themes

Set out below are the research themes identified in the ES as being appropriate to Crossrail worksites within the central route section.

Reference numbers in brackets refer to page numbers from *A Research Framework for London Archaeology* (Museum of London, 2002).

Zone A: Royal Oak to Hatton Garden (appropriate to individual worksites (or groups of worksites) within ES Route windows C1 – C5)

- Understanding London's hydrology and river systems and tributaries and the relationships between rivers and floodplains. (79).
- Understanding the evolving character of development in central London between Westminster and the City, and Southwark. (79).
- Understanding the relationships between the different urban foci within the London region (such as two urban foci of Saxon *Lundenwic* and *Lundenburh*). (80).
- Examining the concept of core/periphery for different periods in London's past, as a means of understanding a settlement and its environs, a city and its hinterland. (81).
- Contributing to our understanding of the creation of the London suburbs (81).
- Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change. (82)
- Understanding how water supply and drainage provision were installed and managed. (82).
- Considering ethnic diversity, for instance between Frisians and Vikings, and how these are represented in the archaeological record. (85).
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience – both in London and at roadside settlements around the region. (85).
- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally or nationally. (86).

Zone B: Hatton Garden to Wilkes Street (appropriate to individual worksites (or groups of worksites) within ES Route windows C6 – C7)

- Understanding London's hydrology and river systems and tributaries and, in particular, understanding the role of the river Thames (as boundary, communication route, resource, ritual focus, barrier, link, etc) in shaping London's history, and the relationships between rivers and floodplains. (79).
- Taking in large enough areas to identify where settlement ends and other features such as fields begin and developing predictive models for settlement location. (80).
- Understanding the relationships between the different urban foci within the London region (such as two urban foci of Saxon *Lundenwic* and *Lundenburh*). (80).

- Understanding the relationships between urban settlements and royal villas or religious estates. (81).
- Understanding how the proximity of London affected the lives of people living and working in the immediate surrounding area (81).
- Contributing to our understanding of the creation of the London suburbs with direct contribution to today's aspirations for an urban regeneration. (81).
- Exploring the concepts of administration and rulership, taking account of London's often unique position as *wic*, bishop's seat and royal city. (81).
- Examining the proposal that there was an ideological polarity between town and antitown systems: Roman towns did not so much fail as were discarded. (81).
- Understanding how water supply and drainage provision were installed and managed. (82).
- Refining our understanding of the chronology and function of the landward and riverside defences and extramural evidence of defensive or military structures in the Roman period. (82).
- Understanding the cultural and symbolic roles played by London's defences through the ages as reflections of power and political security or imposition and dominance. (82).
- Establishing patterns of building renewal and replacement and to understand the life cycle of buildings of different types and function, at different periods. (82).
- Charting how and why different parts of London developed as specialist producers, and understanding the implications of this for London as a world city. (83).
- Considering the changing role and influence of the military in the urban make-up of Roman London. (85).
- Addressing Saxon migration concepts, using place name and archaeological evidence, to determine if, and how, migration took place. (85).
- Researching the influence of the houses of nobility and bishops in the medieval period. (85).
- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research. (85).
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience – both in London and at roadside settlements around the region. (85).
- Understanding the differences, if any, between burial practices in the city and outlying cemeteries. (85).
- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally or nationally. (86).
- Examining the London mendicant houses in light of the many excavations that have taken place in their precincts; were the houses that occupied the City of London vastly different from those elsewhere? (86).
- Characterising assemblages for use in analytic models, where the archaeological record helps to define the nature and extent of different neighbourhoods – in social, economic, ethnic and religious terms. (86).
- The end of the Roman occupation: developing explanatory models to explain socio-political change and considering the influence of surviving Roman structures on Saxon development. (88).
- Establishing how daily work and life in London reflected and contributed to the rise of London as the commercial centre of the British Empire, and to its continuing eminence as a world city thereafter. (88).

- Examining the use in any one period of materials from an earlier period (eg Saxon use of surviving Roman fabric) and the influence on craftsmanship, manufacture and building techniques. (89).

Zone C: Wilkes Street to West India Dock North and Lea Valley (appropriate to individual worksites (or groups of worksites) within ES Route windows C8 to C10 & C12)

- Understanding the relationship between landscape, river and settlement, and the influences of the Thames in particular on communications and social interaction. (79).
- Taking in large enough areas to identify where settlement ends and other features such as fields begin and developing predictive models for settlement location. (80).
- Examining the concept of core/periphery for different periods in London's past, as a means of understanding how evolving settlement patterns reflect the need for sustainable, beneficial relationships between a settlement and its environs, a city and its hinterland. (81).
- Charting how and why different parts of London developed as specialist producers, and understanding the implications of this for London as a world city. (83).
- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research. (85).
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience – both in London and at roadside settlements around the region. (85).
- Understanding the differences, if any, between burial practices in the city and outlying cemeteries. (85).
- Examining the changing roles and diversity of religions in London society at different times. (86).
- Identifying the extent to which religious minorities and non-conformists had a distinct material culture in London, and developing archaeological models for future analysis. (86).
- Establishing how daily work and life in London reflected and contributed to the rise of London as the commercial centre of the British Empire, and to its continues eminence as a world city thereafter. (88).

Zone D: West India Dock to Dartford Tunnel (appropriate to individual worksites (or groups of worksites) within ES Route window C11)

- Understanding the significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetational and faunal development, on human lives. (79).
- Understanding London's hydrology and river systems and tributaries and, in particular, understanding the role of the river Thames (as boundary, communication route, resource, ritual focus, barrier, link, etc) in shaping London's history, and the relationships between rivers and floodplains. (79).
- Understanding the relationship between landscape, river and settlement, and the influences of the Thames in particular on communications and social interaction. (79).
- Understanding the origins of the prehistoric metalwork sequence from the Thames, and examining the links between the metalwork hoards deposited at the headwaters of river tributaries and other activities. (79).

- Studying the correlation between sites associated with watercourses and meander bends, so as to understand the origin of settlements. (80).
- Understanding the relationship between the Bronze Age wooden trackways and the settlements to which they presumably led, and what the trackways represent in terms of woodcraft and woodland management. (81).
- Understanding the development of London's Docklands and Waterways. (82).

Zone E: The Lea Valley (north) (appropriate to individual worksites (or groups of worksites) within ES Route windows C13, C13A & NE1)

- Understanding the significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetational and faunal development, on human lives. (79).
- Understanding London's hydrology and river systems and tributaries and the relationships between rivers and floodplains. (79).
- Understanding the relationship between landscape, river and settlement, and the influences of the Thames in particular on communications and social interaction. (79).
- Examining the success with which small towns in the London region adapted to the capital's growth. (81).
- Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change. (82).
- The Mesolithic/Neolithic transition: understanding the significance of horticultural experimentation at this time, and the transition from hunter-gatherers into farmers. (83).
- Understanding the nature and meaning of the deposition of metalwork in the Thames and at the headwaters of river tributaries. (86).