



Package C136 - Farringdon Station

Archaeology Site-Specific Written Scheme of Investigation

Document Number: C136-SWN-C2-JLT-M123-00001

Document History

Version	Date	Prepared by	Checked by	Authorised by	Reason for Issue
1.0	14-10-09	[REDACTED]	[REDACTED]	[REDACTED]	First Issue
		[REDACTED]	[REDACTED]	[REDACTED]	

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1 Executive Summary

The Crossrail Specialist Technical Reports: Assessment of Archaeological impacts (Part 1-6), published in February 2005 in support of the Crossrail Environmental Statement, identified the archaeological potential of the Farringdon Station area and the potential impacts of the Crossrail Scheme.

Detailed Desk-Based Assessment (DDBA) has subsequently been undertaken for the construction elements and associated worksites outlined in the RIBA D Design for Farringdon Station, developed in 2007.

Farringdon Station will comprise two new ticket halls at Farringdon Road (Western Ticket Hall) and Lindsey Street (Eastern Ticket Hall) which will be constructed within two main worksites (Cardinal House and Lindsey Street). The Crossrail works for Farringdon Station will also include utilities diversions and protective works in the streets around the worksites and compensation grout shafts to mitigate for the effects of settlement. The number, location and construction methodology of these shafts will be determined by C122 during the detailed design phase.

It has been established that basements and the underground car park beneath Cardinal House will have removed virtually all archaeological remains on the site of the Western Ticket Hall. The course of the former Faggesswell Brook is conjectured to have flowed east-west across the site somewhere between Cowcross Street and Charterhouse Street. There is a low potential that the very base of the brook may survive cut deeply into the London Clay, beneath truncation by Cardinal House.

The Eastern Ticket Hall has a high potential for the Post-medieval urbanisation of the area, moderate potential for Medieval religious institutions and associated burial grounds; Prehistoric, Roman and Medieval secular remains, topographic evidence of the Fleet Valley, evidence for late 19th to early 20th century railway infrastructure; and low potential for early to middle Saxon burials and occupation. There is a particular potential for individual deeply cut features such as burials, pits, wells and ditches in the vicinity of Hayne Street and Charterhouse Square as they are situated within the Medieval cemetery of Charterhouse.

The DDBA demonstrated that the construction of the existing underground railway line and retaining walls will have completely removed archaeological deposits from within the Eastern Ticket Hall footprint including the northern and western sides of the Lindsey Street Box. However, archaeological deposits may survive beneath basements at 20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street; and at 33-37 Charterhouse Square.

Basements in the present buildings at the Eastern Ticket Hall will have removed much of the horizontal stratigraphy, although deeply cut features such as pits, wells, burials and ditches may survive below the level of the basements. Archaeological deposits may also survive at the sites of the proposed grout shafts at 67-69 Cowcross Street and Greenhill's Rents from depths of 1m – 1.5m below ground level.

The construction of the station box at the Eastern Ticket Hall will remove all archaeological deposits that survive in its footprint. The establishment of construction compounds associated with the proposed grout shafts at 67-69 Cowcross Street and Greenhill's Rents will have no or minimal archaeological impacts. The final location of these grout shafts is to be determined by C122.

A programme of archaeological field evaluation is required at the Eastern Ticket Hall (20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street; the space between 8 & 10 Hayne Street; and at 33-37 Charterhouse Square). The results of these evaluations will inform a mitigation strategy at the site which may involve *preservation-by-record* (e.g. archaeological excavation and/or watching brief).

A targeted watching brief is required for utilities diversions taking place in Charterhouse Square; Charterhouse Street; Fox & Knot Street as these have the potential to affect archaeological deposits relating to the outer cemetery of Charterhouse (BG207). Whilst not part of the C136 scope it should be noted that a general watching brief is required at the diversion of the Fleet Sewer: St Johns and City of London Branches. Further utilities diversions taking place across the remainder of the Crossrail worksites at Farringdon Station are unlikely to be of sufficient depth to affect archaeological remains and as such no mitigation is required.

A targeted watching brief is also required in the road between 3 & 10 Hayne Street at the Enabling Works stage, following on from utilities works at this location, to monitor groundworks at that location.

Archaeological field evaluation should be undertaken commensurate with the enabling works to establish the presence or absence of archaeological remains on the Eastern Ticket Hall.

The details of the archaeological evaluation are to be determined during detailed design and will be programmed according to feasibility in the construction sequence. The results of the field evaluation will inform a mitigation design, which will comprise *preservation-by-record* (e.g. archaeological excavation and/or watching brief) of archaeological remains on the site.

Compensation grout shafts proposed at Cowcross Street and Greenhill's Rents have the potential to remove any surviving archaeological remains in their footprints. The location of the compensation grout shafts assessed in this document is as per Scheme Design 3. No firm decision has yet been made by C122 with regard to the final location of the compensation grout shafts. Archaeological mitigation will be required in the form of *preservation-by-record* (e.g. archaeological excavation and/or targeted watching brief). The number, location, construction sequence and methodology at the shaft sites will be determined by the C122 team during the detailed design phase, however, it is envisaged that archaeological excavation will occur after Enabling Works, when utilities have been diverted, and prior to Main Works.

A general watching brief will also be required on ground reduction within the piled box at the Western Ticket Hall.

A Non-listed Built Heritage survey identified buildings and street furniture that will require further assessment and recording prior to demolition.

Enabling Works are programmed for early 2010 to early 2011, with Main Works scheduled to begin in 2011.

2 Project Background

2.1 Introduction

The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail (3rd draft November 2007). The requirements being progressed follow the principles of Planning Policy Guidance Note 16 on archaeology and planning (1990). Accordingly the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction work begins.

The strategy for archaeological works has been set out in the Crossrail Generic Written Scheme of Investigation (WSI) (doc. Ref. 14022008-44ES-P2Z1). The Generic WSI presents the strategy for archaeology design, evaluation, mitigation, analysis, dissemination and archive deposition that will be adopted for the design and construction of Crossrail and provides a general statement of objectives, standards and structure for the planning and implementation of archaeological works.

This site specific WSI addresses the works required for Farringdon Station.

2.2 Site Description

There are two main Crossrail worksites for Farringdon Station located within the City of London (Lindsey Street worksite) and the London Borough of Islington (Cardinal House worksite).

The new station will be constructed between Farringdon Road and Lindsey Street. Two new ticket halls will be constructed - one at Farringdon Road, to the west, and one at Lindsey Street to the east. Interchange with London Underground will be provided from the Eastern Ticket Hall at Lindsey Street.

The Crossrail works at Farringdon Station will also include compensation grout shafts to mitigate for the effects of settlement; utilities diversions and protective works in the streets around the worksites; and the diversion of the Fleet Sewer (St Johns branch and City of London branch).

The location of the Crossrail works for Farringdon Station are shown in Drawing Number P30103-C1M10-E00-D-50001 (see Annex 3).

2.3 Summary of Previous Crossrail Studies

The general archaeological potential in the area of the Crossrail worksites for Farringdon Station is described in the Crossrail Archaeological Impact Assessment and the Specialist Technical Reports: Assessment of Archaeological impacts (Part 1-6), published in February 2005, which form supporting documents of the Crossrail ES, and the subsequent Updated Baseline Assessment. In 2006 an Archaeology Programming Assessment outlined the scope and approximate timings of potential archaeological works across the entire Crossrail route. This has been superseded by a Detailed Desk Based Assessment (DDBA) of the site, which informed this WSI (Document No. CR-SD-FAR-EN-SR-00001).

2.4 Geology and Topography

The following summary is based on the Farringdon Station Geotechnical Desk Study (Crossrail 2006a), and the Scheme Design Submission, Civil, Structural & Tunnel Engineering Report, Volume 3 of 8 (Crossrail 2008c), which provide a general overview of the geology of the Crossrail worksites for Farringdon Station. Refer to drawing numbers C136-SWN-C2-DDL-M123-Z-00003 & 00004 (Annex 3) for geological cross-sections and the locations of the boreholes mentioned in the text.

The regional geology of the area around Farringdon Station is typical of that for the London Basin, comprising Cretaceous Chalk, overlain successively by Palaeogene Deposits (Thanet Sand Formation, Lambeth Group and London Clay Formation). River Terrace Deposits (Hackney Gravel) overlay London Clay over most of the site, with the exception of the former course of the Fleet River (forming the western boundary of the Crossrail worksites for Farringdon Station approximately where Farringdon Road now runs) where the River Terrace Deposits have been eroded and Alluvial Deposits overlie the London Clay.

The Fleet was the largest of London's former rivers and is now confined to a sewer beneath Farringdon Street and New Bridge Street. Tributaries flowing from east - west were also present in the area, but archaeological monitoring of Thameslink 2000 trial work at Farringdon indicates that no stream features are likely to survive within the railway cutting (Crossrail 2005).

2.5 Archaeological and Historical Development of the Site

A summary of the archaeological and historical development at each of the sub-sites is set out below. Please refer to the drawings in Annex 3 for the locations of boreholes (Drawing Numbers: C136-SWN-C2-DDL-M123-Z-00003 & 00004) and archaeological sites (Drawing Number P30103-C1M10-E00-D-50001) referred to in this section.

2.5.1 Eastern Ticket Hall

Ground level around the sub-site falls gradually from approximately 118.00m Above Tunnel Datum (ATD) in the northeast (CSQ98) to approximately 116.00m ATD in the south-west (CFI06). With significantly lower levels of c. 109.00m ATD recorded within the railway cutting (BH F13 & BH F8). The ground level is consistent with the natural geology of the area with the London Clay dipping around the eastern edge of the site before rising slightly and then falling away towards the Fleet valley to the west. Information from geotechnical boreholes (BHs F8 & F13) around and within the sub-site demonstrate that in the central and northern parts of the Lindsey Street box the Metropolitan Line cut and cover cutting has been excavated to the level of the London Clay, overlain by a thin layer of Made Ground. Just north of the site, BH F9 demonstrates approximately 1m of River Terrace Deposits overlying the London Clay. Archaeological sites in the surrounding area (CAA00, CFI06, CSQ98, CIN91, LOG82, CQC07 & CLO83) also encountered River Terrace Deposits at depths of between 115.90m ATD and 113.50m ATD underlying Made Ground deposits, indicating that River Terrace Deposits may survive beneath existing basements and in areas without basements in parts of the site not truncated by the railway cutting.

Construction of the Metropolitan Line railway by 1873 dramatically altered the street layout and buildings between Long Lane and Charterhouse Lane with Lindsey Street and Hayne Street both being created. It is likely that all of the 19th century buildings on the site were demolished at that time. Historic mapping shows that the majority of the site was probably undeveloped until the 17th century. The extent of cellaring associated with former buildings across the site is currently unknown.

Within the existing railway cutting borehole data (BHs F8 & F13) demonstrates that truncation has occurred to the level of the London Clay and therefore archaeological deposits are not expected to survive. The presence of basements across the remaining southern area of the site means that the depth of surviving archaeological deposits will vary. Furthermore, it is possible that truncation caused by the construction of the retaining walls has not completely removed all archaeological remains at 3 and 10 Hayne Street.

Archaeological sites and geotechnical boreholes in the area show that Made Ground deposits can generally be expected at approximately 116.00 to 113.00m ATD overlying c.1m of River Terrace Deposits. Therefore, horizontally stratified archaeological deposits are not expected to survive beneath the basements at 22-23 Long Lane and 2 Lindsey Street., which are between

c. 114.00 and 113.00m ATD, however, cut features, such as burials may survive within a layer of River Terrace Gravels overlying the London Clay.

The depth of truncation by basements is slightly less on the eastern side of the station box behind the railway retaining walls, with the majority of basement depths between 115.18 and 114.36m ATD beneath 20-21 Long Lane. Archaeological deposits may survive within the Made Ground not truncated by basements, and cut features, such as burials, may be present within the River Terrace Deposits that overlie the London Clay. There is a particular potential for individual deeply cut features such as burials, pits, wells and ditches in the vicinity of Hayne Street and Charterhouse Square as they are situated within the Medieval cemetery of Charterhouse.

It is unlikely that archaeological remains will survive at 3-4 Lindsey Street, which infilled the area formerly used as railway sidings.

2.5.2 Potential Compensation Grout Shafts

The locations of the compensation grout shafts to the rear of 67-69 Cowcross Street and at Greenhill's Rents are as proposed in Scheme Design 3. No firm decision has yet been made by C122 with regard to the final location of the compensation grout shafts. The assessment below and the corresponding evaluation and mitigation strategy will be updated when the grout shaft locations have been finalised.

2.5.2.1 67-69 Cowcross Street (location to be determined by C122)

Ground level varies around the sub-site from 114.01m ATD (BH F10) in the south-east decreasing to 111.88m ATD (BH F17) to the north-east of the site. These heights reflect the natural topography with the top of the London Clay being lower towards the former course of the Fleet. Ground level at the site itself is at 114.00m ATD. Information from geotechnical boreholes (BHs F4, F5 & F17) in the vicinity demonstrated that Made Ground has truncated Alluvial and River Terrace Deposits down to the level of the London Clay, with the exception of a single borehole to the south-east (BH F10), which demonstrates only a thin layer of River Terrace Deposits.

Historic maps show that the site was probably either sporadically developed or undeveloped until the early/mid 17th century, when urban growth around the site accelerated, particularly the plots fronting onto Cowcross Street, to the immediate north. The area suffered severe bomb damage in WWII and the buildings were replaced with mid-late 20th century office buildings. The extent and consistency of cellaring associated with any of these earlier buildings is uncertain.

The presence of Made Ground truncating London Clay demonstrated by nearby boreholes and archaeological interventions indicate that surviving archaeological deposits dating to before the Medieval period are likely to be minimal within the site and it seems unlikely that any horizontal stratigraphy will survive, however, the presence of very deep cut features such as pits, wells or stream channels cannot be entirely ruled out. Interventions in the surrounding area suggest that archaeological deposits may be present within the Made Ground from c. 1.5m. Archaeological intervention to the north of Cowcross Street (EGC04) encountered 1-2m of 19th century Made Ground and demolition debris overlying 1m of Post-medieval garden deposits and a possible thin late Medieval soil horizon before natural gravels were encountered. A number of Medieval burials, cesspits and building remains were also encountered at the Cowcross redevelopment on the northern side of Cowcross Street (COW89).

It is likely that the truncation demonstrated by the borehole data has removed all Medieval horizontal stratigraphy, however, the exact nature of specific buildings that may have existed on

the site is unknown and the possibility remains that the bases of deeply cut features survive below the levels of truncation.

Archaeological interventions in the vicinity (FNG02 & EGC04) have encountered much evidence for Post-medieval urbanisation around the sub-site. There is a high potential for evidence of 16th to 19th century buildings and other Post-medieval occupation features surviving, particularly if there are no modern basements. There is also a moderate potential for evidence relating to late 19th to early 20th century railway infrastructure.

2.5.2.2 Greenhill's Rents (location to be determined by C122)

Ground level varies slightly around the sub-site from 114.01m ATD (BH F10) in the south-west rising slightly to 115.00m ATD (BH F11) to the north-east of the site. These heights reflect the natural topography with the top of the London Clay falling towards the former course of the Fleet. Ground level at the site itself is at 116.00m ATD. Information from geotechnical boreholes (BHs F10 & F11) to the south-west and north-east of the sub-site respectively, demonstrate that Made Ground is present to depths of c. 108.00m ATD in BH F10 and c. 112.00m ATD in BH F11, beneath which survives approximately 1.5m of River Terrace Deposits before the London Clay is reached, indicating that River Terrace Deposits are likely to be encountered within the site.

Historic mapping shows that the area around the site has undergone a number of phases of development, however the site itself has only seen sporadic building and may have retained areas that were largely undeveloped in terms of large scale buildings. The extent and consistency of cellaring associated with former buildings is uncertain. The site has not been truncated by the construction of the Metropolitan Line cut and cover tunnel located immediately south.

Borehole data from nearby indicates that provided there are no basements, archaeological deposits at this sub-site may survive from c. 1.5m to c. 9.6m Below Ground Level (BGL) (to c. 106.41m ATD) including approximately 1.5m of River Terrace Deposits at the bottom of the sequence of superficial deposits at which point the London Clay is reached. Surviving archaeological deposits would be limited to the bases of deeply cut features. Archaeological intervention to the north (EGC04) encountered 1-2m of 19th century Made Ground and demolition debris overlying 1m of Post-medieval garden deposits and a possible thin late Medieval soil horizon before Terrace Gravels were encountered.

Archaeological interventions in the vicinity (FNG02 & EGC04) have encountered much evidence for Post-medieval urbanisation around the site. There is a high potential for evidence of 16th to 19th century buildings and other Post-medieval occupation features surviving, particularly if there are no modern basements. There is also a moderate potential for evidence relating to late 19th to early 20th century railway infrastructure.

2.5.3 Western Ticket Hall

The site was open fields alongside the Fleet River until the 17th century when development accelerated after the Great Fire of London. In the 18th century the site comprised a block of buildings and a number of small alleys and streets. The area underwent massive change in the 1800s with the construction of the Metropolitan Line and Smithfields Market and by the close of the 19th century the Western Ticket Hall footprint was the site of a Great Northern Railway (GNR) Goods Depot. In the 20th century the site continued as a Depot until World War II when it was damaged beyond repair by a V2 long range rocket. To the immediate west of the Goods Depot a row of terraces were constructed fronting onto Farringdon Road. The terraces were not destroyed by the V2 rocket and remained until the construction of Cardinal House in the 1960s.

Archaeological monitoring of Thameslink 2000 trial work at Farringdon (FNG02) indicates that no archaeological remains are likely to survive within the areas of the railway cuttings. This includes an area of former sidings beneath Cardinal Tower (48-52 Cowcross Street; 2a, 2b and 4-10 Farringdon Road, and part of 47-53 Charterhouse Street), which has a double basement, with an adjacent NCP car park also at double basement level (Crossrail 2005).

The course of the former Faggesswell Brook is conjectured to have flowed east-west across the site somewhere between Cowcross Street and Charterhouse Street. Therefore, there is a small possibility that the very base of the brook may survive cut deep into the London Clay, beneath truncation by Cardinal House (Crossrail 2005).

Geotechnical boreholes (e.g. F1 – see Annex 3 for geological sections and borehole locations) show that there is just over 8m of Made Ground beneath Farringdon Road, Greville Street and the western end of Cowcross Street. Utilities diversions at this location are located within the layer of Made Ground and as such are unlikely to affect buried archaeological deposits.

3 Construction Impacts and Mitigation

3.1 Summary

There is potential for archaeological remains to survive at the following Crossrail worksites for Farringdon Station related to the following structures:

- Cardinal House worksite - Western Ticket Hall (but previous studies indicate that there is only a very slight potential for archaeological deposits to survive beneath Cardinal Tower, which occupies part of the Western Ticket Hall worksite (Crossrail 2005)).
- Lindsey Street worksite - Eastern Ticket Hall (southern and eastern sections of the Lindsey Street Box), 3 Hayne Street and 33-37 Charterhouse Square.
- Worksite at 67-69 Cowcross Street - potential compensation grout shaft (location to be determined by C122 at detailed design).
- Worksite at Greenhill's Rents - potential compensation grout shaft (location to be determined by C122 at detailed design).

In addition, there will be utilities diversions and protective works in the streets around the worksites.

The Crossrail works are divided into Enabling Works and Main Works. Enabling works are defined as those works that are required to facilitate the Main Works, and as such are required prior to the start of the Main Works programme. Enabling works at Farringdon that could disturb archaeological remains include:

3.2 Enabling Works

3.2.1 Eastern Ticket Hall

- Utilities abandonment, protection and diversion at and around the site of the Eastern Ticket Hall (on Charterhouse Square; Charterhouse Street; and Fox & Knot Street.
- Demolition of the buildings required for the Eastern Ticket Hall, the locations of which are shown on figure 1 below.

3.2.2 Western Ticket Hall (Thameslink Project)

- Demolition of the buildings required for the Western Ticket Hall (including Cardinal House and a car-park access ramp off Cowcross Street currently running beneath Cardinal House), the location of which is shown on Figure 2 below.
- Diversion of the St Johns and City of London branches of the Fleet Sewer.

The following impacts will be caused by the Crossrail Main Works at Farringdon Station. It should be noted that location and final sequencing of the construction methodology will be confirmed during the detailed design phase.

3.3 Main Works

3.3.1 Eastern Ticket Hall

- The staged construction at the Eastern Ticket Hall will remove all surviving archaeological deposits beneath basements of the existing building and road at 20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street; the road between 3 & 10 Hayne Street; and at 33-37 Charterhouse Square.

3.3.2 Potential Compensation Grout Shafts at 67-69 Cowcross Street and Greenhill's Rents (locations to be determined by C122)

- Utilities abandonment, protection and diversion at and around the site of the potential compensation grout shafts (exact locations tbc).
- Worksite establishment associated with the grout shafts at 67-69 Cowcross Street and Green Hills Rents is expected to have little or no archaeological impact.
- The grout shafts would completely remove any archaeological deposits within their footprints.

3.3.3 Western Ticket Hall

- Ground reduction in the footprint of the piled box will remove any surviving archaeological deposits deeply cut into the London Clay.

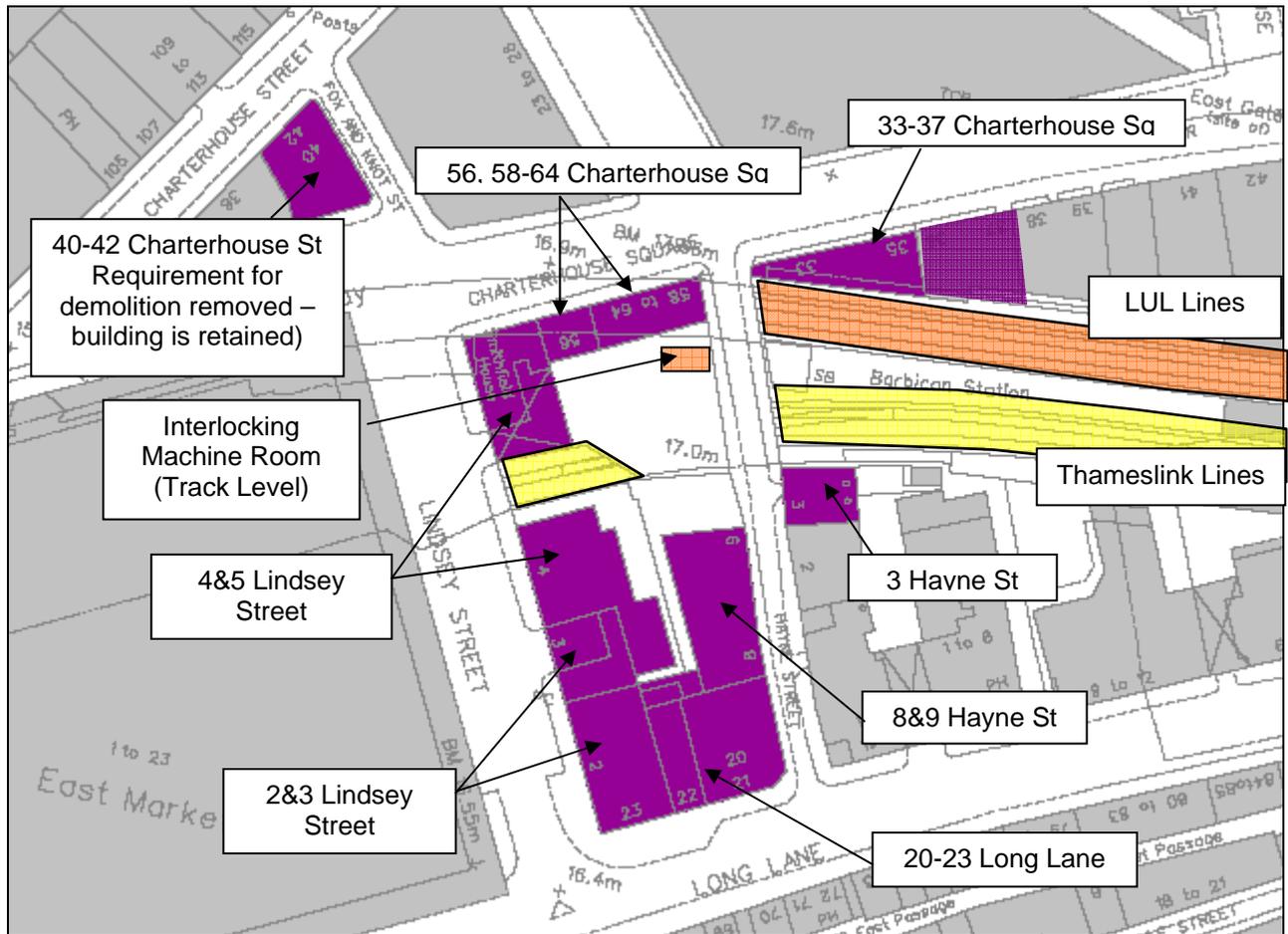


Figure 1 Property Locations for Demolition at Eastern Ticket Hall – Lindsey Street worksite

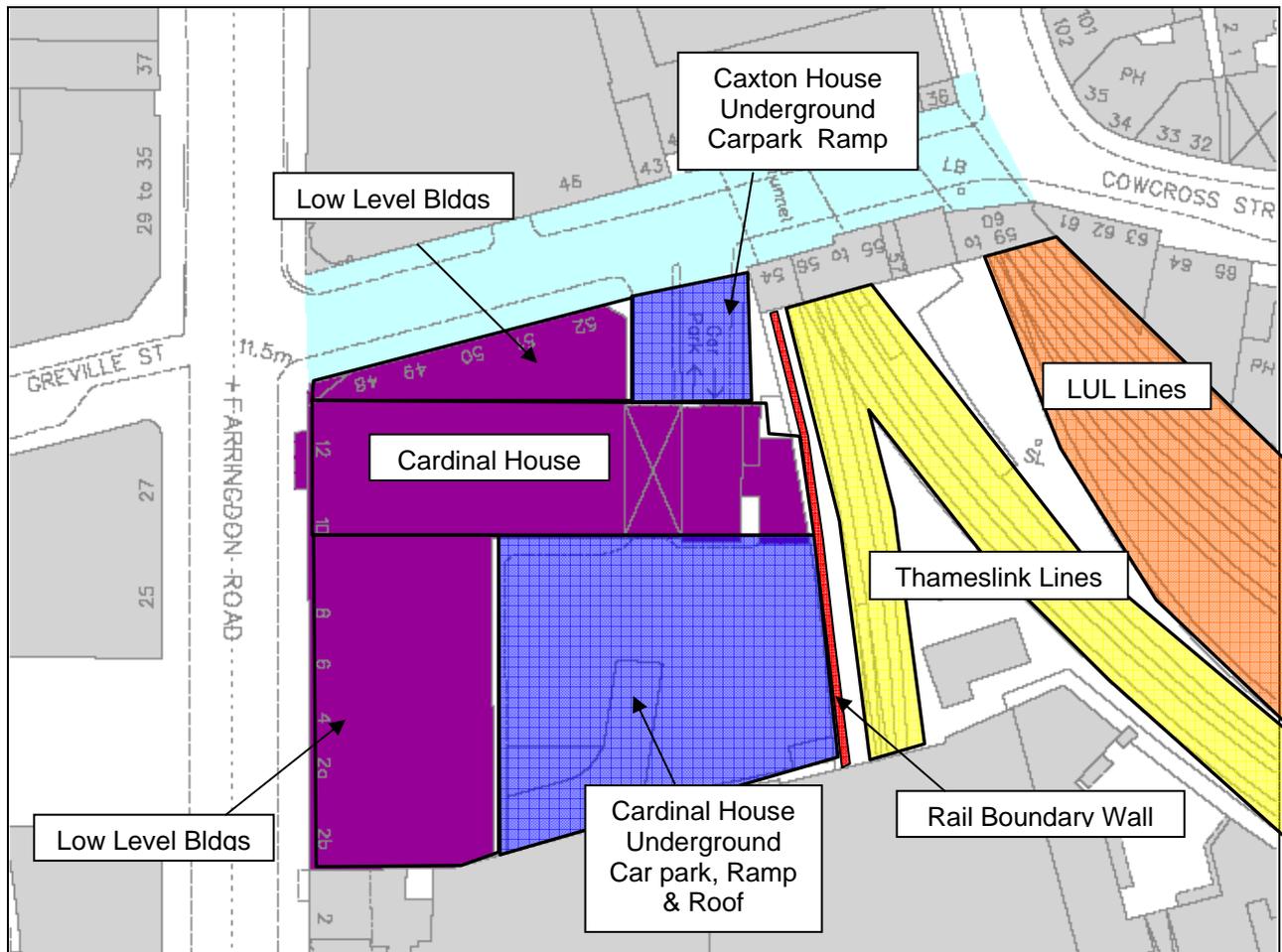


Figure 2 Property Locations for Demolition at Western Ticket Hall - Cardinal House worksite

3.4 Outline Mitigation Design

The results of archaeological monitoring of Geotechnical Package 13 investigations and analysis of the results of unmonitored boreholes shall be reviewed during the detailed design phase (RIBA E) and the archaeological evaluation and mitigation strategy will be updated.

Furthermore, information regarding foundation types and depths will require review during the detailed design phase. As a result, archaeological evaluation and mitigation strategies will be updated as required.

Internal inspections of non-listed built heritage properties (3 Hayne Street; 3 Lindsey Street; and 54 Charterhouse Street and 5 Lindsey Street) will be carried out as soon as access is available to determine appropriate levels of archaeological recording at those locations.

It is recommended that archaeological field evaluation will be required at the following locations:

- Eastern Ticket Hall (20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street; and 33-37 Charterhouse Square).

The results of the archaeological evaluation will inform the mitigation design, and, if required, will comprise *preservation-by-record* (e.g. archaeological excavation and/or watching brief).

The following locations do not require archaeological field evaluation, but will require mitigation:

- Potential compensation grout shaft sites at 67-69 Cowcross Street and Greenhill's Rents will require mitigation in the form of *preservation-by-record* (e.g. archaeological excavation and/or targeted watching brief). The number, location, construction sequence and methodology at the shaft sites will be determined by C122 during the detailed design phase. When the location for the grout shafts is confirmed, appropriate archaeological mitigation will be designed.
- Targeted watching brief at utilities diversions at Charterhouse Square; Charterhouse Street; Fox & Knot Street; and at the site of the potential compensation grout shafts.
- General watching brief at the diversion of the Fleet Sewer (St Johns and City of London branches).
- Targeted watching brief in the road between 3 & 10 Hayne Street to monitor groundworks relating to the demolition of the southern arch and abutment of the Hayne Street bridge.
- General watching brief during ground reduction in the footprint of the piled box at the Western Ticket Hall.
- Non-listed built heritage recording (see section 5.4).

4 Aims and Objectives

4.1 Research Aims

Selected research themes derived from *A Research Framework for London Archaeology 2002* (Nixon et al, 2003) are included in the *Assessment of Archaeology Impacts Technical Report* (Crossrail 2005). Archaeological investigation and mitigation within the Crossrail worksites for Farringdon Station have the potential to contribute to the research themes set out below.

Evidence for burials and/or features associated with the Charterhouse burial ground may contribute to the following research themes:

- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research;
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience; and
- Understanding the differences, if any, between burial practices in the city and outlying cemeteries.

Archaeological remains associated with post-medieval extra-mural development may contribute to the following theme:

- Contributing to our understanding of the creation of the London suburbs with direct contribution to today's aspirations for an urban regeneration.

4.2 Objectives of the Investigation

The overall objectives of the investigation are to establish the nature, extent and state of preservation of any surviving archaeological remains that will be impacted upon by the development. The sites codes below are shown on Drawing Number P30103-C1M10-E00-D-50001 (see Annex 3).

4.2.1 Eastern Ticket Hall

A ditch system of possible Roman date was recorded between Cloth Fair and Long Lane (CLO83) less than 50m to the south-west. Archaeological investigations at the Lindsey Street worksite (Farringdon Eastern Ticket Hall) have the potential to recover:

- Archaeological remains of Roman date relating to extra-mural activity.

A single burial, possibly derived from the Black Death cemetery of 1348, was recorded at Charterhouse Square, less than 150m to the north. A large medieval quarry pit, assumed to be contemporary with the monastery, was recorded at Carthusian Street (CIN91), c.150m to the north-east. The southern limit of the priory precinct is believed to fall within the site (Barber and Thomas, 2002). Archaeological investigations at the Lindsey Street worksite (Farringdon Eastern Ticket Hall) have the potential to recover:

- Archaeological remains of medieval date relating to St Bartholomew's Priory and Hospital
- Archaeological remains of medieval date relating to Charterhouse priory.

The remains of 16th century houses relating to development of the area to the north of St Bartholomew's Church were recorded between Cloth Fair and Long Lane. Cess pits and brick wall of 17th and 18th century date were recorded at Carthusian Street and also at Long Lane. Brick walls and floor surfaces of 18th century date were recorded at the junction of Carthusian Street and Charterhouse Square (CQC07), 120m to the north-east of the proposed Eastern Ticket Hall. Burials and floor surfaces associated with monastery were recorded between Cloth Fair and Long Lane (CLO83), and burials were also noted at Long Lane (LOG82) less than 100m to the south-east of the proposed Eastern Ticket Hall. Archaeological investigations at the Lindsey Street worksite (Farringdon Eastern Ticket Hall) have the potential to recover:

- Archaeological remains of Post-medieval date relating to creation and expansion of the extra-mural suburbs.

4.2.2 Potential Compensation Grout Shafts at 67-69 Cowcross Street and Green Hills Rents (locations to be determined by C122):

Several phases of medieval buildings, a chalk-lined well and cess-pits were recorded across several sites in the vicinity of Cowcross Street (COW89). Medieval burials were also recorded in the west of the site. Archaeological investigations at the Cowcross Street and Green Hills Rents grout shafts have the potential to recover:

- Archaeological remains of medieval date relating to the extra-mural suburbs.

4.2.3 Western Ticket Hall:

The course of the former Faggesswell Brook is conjectured to have flowed east-west across the site somewhere between Cowcross Street and Charterhouse Street. Archaeological investigation at the Western Ticket Hall has a very limited potential to recover:

- The very base of the Faggesswell Brook which may survive cut deeply into the London Clay, beneath truncation by Cardinal House (Crossrail 2005).

5 Scope of the Investigation

The results of archaeological monitoring of Geotechnical Package 13 investigations and analysis of the results of unmonitored boreholes shall be reviewed during RIBA E and the archaeological evaluation and mitigation strategy will be updated.

A review of additional information collected at detailed design regarding foundation types and depths will be undertaken. Archaeological evaluation and mitigation strategies will be updated as required.

Internal inspections of non-listed built heritage properties (3 Hayne Street; 3 Lindsey Street; and 54 Charterhouse Street and 5 Lindsey Street) will be carried out as soon as access is available to determine appropriate levels of archaeological recording at those locations.

5.1 Eastern Ticket Hall

5.1.1 Enabling Works

Archaeological targeted watching brief on utilities diversions at Charterhouse Square; Charterhouse Street; and Fox & Knot Street.

Archaeological field evaluation comprising trial pits/trenches will be required to establish the level of previous piling, archaeological significance and level of survival at the following locations: 20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street; 10 Hayne Street; and at 33-37 Charterhouse Square. See Drawing Number: P30103-C1M10-E00-D-50003 (Annex 3) for the locations of the above sites.

The details of the archaeological evaluation are to be determined at detailed design and will be programmed according to feasibility in the construction sequence.

Results of the archaeological evaluation will inform the mitigation design, and will constitute *preservation-by-record* (e.g. archaeological excavation and/or watching brief). Archaeological mitigation (if required) would be undertaken commensurate with the Main Works. These mitigation measures are defined in the Crossrail Archaeology Generic Written Scheme of Investigation (2007).

Archaeological mitigation in the form of *preservation-by-record*, comprising a targeted watching brief is required in the road between 3 & 10 Hayne Street to monitor groundworks relating to the demolition of the southern arch and abutment of the Hayne Street bridge. Archaeological deposits may survive behind the railway retaining wall at this location.

5.2 Potential Compensation Grout Shafts at 67-69 Cowcross Street and Greenhill's Rents

The Crossrail worksites at Farringdon Station will also include compensation grout shafts, however, the number, location, construction sequence and methodology at the shaft sites will be determined by C122 during the detailed design phase. When the location for the grout shafts is confirmed, appropriate archaeological mitigation will be designed but this is likely to be in the form of *preservation-by-record* (e.g. archaeological excavation and/or targeted watching brief). It is envisaged that archaeological mitigation will occur after Enabling Works, when utilities have been diverted, and prior to Main Works.

5.3 Western Ticket Hall

5.3.1 Enabling Works

Archaeological mitigation in the form of *preservation-by-record*, comprising a general watching brief at the diversion of the Fleet Sewer (St Johns and City of London branches). This forms part of the scope of the Thameslink Project.

5.3.2 Main Works

Archaeological mitigation in the form of *preservation-by-record*, comprising a general watching brief during ground reduction in footprint of the piled box. This will occur commensurate with the Main Works.

5.4 Non-Listed Built Heritage Assessment and Recording

Non-listed built heritage (NLBH) assessment and recording forms part of the archaeological mitigation strategy for Crossrail. The definition of non-listed built heritage adopted follows Information Paper D22 Archaeology and encompasses above ground historic features and structural elements of historical interest.

Two main groups are:

- Non-listed buildings proposed for demolition in conservation areas; and
- Historic street furniture and materials falling within a worksite and being temporarily or permanently impacted upon by the works.

The detailed scope for this element of works includes:

- 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;
- Other important non-listed buildings and structures of historic interest outside conservation areas (i.e. the standing walls at Stepney Green), locally listed station buildings and railway structures and any industrial and defence archaeology of significance.

The Crossrail Environmental Statement and supporting Specialist Technical Reports define the baseline built heritage resources (both statutorily protected and non-listed) across the route, the potential significant impacts, mitigation and any residual impacts after that mitigation is employed (Crossrail 2005).

A walkover survey of the Farringdon Station area undertaken in 2009 by the MDC3 Heritage Specialist (Mott MacDonald) identified NLBH assets which will be demolished as part of the Enabling Works. The survey has identified where further assessment is required to determine the need for, and/or level of, mitigation works in advance of demolition. The results of the survey are outlined in Tables 1 and 2 below. The bracketed figure references in tables 1 and 2 are shown on drawing number P30103-C1M10-E00-D-50004 (Annex 3).

Internal inspections of non-listed built heritage properties (3 Hayne Street; 3 Lindsey Street; and 54 Charterhouse Street and 5 Lindsey Street) will be carried out as soon as access is available to determine appropriate levels of archaeological recording at those locations.

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
3 Hayne Street [1]		<p>Late 19th century, three-storey building, plus attic, constructed in stock brick with whitewashed façade. The west façade has been cosmetically altered with the addition of external shutters, replacement windows and entrance porch. However, there is potential for surviving internal fittings and fixtures.</p>	<p>Not listed, but located immediately adjacent to the Charterhouse Square Conservation Area. The building is of interest as part of the historic development of this area after the arrival of the railway.</p>	<p>To be demolished.</p>	<p>Internal inspection required before establishing an appropriate level of archaeological recording.</p>
8-9 Hayne Street [2]		<p>Late 19th century office buildings. Four storeys plus attic, (behind parapet) and basement. Constructed from stock brick with red brick detailing. Architectural emphasis to ground floor with continuous impost band separated by large window openings and two recessed doorways. Paired window openings to upper floors segmented by engaged Tuscan colonettes. Iron grilles over basement windows. Evidence of truncation to ground floor on northern elevation supported by 'gantry' reference on the 1953 O.S. map. Also extant on the eastern elevation is evidence of the original footbridge which spanned Hayne Street, now replaced with double casement window. Much internal historic</p>	<p>Not listed or located within a conservation area. The building is of historic interest and is an interesting surviving example of late 19th century architecture in the area. The building also features three cast iron boundary plaques presumably taken from the now demolished 2 Hayne Street (see plaque description (table 2) for further details)</p>	<p>To be demolished.</p>	<p>Level II English Heritage survey to be undertaken prior to demolition.</p>

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
		fabric has been lost, with the exception of numerous cast iron structural columns.			
Chimney to the rear of 20-21 Long Lane [3]		Truncated brick chimney surviving to the rear of No 20-21 Long Lane, although not structurally attached to it. The chimney pre-dates No. 8 Hayne Street, suggesting that it is mid-19th century.	Not listed or located within a conservation area. However, it has historic interest as part of the industrial heritage of this area.	To be demolished.	Level II English Heritage survey to be undertaken on the chimney before demolition.

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
22 Long Lane [4]		<p>Narrow, four-storey building fronting Long Lane. Constructed from brick with plastered façade. Shop front at ground-floor level with deep plain fascia over large glazed frontage. Two steel framed casements to upper floors. The building is surmounted by a low parapet, painted with geometric wave pattern. The façade represents a continuation the mid-20th century 23 Long Lane.</p>	<p>Not listed or located within a conservation area. However, the building is an interesting example of Art Deco/International style architecture.</p>	<p>To be demolished.</p>	<p>Level II English Heritage record to be undertaken prior to demolition.</p>
2 Lindsey Street and 23 Long Lane [5]		<p>5 storey building with frontages to both Long Lane and Lindsey Street. Constructed from brick with rendered elevations and distinctive Art Deco proportions. Commercial frontage to the ground floor with large steel-framed openings under a deep fascia. Steel framed casements above, divided by decorative panels, with examples of applied fan detail. 4th floor is distinguished by a continuous sill band with painted geometric wave detail. Above is an attic storey consisting of large horizontal steel framed windows.</p>	<p>Not listed or located within a conservation area. However, the building is an interesting example of Art Deco/International style architecture.</p>	<p>To be demolished.</p>	<p>Level II English Heritage record to be undertaken prior to demolition.</p>

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
3 Lindsey Street [6]		<p>Single-storey commercial building formerly in use as a tripe dresser. Glazed tile fascia bearing the name Edmund Martin Ltd. The shop front is concealed by modern shutters. The building is surmounted by a timber louvre. To the north of the façade is a single surviving Corinthian pilaster, probably belonging to an earlier structure at No. 4 Lindsey Street.</p> <p>The building is currently vacant and in a poor structural condition.</p>	<p>Not listed or located within a conservation area. However, the building is of historic interest due to its association with the meat trade which dominated the historic development of the area.</p>	<p>To be demolished.</p>	<p>Internal inspection required before establishing an appropriate level of archaeological recording.</p>
Retaining arches below Hayne Street [7]		<p>Row of brick retaining arches running north-south below 8-9 Hayne Street. The arcade starts at the railway line, but it is unclear where it terminates. The arches are not depicted on the original plans for the Metropolitan railway, but appear to be of a contemporary date, possibly erected to support new buildings on Hayne Street.</p>	<p>Not listed or within a conservation area, but of historic interest as part of the development of the railway.</p>	<p>To be demolished.</p>	<p>Level II English Heritage survey to be undertaken on the arches before demolition. This will form part of a single recording programme to include the Barbican arches [8] and the Barbican Signal Box [11].</p>

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
Retaining arches to Barbican Station [8]		<p>Row of brick retaining arches at Barbican Station. The arcade represents a continuation of the track and is distinct from the ornate brick arcade which forms part of the station. The arcade appears on the original plans for the Metropolitan railway.</p>	<p>Unlisted building within a conservation area but of historic interest as part of the development of the railway.</p>	<p>To be partially demolished.</p>	<p>Level II English Heritage survey to be undertaken on the arches before demolition, as part of the recording of the Hayne Street retaining arches [7]. The extent of the survey is to be defined during detailed design.</p>
33-37 Charterhouse Square [9]		<p>Wedge-shaped, late 19th century building located on the corner of Charterhouse Square and Hayne Street. Includes 33-35 and 36-37 Charterhouse Square as a single build, denoted by rusticated end pilasters. The structure is four storeys, plus attic and basement. Constructed from red brick with stone dressings. Large window openings to all floors with continuous sill and floor bands. Large double entrance to 36-37, under a single bracketed cornice. The entrance to 33-35 is located on the corner within a two-storey projection with classical pediment detail and large bracketed cornice.</p>	<p>Unlisted building which makes a positive contribution to the Charterhouse Square Conservation Area.</p>	<p>To be demolished.</p>	<p>Level II English Heritage survey to be undertaken on the prior demolition.</p>

Name [Drawing Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
54 Charterhouse Street & 5 Lindsey Street (Smithfield House) [10]		<p>Early 20th century, two-storey office and warehouse building located on the corner of Lindsey Street and Charterhouse Square. Rendered main façade to Charterhouse Square with large steel-framed casements to ground and first floor, set within recessed panel. The elevation is surmounted by a tall, central pediment, inscribed with 'Smithfield House'. The Lindsey Street elevation is simpler in execution with large casements to first floor. The ground floor contains a single entrance to the north, with evidence of a vehicle entrance to the south. The rest of the elevation is boarded.</p>	<p>Unlisted building within a conservation area. Although a later addition to the streetscape, it remains of historic interest to the industrial development of the site.</p>	<p>To be demolished.</p>	<p>Internal inspection required before establishing an appropriate level of archaeological recording.</p>
Barbican Station Signal Box [11]		<p>Signal box located at the western end of the central platform at the Barbican Station. Small concrete structure raised on piers. Access via a modern external stair. The east façade contains a central glazed and panel door, flanked by iron-framed casements.</p>	<p>Unlisted building within a conservation area. Historic interest as part of the development of the railway system.</p>	<p>To be demolished.</p>	<p>Level II English Heritage survey to be undertaken on the structure before demolition as part of a wider recording project to include the retaining arches at Hayne Street [7] and the Barbican Station [8].</p>

Table 1 Non Listed Built Heritage within the Farringdon Station Area

Street furniture surveys have been carried out by Crossrail's Enabling Works Managing Agent (EWMA), which have identified all elements of street furniture at Farringdon Station. The results of the EWMA survey have been reviewed and items of street furniture of historic significance are set out in the table below.

Name [Figure Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
Boundary Plaques attached to 8 Hayne Street [12]		Group of three cast iron plaques denoting the ward boundary for the Boroughs of Finsbury and Smithfield. Dated to 1873, 1890 and 1900 respectively. From historic O.S map analysis these plaques originally appear on number 2 Hayne Street and would have been moved to their current location prior to the building's demolition.	The plaques have significance as evidence of the historic ward boundary.	To be removed as part of the demolition of 8 Hayne Street	The plaques should be removed prior to demolition and reinstated in their original location (to be determined after the recording of 8-9 Hayne Street).

Name [Figure Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
Historic surface to Charterhouse Square [13]		Historic granite sett surface surrounding New Church Hawe. Formed by a regular pattern of rectangular setts. Despite some patchwork repair, there is a comprehensive coverage and good level of survival.	The historic surface makes a positive contribution to the character and appearance of the Charterhouse Square Conservation Area.	Potential impact from utilities diversions and geotechnical investigations.	If any works necessitate the removal of the surface, such as utilities diversions, a survey of the surface should be carried out to inform its reinstatement.
Pillar Box outside 59-60 Cowcross Street [14]		Type 'C' pillar box with the Queen Victoria Royal Cypher dating it to pre-1901.	An early example of the Type 'C' pillar box which makes a positive contribution to the Charterhouse Square Conservation Area streetscape.	Potential impact from diverted utilities.	If any works necessitate the removal of the pillar box, such as utilities diversions, its location should be recorded to ensure it is reinstated in the correct position.

Name [Figure Ref]	Image	Description	Significance	Impact	Mitigation/Further Investigation
Pillar box on Charterhouse Square [15]		Type 'C' pillar box with the Queen Victoria Royal Cypher dating it to pre-1901.	An early example of the Type 'C' pillar box which makes a positive contribution to the Charterhouse Square Conservation Area streetscape.	Potential impact from diverted utilities.	If any works necessitate the removal of the pillar box, such as utilities diversions, its location should be recorded to ensure it is reinstated in the correct position.

Table 2 Non Listed Street Furniture within the Farringdon Station Area

6 Programme

6.1 Introduction

Site-specific evaluation and mitigation measures are presented using the following phasing:

- **CRITICAL phase** advanced archaeological works which need to be undertaken prior to the Enabling Works (this may apply to very significant archaeological remains where complex mitigation is required and where early site access is required)
- **Phase 1** archaeological works to be undertaken commensurate with the programme of Enabling Works
- **Phase 2** archaeological works to be undertaken commensurate with the Main Works
- **Phase 3** archaeological works to be undertaken after the Main Works phase (e.g. post excavation assessment, analysis, publication and dissemination).

The results of archaeological monitoring of Geotechnical Package 13 investigations and analysis of the results of unmonitored boreholes shall be reviewed during the detailed design phase (RIBA E) and the archaeological evaluation and mitigation strategy will be updated.

Information regarding foundation types and depths will require review during the detailed design phase. As a result, archaeological evaluation and mitigation strategies will be updated as required.

Internal inspections of non-listed built heritage properties (3 Hayne Street; 3 Lindsey Street; and 54 Charterhouse Street and 5 Lindsey Street) will be carried out as soon as access is available to determine appropriate levels of archaeological recording at those locations.

The relevant sections of the latest construction programme PCS3.1 for the Crossrail works at Farringdon Station are reproduced below.

Enabling Works		641	05-May-0...	11-Nov-11
Enabling Works - East (Barbican End)		604	05-May-0...	21-Sep-11
FAR100340	EWMA East Enabling Works Complete	0		28-Feb-11
FAR100380	All Enabling Works East Complete	0		09-May-11
FAR100350	LU Enabling Works East Complete	0		21-Sep-11
London Underground - Works		604	05-May-0...	21-Sep-11
FAR108260	LU Works Complete	0		09-May-11
London Underground - Works - Work Package 1 -IMR		604	05-May-0...	21-Sep-11
FAR100370	CLR Provide LU with Authority to Proceed	20	05-May-0...	02-Jun-09 A
FAR100390	LU Issue Notice to Proceed	0	03-Jun-09 A	
FAR100380	Mobilisation of IMR Project Team	12	03-Jun-09 A	18-Jun-09 A
FAR100400	Procure Design & Build Contractor	117	19-Jun-09 A	25-Sep-09
FAR100410	Approvals	333	19-Jun-09 A	28-Oct-10
FAR100420	Pre- Site Assurance	338	19-Jun-09 A	02-Nov-10
FAR100430	Design & Build Contract Award	0	28-Sep-09	
FAR100540	Package 2 Design & Sanatise All LU cables from CRL work Areas	320	28-Sep-09	31-Dec-10
FAR100440	Concept Design (RIBA C)	118	29-Sep-09	25-Mar-10
FAR100450	Detailed Design (RIBA D)	86	12-Jan-10	20-May-10
FAR100480	Procure Long Lead Items	100	26-Mar-10	24-Aug-10
FAR100470	Final Design & Review (RIBA E)	25	21-May-10	25-Jun-10
FAR100480	Additional Procurement (If Required)	30	28-Jun-10	08-Aug-10
FAR100490	Installation Access Approvals/ Mobilisation	50	28-Jun-10	08-Sep-10
FAR100500	Installation - Civil M&E	162	03-Nov-10	12-Jul-11
FAR100860	LU - IMR Works Target Completion Date	0		09-May-11*
FAR100510	Installation - Signalling	40	13-Jul-11	07-Sep-11
FAR100520	Commission/ Hand over	10	08-Sep-11	21-Sep-11
FAR100530	IMR Relocated	0		21-Sep-11*
C242 Utility Diversions		335	02-Nov-09	28-Feb-11
C245 - Durward St Utility Diversions Associated with Swanleigh School		0	28-Feb-11	28-Feb-11
FAR108650	Barbican Utility Diversions Complete	0		28-Feb-11
Utility - Civil		320	02-Nov-09	07-Feb-11
FAR108870	Utility Civil Design	125	02-Nov-09	30-Apr-10
FAR108890	Procure Civil Utility Contractor	61	04-May-10	28-Jul-10
FAR108900	EDF Civil Contractor Mobilises	60	29-Jul-10	21-Oct-10
FAR108910	EDF Civil Install new service trench in Lindsey St.	40	09-Dec-10	07-Feb-11
Utility - EDF		335	02-Nov-09	28-Feb-11
FAR108330	Utility EDF Design	132	02-Nov-09	12-May-10

Table 3 PCS3.1 Enabling Works part 1

FAR108340	Procure EDF Utility Contractor	60	13-May-10	05-Aug-10
FAR108350	EDF Utility Contractor Mobilises	60	06-Aug-10	29-Oct-10
FAR108360	EDF Utility Diversions	83	01-Nov-10	28-Feb-11
Utility - Telecomms		335	02-Nov-09	28-Feb-11
FAR108370	Utility Telecomms Design	132	02-Nov-09	12-May-10
FAR108380	Procure Telecomms Utility Contractor	60	13-May-10	05-Aug-10
FAR108390	Telecomms Utility Contractor Mobilises	60	06-Aug-10	29-Oct-10
FAR108400	Telecomms Utility Diversions	83	01-Nov-10	28-Feb-11
Utility - Water & Sewer		320	02-Nov-09	07-Feb-11
FAR108410	Water & Sewer Design (PDP assumption)	132	02-Nov-09	12-May-10
FAR108420	Procure Water & Sewer Utility Contractor	60	13-May-10	05-Aug-10
FAR108430	Water & Sewer Utility Contractor Mobilises	40	06-Aug-10	01-Oct-10
FAR108440	Water & Sewer Utility Diversions	40	09-Dec-10	07-Feb-11
Utility - Gas		315	02-Nov-09	31-Jan-11
FAR108290	Utility Gas Design	132	02-Nov-09	12-May-10
FAR108300	Procure Gas Utility Contractor	60	13-May-10	05-Aug-10
FAR108310	Gas Utility Contractor Mobilises	60	06-Aug-10	29-Oct-10
FAR108320	Gas Utility Diversions	20	04-Jan-11	31-Jan-11
C209 Demolition for eastern Ticket Hall		407	05-May-0...	08-Dec-10
FAR108180	Dust Monitoring	220	05-May-0...	14-May-10
FAR108000	Undertake Surveys	89	01-Jun-09 A	05-Oct-09
FAR108140	Eastern Ticket Hall Demolition Contract C209 Issue ITT	0	12-Aug-0...	
FAR108010	Procure Demolition Contractor	55	12-Aug-0...	29-Oct-09
FAR108030	Prepare & Submit Section 61	60	02-Oct-09	24-Dec-09
FAR108130	Eastern Ticket Hall Demolition Contract C209 Contract Award	0		29-Oct-09
FAR108020	Mobilise	31	30-Oct-09	11-Dec-09
FAR108150	Cantalever scaffold design & LU Approval	50	14-Dec-09	24-Feb-10
FAR108160	Site Entry Into East Ticket Hall Area	0	22-Mar-10	
FAR108060	Disconnect Existing Utilities	5	22-Mar-10	26-Mar-10
FAR108170	Type 3 Hazmat Survey & Documentation	33	22-Mar-10	10-May-10
FAR108270	Start Erecting Demolition CantaleverScaffold Rail Protection	0	17-May-10	
FAR108050	Site Setup & Hoardings etc	15	17-May-10	07-Jun-10
FAR108040	Preparation Works & Install Cantalever Scaffold Crash Deck	46	17-May-10	20-Jul-10
FAR108280	Start Demolition of Barbican Area Demolitions	0	08-Jun-10	
FAR108070	Demolition of 2-3 Lindsey St, 20-23 Long Lane & 8-9 Hayne Street	99	08-Jun-10	25-Oct-10
FAR108120	Access Available To Thames Link Track Area	0	15-Jul-10*	
FAR108100	Demolition of 3 Hayne Street	36	15-Jul-10	03-Sep-10
FAR108090	Demolition of 5 Linsey St & 56, 58-64 Charterhouse Sq	98	15-Jul-10	30-Nov-10
FAR108080	Demolition of 33-37 Charterhouse Sq	44	20-Jul-10	21-Sep-10
FAR108110	Removal of Deck Above IMR	46	06-Oct-10	08-Dec-10
FAR108190	Eastern demolition Works Complete	0		08-Dec-10
Site Power Supplies		312	27-Oct-09	20-Jan-11
FAR107920	Smithfield Market - Install Minor Supply	180	27-Oct-09*	14-Jul-10
FAR107960	Lindsey Street - Install Major Supply	186	27-Oct-09*	22-Jul-10
FAR107940	Western Ticket Hall - Install Major Supply	220	09-Mar-10*	20-Jan-11
FAR107930	Smithfield Market - Minor Supply Available	0		14-Jul-10
FAR107970	Lindsey Street - Major Supply Available	0		22-Jul-10
FAR107950	Western Ticket Hall - Major Supply Available	0		20-Jan-11
TBM Power Supply		553	08-Sep-09	11-Nov-11
FAR107980	Install TBM Power Supply	553	08-Sep-09*	11-Nov-11
FAR107990	TBM Power Supply Available	0		11-Nov-11
C259 Aercheology - Farringdon		58	27-Jul-09 A	15-Oct-09
FAR108660	C259 - Prepare Tender Documents & Procure Archeology Contractor	58	27-Jul-09 A	15-Oct-09
FAR108670	C259 - Whitechapel Aercheology Contract Awarded	0		15-Oct-09

Table 4 PCS3.1 Enabling Works part 2

Farringdon - East Ticket Hall		1764	01-Mar-10	17-Feb-17
ETH - Advance Works		1386	01-Mar-10	24-Jul-15
Removal Of Smithfield Market Vent Ducts		88	23-Nov-10	01-Mar-11
FAR1087:	Install Market alternative ducts/units & comm'n	38	23-Nov-10	19-Jan-11
FAR1087:	Decommission/remove old units & BO foundation	35	20-Jan-11	01-Mar-11
LU Former Siding Operation - Remedial Works		181	01-Mar-10	18-Oct-10
FAR1088:	Trial trenching, underpin ground beam and guide	84	01-Mar-10	03-May-10
FAR1088:	Mob. low HR plant/install party wall footings	49	04-May-10	21-Jun-10
FAR1088:	Demobilise low head room piling plant	6	22-Jun-10	27-Jun-10
FAR1088:	Cast Capping beam, infill wall & lintel	83	22-Jun-10	23-Aug-10
FAR1088:	Install jacks, Jack & pack new wall	28	24-Aug-10	20-Sep-10
FAR1088:	Party wall strength gain period	28	21-Sep-10	18-Oct-10
Demolition Barbican retaining Walls		77	01-Mar-11	21-Jun-11
FAR1087:	Demolish Barb'n Party Wall N to platform lvl	85	01-Mar-11	24-May-11
FAR1087:	Barbican Platform 1 Works	21	25-May-11	14-Jun-11
FAR1087:	Clear Site	7	15-Jun-11	21-Jun-11
Emergency Access Provision Smithfield Market		1180	23-Nov-10	24-Jul-15
FAR1088:	Provision of Market alternative escape routes	27	23-Nov-10	23-Dec-10
FAR1088:	Temporary Arrangements in force for demolition	46	24-Dec-10	07-Feb-11
FAR1087:	Changeover to final arrangements	70	11-Jan-11	01-Apr-11
FAR1087:	Temporary provisions until shaft excavation	38	08-Feb-11	17-Mar-11
FAR1087:	Arrangements in force during box exc. & fitout	1590	18-Mar-11	24-Jul-15
ETH - Bridge Construction		1075	10-May-11	08-Aug-15
Piling Hayne St & Hayne st Bridge		917	10-May-11	18-Dec-14
FAR1058:	Mobilise Plant & obstruction removals	8	10-May-11	18-May-11
FAR1058:	Pedestrian Overbridge piles (4 No)	3	17-May-11	19-May-11
FAR1057:	Demobilise rigs	4	20-May-11	24-May-11
FAR1058:	4 Lindsey St Secant Piles	11	25-May-11	07-Jun-11
FAR1087:	HSB exca. above central pier & southern abutment	6	08-Jun-11	13-Jun-11
FAR1087:	Investigate spandrell gaps & remove parapets	12	14-Jun-11	25-Jun-11
FAR1058:	Set up main ETH site for shaft sinking	3	25-Jun-11	28-Jun-11
FAR1058:	Archaeol/Excav. ETH Main Site	146	25-Jun-11	13-Dec-11
FAR1058:	Staged infill of gaps	38	26-Jun-11	02-Aug-11
FAR1058:	Piling in southern abutment	19	03-Aug-11	21-Aug-11
FAR1058:	Relocate & piling in central pier	40	22-Aug-11	30-Sep-11
FAR1057:	Form pile cap in 3 Hayne Street	15	30-Oct-14*	15-Nov-14
FAR1057:	Cast abutment & bearing shelf & place bearings	28	17-Nov-14	18-Dec-14
Hayne St Bridge Reconstruction		76	12-Dec-14	01-Apr-15
FAR1058:	HSB remove remaining parapets & exc to 116m ATD	12	12-Dec-14	08-Jan-15
FAR1058:	HSB cast deck slab & cure	26	09-Jan-15	07-Feb-15
FAR1058:	Demolish southern span & fix reinforcement	19	09-Feb-15	02-Mar-15
FAR1058:	Place precast parapet units & form S. abutment	21	25-Feb-15	20-Mar-15
FAR1058:	Shutter & cast concrete and resurface bridge	21	03-Mar-15	26-Mar-15
FAR1058:	Strike shutter & lay brickwork	10	09-Mar-15	19-Mar-15
FAR1058:	Brickwork to southern abutment & waterproof	6	20-Mar-15	26-Mar-15
FAR1058:	Cast southern abutment in lifts to deck soffit	5	27-Mar-15	01-Apr-15
Pedestrian Overbridge		87	02-Apr-15	08-Aug-15
FAR1057:	Temp works, bridge preparation, lift crane	18	02-Apr-15	01-May-15
FAR1057:	Slidebridge element along Moorgate trackbed	21	13-Apr-15	07-May-15
FAR1057:	Del & fab 9.5m, 19m & support frame	9	27-Apr-15	07-May-15
FAR1057:	Mobilise & erect crane	4	02-May-15	07-May-15
FAR1057:	Lift & slide 9.5m section	3	08-May-15	11-May-15
FAR1057:	Lift support frame & 19m bridge section	3	12-May-15	14-May-15
FAR1057:	Demobilise crane & jack 9.5m underbridge section	14	15-May-15	01-Jun-15
FAR1058:	Re-establish Moorgate Trackbed	67	20-May-15	08-Aug-15
FAR1058:	Release jacks & dismantle support trestle	16	02-Jun-15	17-Jun-15
FAR1058:	Install floor & finishes in footbridge area	33	18-Jun-15	20-Jul-15

Table 5 PCS3.1 Eastern Ticket Hall part 1

ETH - Deep Box Construction		1484	10-May-11	17-Feb-17
Piling Southern Ticket Hall Area		49	10-May-11	18-Jul-11
FAR1065	OSD Core foundation piles	53	10-May-11	11-Jul-11
FAR1065	OSD pile caps	55	14-May-11	18-Jul-11
Install; & Maintain Dewatering System		1205	10-May-11	10-Feb-16
FAR1059	Drilling of wells, discharge ducting	53	10-May-11	11-Jul-11
FAR1059	Commissioning - acidification, pump installation	49	12-Jul-11	29-Aug-11
FAR1059	Monitor/Maintain of dewatering sys during constd	1523	30-Aug-11	30-Oct-15
FAR1059	S'down, Decomm'n, Reinstate, Closeout Dewatering	76	31-Oct-15	10-Feb-16
Tension Piles for Station Box		29	10-May-11	20-Jun-11
FAR1060	Mobilise Rig and support crane	2	10-May-11	11-May-11
FAR1060	Mobilise / Obstruction removals	6	10-May-11	16-May-11
FAR1060	Installation of Tension Piles (25 No)	31	12-May-11	17-Jun-11
FAR1060	Demobilise piling plant and crews	2	18-Jun-11	20-Jun-11
Diaphragm walls for Station Box		199	10-May-11	17-Feb-12
FAR1062	Moorgate track removals	23	10-May-11	06-Jun-11
FAR1062	Excavate Moorgate trackbed	36	07-Jun-11	18-Jul-11
FAR1059	Mobilise Plant & setup bentonite plant and tanks	19	01-Oct-11	22-Oct-11
FAR1059	Guidewall and obstruction removals	19	01-Oct-11	22-Oct-11
FAR1059	Diaphragm Walling for Deep Box (inc trial panel)	71	24-Oct-11	27-Jan-12
FAR1059	Place concrete platform/piling base	12	22-Nov-11	05-Dec-11
FAR1059	Demobilise Dwall plant and tanks etc	18	28-Jan-12	17-Feb-12
Box - Excavation, Lining & Propping		179	18-Feb-12	01-Nov-12
FAR1060	Excavate to 104m ATD (Basement level-5)	14	18-Feb-12	05-Mar-12
FAR1060	Place working level blinding layer	5	06-Mar-12	10-Mar-12
FAR1060	Drilling in tie bars	7	12-Mar-12	19-Mar-12
FAR1060	Install shuttering & reinforcement	13	20-Mar-12	03-Apr-12

Table 6 PCS3.1 Eastern Ticket Hall part 2

FAR1060	Cast ringbeam in stages	7	04-Apr-12	20-Apr-12
FAR1060	Cure & strike	7	21-Apr-12	28-Apr-12
FAR1061	Excavate to 92m ATD	28	30-Apr-12	02-Jun-12
FAR1061	Place working level blinding layer	6	04-Jun-12	09-Jun-12
FAR1061	Drilling in tie bars	6	11-Jun-12	16-Jun-12
FAR1061	Install shuttering & reinforcement	17	18-Jun-12	06-Jul-12
FAR1061	Cast ringbeam in stages	6	07-Jul-12	13-Jul-12
FAR1061	Cure & strike	6	14-Jul-12	20-Jul-12
FAR1061	Excavate to 77.6m ATD	28	21-Jul-12	22-Aug-12
FAR1061	Place working binding layer	4	23-Aug-12	28-Aug-12
FAR1061	Drilling in tie bars	7	29-Aug-12	05-Sep-12
FAR1061	Install shuttering & reinforcement	30	06-Sep-12	10-Oct-12
FAR1062	Cast ringbeam in stages	9	11-Oct-12	20-Oct-12
FAR1062	Cure & strike	10	22-Oct-12	01-Nov-12
Box - Internal Floors & Walls		228	26-Mar-14	18-Feb-15
FAR1062	Cast int. walls, walls & floor to 84.0m ATD	30	26-Mar-14	09-May-14
FAR1062	Cast int. walls, walls & floor to 91.2m ATD	29	02-May-14	06-Jun-14
FAR1062	Cast int. walls, walls & floor to 95.5m ATD	30	31-May-14	04-Jul-14
FAR1062	Build up working level for escalator	12	05-Jul-14	18-Jul-14
FAR1062	Cast int. walls, walls & floor to 101.8m ATD	31	19-Jul-14	23-Aug-14
FAR1062	Cast int. walls, walls & floor to 105.4m ATD	28	18-Aug-14	19-Sep-14
FAR1063	Cast int. walls, walls & floor to 109.37m ATD	40	08-Sep-14	23-Oct-14
FAR1063	Cast int. walls & walls to surface	23	04-Oct-14	30-Oct-14
FAR1063	Cast Moorgate track corridor box across shaft	83	31-Oct-14	18-Feb-15
Ticket Hall Structure		339	03-Nov-14	05-Mar-16
FAR1068	Construct basement level over shaft	63	03-Nov-14	28-Jan-15
FAR1068	Demob Crane, shotcrete facilities etc.	9	29-Jan-15	07-Feb-15
FAR1068	Breakout cover over N half of site Sth of box	10	09-Feb-15	19-Feb-15
FAR1068	Structural fill/excavation to N half to site	26	20-Feb-15	21-Mar-15
FAR1068	Fix rebar and cast base slab & upstand	28	05-Mar-15	15-Apr-15
FAR1068	Construct external & internal walls N half.	28	19-Mar-15	29-Apr-15
FAR1068	Construct road level roof N half	28	02-Apr-15	14-May-15
FAR1068	Clear South site area inc. Market Escape	4	15-May-15	19-May-15
FAR1068	Breakout cover over S half of site Sth of box	13	20-May-15	04-Jun-15
FAR1069	Structural fill/excavation to S half of site	27	05-Jun-15	06-Jul-15
FAR1069	Fix rebar & cast base slab & upstand S half	28	17-Jun-15	18-Jul-15
FAR1069	Construct external & internal walls S half	28	19-Jun-15	21-Jul-15
FAR1069	Construct road level roof S half	28	23-Jun-15	24-Jul-15
FAR1069	Form superstructure to crash deck level	180	25-Jul-15	05-Mar-16
Internal Architectural fitout		170	25-Jul-15	24-Mar-16
FAR1070	Architectural Fit out ETH	196	25-Jul-15	24-Mar-16
M&E / Systems Installation / Fit out		329	31-Oct-15	17-Feb-17
FAR1071	E&M Building services FARR ETH	235	31-Oct-15	25-Aug-16
FAR1075	Tunnel Vent.install'n(TVF) FARR ETH	131	07-Mar-16	17-Aug-16
FAR1070	MIP&Pass.aces lift installation to ETH	160	07-Mar-16	21-Sep-16
FAR1071	Low lvl Escalator ES2 installation	273	10-Mar-16	17-Feb-17
FAR1075	System wide installation ETH	131	15-Mar-16	25-Aug-16
FAR1070	Escalator installation - ETH Shaft	160	01-Aug-16	17-Feb-17
FAR1070	ETH AFC (Automatic Fare Collector) inst'n	131	05-Sep-16	17-Feb-17

Table 7 PCS3.1 Eastern Ticket Hall part 3

ETH - Pilot TBM Reception & Recovery Chamber		523	22-Oct-12	13-Nov-14
ETH EB TBM Recovery		496	28-Nov-12	13-Nov-14
FAR1063f	Rescue EB Pilot tunnel head & parts	35	28-Nov-12	21-Jan-13
FAR1064f	Dismantle EB pilot tunnel cradle	12	22-Jan-13	04-Feb-13
FAR1064f	Charterhouse Shaft access to ug works	521	06-Feb-13	13-Nov-14
ETH WB TBM Recovery		70	22-Oct-12	30-Jan-13
FAR1063f	Mobilise shotcrete equipment & crew	10	22-Oct-12	01-Nov-12
FAR1063f	Form reception eye in D-wall	14	02-Nov-12	17-Nov-12
FAR1063f	Fab WB Pilot Preception frame & slide provisions	27	19-Nov-12	19-Dec-12
FAR1063f	Mobilise 350t crane & slide shield	8	20-Dec-12	11-Jan-13
FAR1063f	Disconnect & lift TBM head & body	5	10-Jan-13	15-Jan-13
FAR1063f	Demobilise 350t crane	4	26-Jan-13	30-Jan-13
ETH - Running Tunnel TBM Recovery		453	31-Jan-13	13-Nov-14
ETH EB TBM Recovery		160	28-Mar-14	13-Nov-14
FAR1064f	Reception eye & cradle for EB running tunnel	22	28-Mar-14*	01-May-14
FAR1064f	Removal of EB TBM	32	02-May-14	10-Jun-14
FAR1064f	Dismantle cradle	21	21-Oct-14	13-Nov-14
ETH WB TBM Recovery		46	31-Jan-13	08-Apr-13
FAR1064f	Fab WB RT reception frame & slide provisions	25	31-Jan-13	28-Feb-13
FAR1064f	Slide shield & mobilise 350t crane	8	01-Mar-13	09-Mar-13
FAR1064f	Disconnect & lift TBM head & body	6	06-Mar-13	12-Mar-13
FAR1064f	Retrieve & lift backup gantry 1,2 & 3	14	13-Mar-13	28-Mar-13
FAR1064f	Demobilise 350t crane	1	08-Apr-13	08-Apr-13
ETH - Escalator Shaft		326	19-Jul-14	30-Oct-15
Shaft Excavation		166	19-Jul-14	14-Mar-15
FAR1027f	Form Escalator opening ring beam in Shaft Wall	21	19-Jul-14	08-Aug-14
FAR1027f	Mobilise & install pipe arch canopy	18	09-Aug-14	26-Aug-14
FAR1027f	Breakout top heading	4	27-Aug-14	30-Aug-14
FAR1027f	Breakout & excavate escalator UMC 8m	40	31-Aug-14	09-Oct-14

Table 8 PCS3.1 Eastern Ticket Hall part 4

FAR1027f	Install pipe arch canopy	14	10-Oct-14	23-Oct-14
FAR1027f	Drive escalator barrel	33	24-Oct-14	25-Nov-14
FAR1027f	Place pipe arch canopy & drive escalator barrel	109	26-Nov-14	14-Mar-15
Shaft Lining		180	15-Mar-15	30-Oct-15
FAR1027f	Invert membrane/Concrete escalator barrel	30	15-Mar-15	13-Apr-15
FAR1027f	Crown membrane/concrete escalator barrel	75	14-Apr-15	27-Jun-15
FAR1028f	Invert membrane/concrete UMC escalator	25	28-Jun-15	22-Jul-15
FAR1028f	Crown membrane/Concrete UMC escalator	100	23-Jul-15	30-Oct-15
ETH - Charterhouse Square Works		1287	08-Feb-11	09-Mar-16
Piling Charterhouse Square Box		139	08-Feb-11	25-Aug-11
FAR1065f	Set up Site Charterhouse Square	7	08-Feb-11	15-Feb-11
FAR1065f	Archaeological Excavation 35-38 Charterhouse Sq	50	16-Feb-11	14-Apr-11
FAR1065f	Mobilise low headroom rig to site, dismantle, or	19	15-Apr-11	17-May-11
FAR1065f	Secant Piling boundary wall North & East (85No)	55	18-May-11	21-Jul-11
FAR1065f	Piling for temporary works shaft	18	22-Jul-11	11-Aug-11
FAR1065f	Dismantle and remove rig	6	12-Aug-11	18-Aug-11
FAR1065f	Casting of pile caps and ground beams	12	12-Aug-11	25-Aug-11
Charterhouse Sq Temporary Shaft		1007	26-Aug-11	19-Aug-15
FAR1065f	Staged infill of basement area beneath road	21	26-Aug-11	20-Sep-11
FAR1066f	Site set up for shaft sinking	48	26-Aug-11	21-Oct-11
FAR1066f	Erect shaft gantry crane	27	21-Sep-11	21-Oct-11
FAR1066f	Shaft sinking to canopy level & blind	50	22-Oct-11	19-Dec-11
FAR1066f	Install & commission monitoring	13	12-Dec-11	09-Jan-12
FAR1066f	Enlarge shaft, sink & cast base plug	41	10-Jan-12	25-Feb-12
FAR1066f	Reception eye & cradle for pilot tunnel	21	27-Feb-12	21-Mar-12
FAR1066f	Erect Shutter & cast basal plug	11	23-Jan-15	04-Feb-15
FAR1066f	Staged infill of shaft to enlargement	10	05-Feb-15	16-Feb-15
FAR1066f	Decommission instruments & infill pipe canopy	10	17-Feb-15	27-Feb-15
FAR1066f	Staged infill of shaft to surface	5	28-Feb-15	05-Mar-15
FAR1067f	Erect hoarding & demolish party wall	13	06-Mar-15	20-Mar-15
FAR1067f	Obstruction clearance & piling	57	21-Mar-15	06-Jun-15
FAR1067f	Form pilecap	12	08-Jun-15	20-Jun-15
FAR1067f	Cast abutment & bearing shelf & place bearings	28	22-Jun-15	23-Jul-15
FAR1067f	Backfill of concrete drop pipes	11	24-Jul-15	05-Aug-15
FAR1067f	Backfill of concrete vent pipes	12	06-Aug-15	19-Aug-15
Charterhouse Sq Superstructure (OSD) & Fitout		160	24-Jul-15	09-Mar-16
FAR1067f	35-38 Charterhouse Sq basement level	25	24-Jul-15	21-Aug-15
FAR1067f	35-38 Charterhouse Sq Road level (1)	26	22-Aug-15	22-Sep-15
FAR1067f	35-38 Charterhouse Sq Roof & cladding	19	23-Sep-15	14-Oct-15
FAR1067f	Fitout of Charterhouse Square	37	15-Oct-15	26-Nov-15
FAR1068f	35-38 Charterhouse Sq upper floors & facade	114	15-Oct-15	09-Mar-16

Table 9 PCS3.1 Eastern Ticket Hall part 5

6.2 Archaeological Investigation – Eastern Ticket Hall & 3 Hayne Street

Phase 1 Enabling Works

NLBH heritage recording should occur as soon as possible, prior to demolition. Site entry for demolitions at the Eastern Ticket Hall are programmed to begin 22 Mar 2010.

A targeted watching brief is required for utilities diversions in Charterhouse Square; Charterhouse Street; and Fox & Knot Street at Enabling Works (02 Nov 2009 – 28 Feb 2011).

Archaeological field evaluation should occur at 20-23 Long Lane; 8-10 Hayne Street; 3 Hayne Street and 33-37 Charterhouse Square in the Enabling Works stage during (i.e. at the soft strip

stage after the removal of asbestos) or immediately after the demolition process. 2-3 Lindsey Street; 20-23 Long Lane and 8 & 9 Hayne Street are programmed to be demolished 08 Jun 2010 – 25 Oct 2010. 33-37 Charterhouse Square are programmed to be demolished 20 Jul 2010 – 21 Sep 2010.

Archaeological field evaluation will take c. 2-4 weeks on site at each location. Reporting will also take up to 4 weeks (total 8 weeks).

The details of the archaeological evaluation are to be determined during the detailed design phase, and will be programmed according to feasibility in the construction sequence.

The results of the evaluation will inform the mitigation design and will comprise *preservation-by-record* (e.g. archaeological excavation and/or watching brief). Mitigation will be programmed according to feasibility in the construction sequence and could occur at Phase 1 Enabling Works or Phase 2 Main Works.

A minimum of 8 weeks should be allowed in the programme between evaluation fieldwork end and start of mitigation work. This incorporates the 4 weeks of reporting mentioned above and preparation of a WSI for mitigation works.

Archaeological mitigation in the form of *preservation-by-record* (e.g. targeted watching brief) will be required in the road between 3 & 10 Hayne Street, at the Enabling Works stage following on from utilities works at this location.

6.3 Archaeological Investigation – 67-69 Cowcross Street and Greenhill's Rents Grout Shafts

Archaeological mitigation in the form of *preservation-by-record* (e.g. archaeological excavation and/or targeted watching brief). No details are available on construction sequence and methodology at the shaft sites or the finalised locations, however, it is envisaged that archaeological excavation will occur after Enabling Works, when utilities have been diverted, and prior to Main Works. The compensation grout shafts are programmed to be constructed 17 Feb 2012 – 12 Jan 2016.

The specific locations of the grout shafts at these sites will be determined by C122 during the detailed design phase.

6.4 Archaeological Investigation – Western Ticket Hall

A General Watching brief is required at the diversion of the Fleet Sewer (St Johns and City of London branches) at Enabling Works. NB. This falls under the scope of the Thameslink Project.

A General Watching Brief is required during ground reductions within the piled box, at the Main Works stage (08 Feb 2011 – 10 Feb 2017).

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 standards and specifications;
 - Institute for Archaeologists – Standard and Guidance for archaeological field evaluation, 2008 (revised);
 - Institute for Archaeologists – Standard and Guidance for archaeological excavation, 2008 (revised);
 - Institute for Archaeologists – Standard and Guidance for an archaeological watching brief, 2008 (revised);
 - 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); and
 - English Heritage – Understanding Historic Buildings – A guide to good recording practice, 2006

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 Project Archaeologist 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 Project Archaeologist 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.
- 7.1.8 Project Archaeologist 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.
- 7.1.12 The Principal Contractor will be required to cease all works at that location until further instruction is provided by the Project Archaeologist. 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.
- 7.1.15 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Project Archaeologist to incorporate any additional specific primary fieldwork event aims.

Treasure Act

7.1.16 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.

7.1.17 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.

7.1.8 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.

7.1.9 Project Archaeologist 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.

7.1.10 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.

7.1.11 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.

7.1.12 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

7.2.8 [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)].

7.2.9 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 CDM co-ordinator.

7.2.10 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.

7.2.11 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 Project Archaeologist. All spatial setting out and recording shall be in accordance with The London Survey Grid Standard (formerly Crossrail Survey Grid). See Crossrail standard CR-STD-010.

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 Marker (PGM) data supplied to the Archaeology Contractor by the Project Archaeologist. 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 watching brief

Scope of Watching Brief

- 7.4.1 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.
- 7.4.2 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.
- 7.4.3 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.
- 7.4.4 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 Contractor's or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works.
- 7.4.5 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
- 7.4.6 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.
- 7.4.7 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.
- 7.4.8 The specification for watching briefs (general and targeted) are set out below:

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

- 7.4.9 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 Archaeologist. 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

- 7.4.10 The Archaeology Contractor shall undertake a targeted watching brief during enabling works at the Eastern Ticket Hall during utilities diversions at Charterhouse Square; Charterhouse Street and Fox & Knot Street; and in the road between 3 & 10 Hayne Street. The Archaeology Contractor shall undertake a general watching brief during enabling works at the Western Ticket Hall during the diversion of the Fleet Sewer (St John and City of London branches) and during Main Works at ground reduction in the footprint of the piled box.
- 7.4.11 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.
- 7.4.12 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.
- 7.4.13 The core team shall undertake the observation and any required investigation such as they may reasonably be able to undertake.
- 7.4.14 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.
- 7.4.15 The Archaeology Contractor's core and support teams shall be advised where necessary by specialists, as appropriate and as agreed with the Project Archaeologist.
- 7.4.16 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;
 - 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

- 7.4.17 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.
- 7.4.18 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.
- 7.4.19 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

- 7.4.20 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.
- 7.4.21 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 consist of monochrome prints/negatives and colour transparencies. A 35mm format (film or digital) SLR camera is

acceptable for all site photography. The Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, structures, and quaternary deposits. Each photograph and transparency shall clearly show details of the above. Each photograph and 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 illustrate work in progress.

7.5 Specification for archaeological investigation

- 7.5.1 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.
- 7.5.2 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.
- 7.5.3 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.
- 7.5.4 Each trial excavation has been assigned a unique ID number by the Project Archaeologist. The Archaeology Contractor shall not vary this number unless agreed by the Project Archaeologist in writing.
- 7.5.5 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.
- 7.5.6 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).
- 7.5.7 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.

- 7.5.8 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.
- 7.5.9 Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machining.
- 7.5.10 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.
- 7.5.11 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.
- 7.5.12 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.

- 7.5.13 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.
- 7.5.14 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.
- 7.5.15 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.
- 7.5.16 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.
- 7.5.17 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

- 7.5.18 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).
- 7.5.19 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.
- 7.5.20 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.
- 7.5.21 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.
- 7.5.22 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.
- 7.5.23 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.
- 7.5.24 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.

- 7.5.25 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 CR-PN-PRW-EN-PD-00010). The Archaeology Contractor shall revise the Archaeological Contractor's Method Statement to reflect any additional requirements for built heritage recording.
- 7.5.26 The photographic record shall consist of monochrome prints/negatives and colour transparencies. A 35mm format SLR camera (film or digital) is acceptable for all site photography. The Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, and structures. Each photograph and transparency shall clearly show details of the above, and may require the use of artificial lighting to achieve suitable definition. Each photograph and transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the project event code and context/feature number. In addition, the Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.
- 7.5.27 The transparencies shall be mounted in suitable frames for long-term curation in preparation for deposition with the archive. Digital photography and 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.
- 7.5.28 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.

7.6 Specific Requirements for the excavation of trial trenches or pits

- 7.6.1 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.
- 7.6.2 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).
- 7.6.3 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.

- 7.6.4 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.
- 7.6.5 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.

7.7 Archaeological science

- 7.7.1 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 Project Archaeologist 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.
- 7.7.2 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).
- 7.7.3 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.
- 7.7.4 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).
- 7.7.5 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.

- 7.7.6 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).
- 7.7.7 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.
- 7.7.8 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.
- 7.7.9 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).
- 7.7.10 Samples for absolute dating shall be submitted promptly to the supply laboratory proposed by the Archaeology Contractor or other supplier as 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.
- 7.7.11 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.
- 7.7.12 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).

- 7.7.13 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).
- 7.7.14 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

- 7.7.15 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.
- 7.7.16 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.
- 7.7.17 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).
- 7.7.18 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.
- 7.7.19 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.

- 7.7.20 For 'bulk disturbed' samples the limits of the sample zone shall be recorded and identified on plan.
- 7.7.21 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.
- 7.7.22 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.
- 7.7.23 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.
- 7.7.24 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

8.1 Archaeological Contractors Method Statement

8.1.1 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;
- 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;
- 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 7.1);
- 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.
- 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.

8.2 Site Archives

- 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.

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 Rob Whitehead (English Heritage) the City of London and the London Borough of Islington for comment.

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 standard CRS-SDT-05. Each drawing shall identify the relevant event code and sub-site division, if applicable.

8.6 Fieldwork Report

- 8.6.1 The evaluation report and watching brief reports 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
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, these 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;
 - 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 Project Archaeologist 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 Rob Whitehead (English Heritage) and the City of London and the London Borough of Islington for comment.
- 8.6.12 The following shall appear in the footer or header of each Fieldwork Report:

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8.7 SMR/HER Summary Sheet

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

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.
- 8.8.3 The Summary Report shall be submitted as an MS Word *.document in accordance with the Employer's information management standards and procedures.

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

- 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 City of London, the London Borough of Islington and Rob Whitehead (English Heritage) 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

- 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 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 and glossary of terms

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- Crossrail 2005a. Assessment of Archaeological Impacts, Technical Report, Part 2 of 6, Central Section, Report Number 1E0318-C1E00-00001
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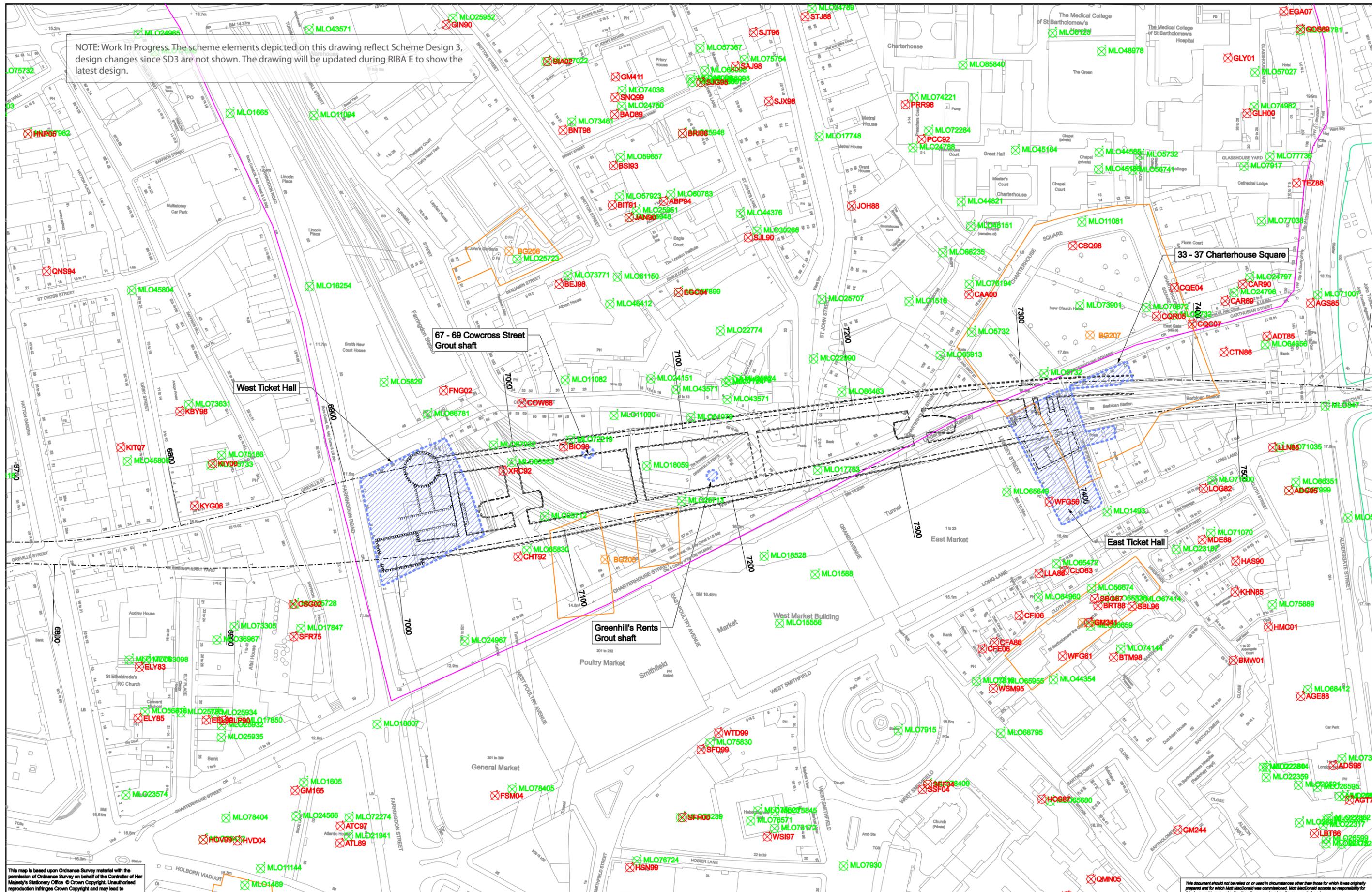
12 ANNEXES (to be provided at tender stage)

- 1 Archaeological Research Agenda
- 2 Site information
Services and Utilities, Extinguishments of Rights of Way, Surface Water Control, Protective Fencing, Credit Boards, Care in Executing the Site Operations, Parking of Vehicles
- 3 Plans and other illustrations
- 4 Health and Safety requirements:
Designers Risk Assessment and CDM requirements
Archaeological Contractors risk assessments and Health and Safety Plans
Archaeological Contractor's Safety Audits, Safety Inspections, Reporting of Accidents
Personal Protective Equipment (PPE)
Labelling of Hazardous Substances, Contaminated Land
Crossrail Health and Safety Management System, Crossrail Drugs and Alcohol Policy
Crossrail Policy for work on Network Rail Land
- 5 Environmental protection requirements
- 6 Programme and order of work for implementation of works and integration with other activities
- 7 Enabling and temporary works design requirements, attendances and implementation
- 8 Security requirements



Annex 3 – Plans and other illustrations

NOTE: Work In Progress. The scheme elements depicted on this drawing reflect Scheme Design 3, design changes since SD3 are not shown. The drawing will be updated during RIBA E to show the latest design.



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REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A02	05/12/2008	SCHEME DESIGN 3 ISSUE	PWC	MC	DSW		

LEGEND

- MLO21941 Greater London Sites and Monuments Record
- ATL89 Site Codes
- Archaeological Priority Zone
- BG205 Burial Ground
- L036 Scheduled Ancient Monuments
- Registered Parks and Gardens
- Crossrail Worksite

Scale 1:1000

North arrow pointing up.

Crossrail

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 LONDON SW1E 8BH
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 www.crossrail.co.uk

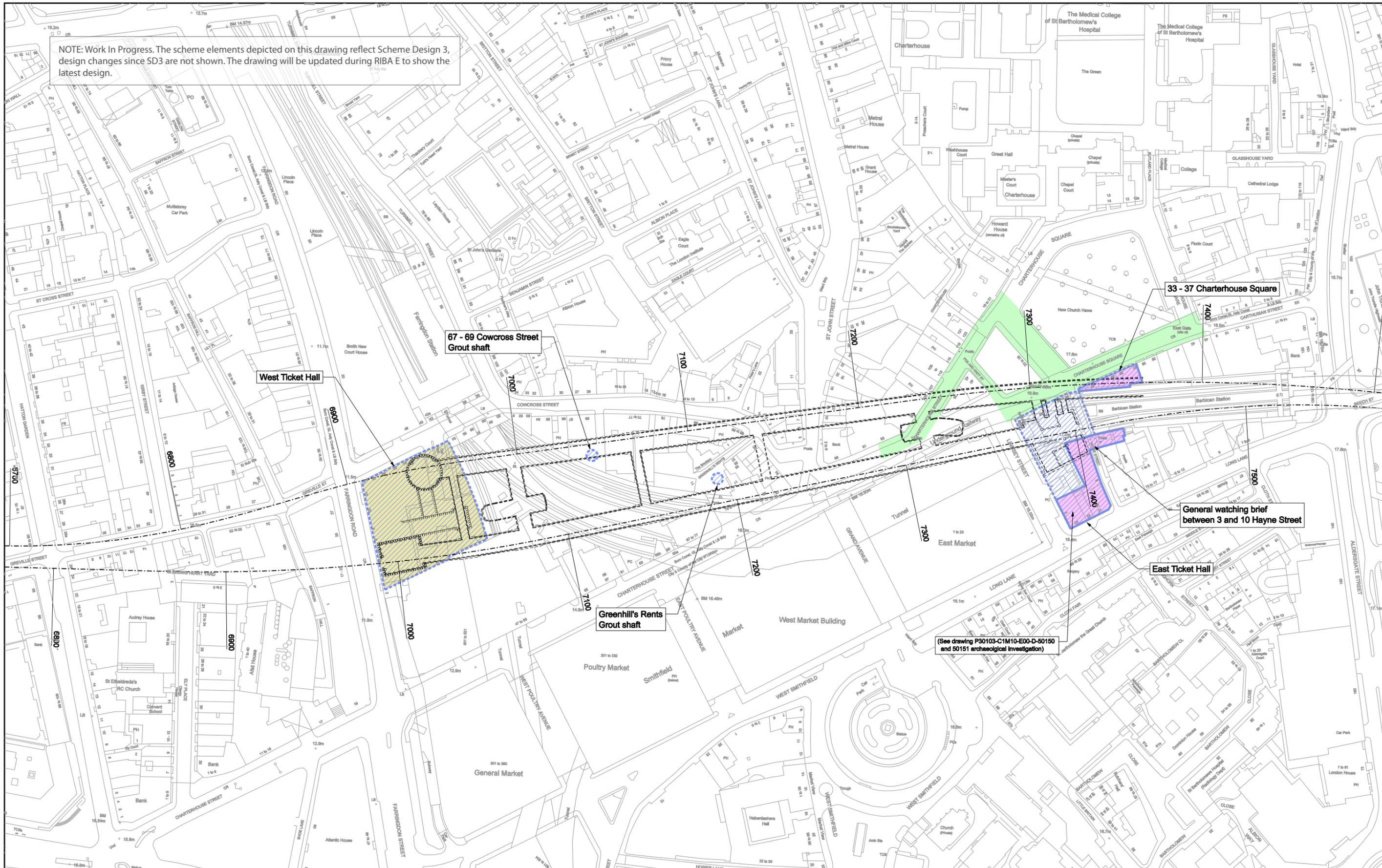
CONTRACT No. / CONSULTANT:
 1199 / MOTT MACDONALD

TITLE:
**FARRINGDON STATION
 ARCHAEOLOGICAL BASE LINE**

SCALE: 1:1000 @ A1
 DRAWING AND CAD FILE No: P30103-C1M10-E00-D-50001
 REV: A02

RESTRICTED

NOTE: Work In Progress. The scheme elements depicted on this drawing reflect Scheme Design 3, design changes since SD3 are not shown. The drawing will be updated during RIBA E to show the latest design.



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REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A02	05/12/2008	SCHEME DESIGN 3 ISSUE	PWC	MC	DSW		

LEGEND

-  Crossrail Worksite
-  General watching brief at utilties diversions
-  Trial trench evaluation during enabling works
-  General watching brief at main works

Scale 1:1000



N



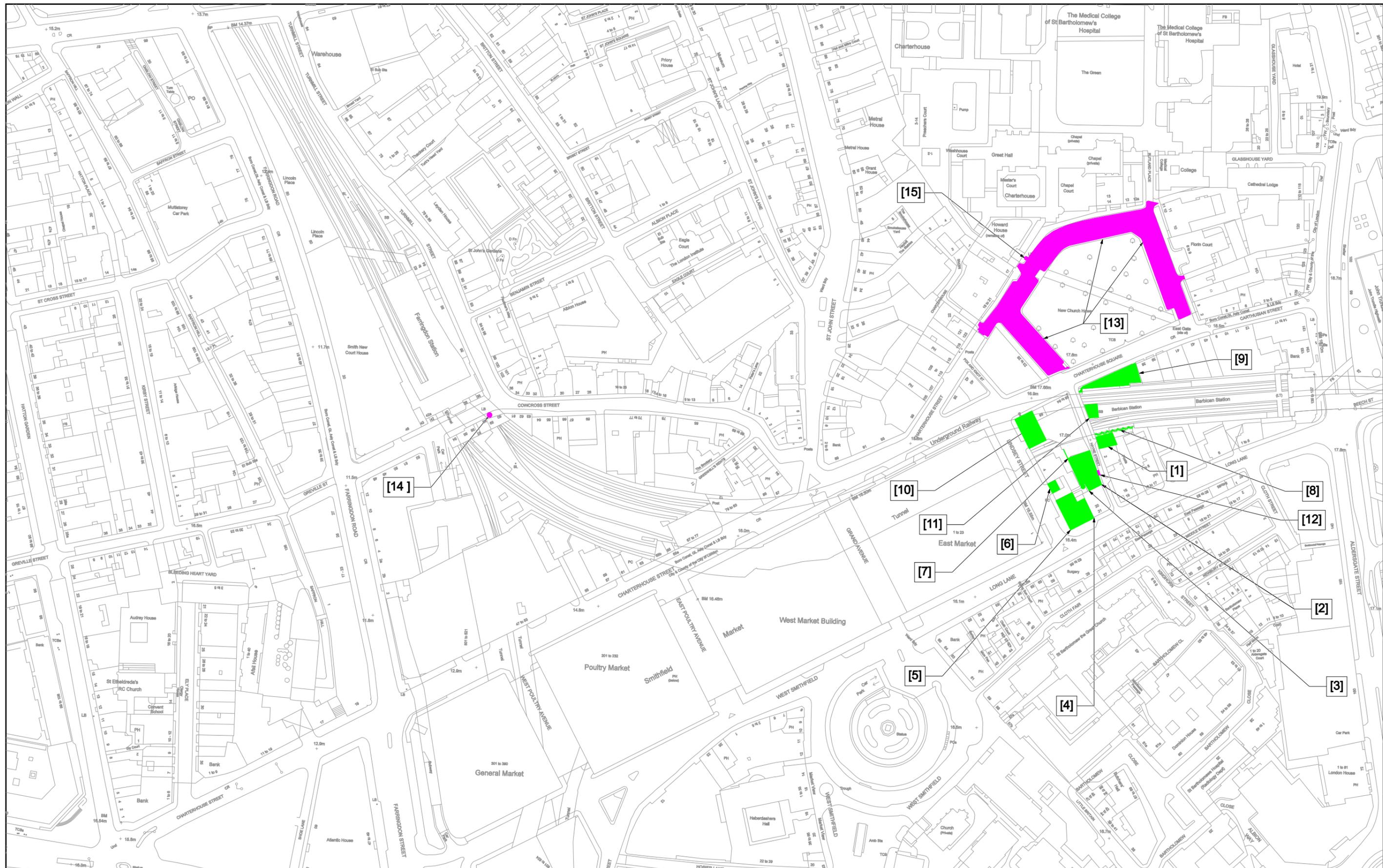

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CONTRACT No. / CONSULTANT:
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TITLE:
**FARRINGDON STATION
 ARCHAEOLOGY
 AREA FOR EVALUATION AND MITIGATION**

SCALE: 1:1000 @ A1 DRAWING AND CAD FILE No: P30103-C1M10-E00-D-50003 REV: A02

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REV	DATE	DESCRIPTION	BY	CHKD	APP	CAD	ACC
A02	05/12/2008	SCHEME DESIGN 3 ISSUE	PWC	MC	DSW		

Non-listed historic building
 Historic street furniture

Scale 1:1000

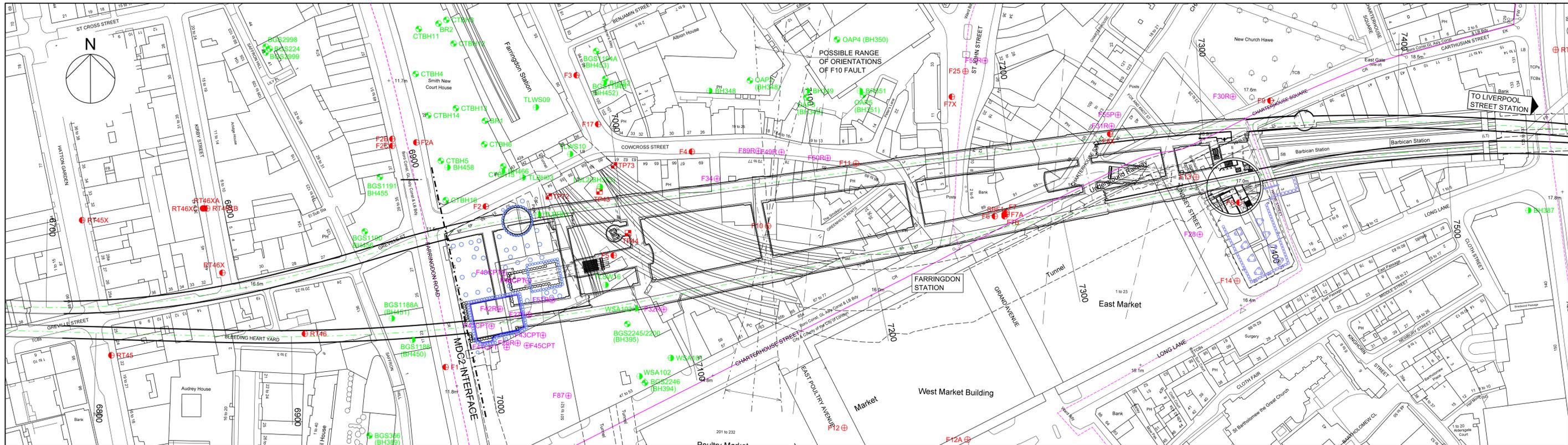
N

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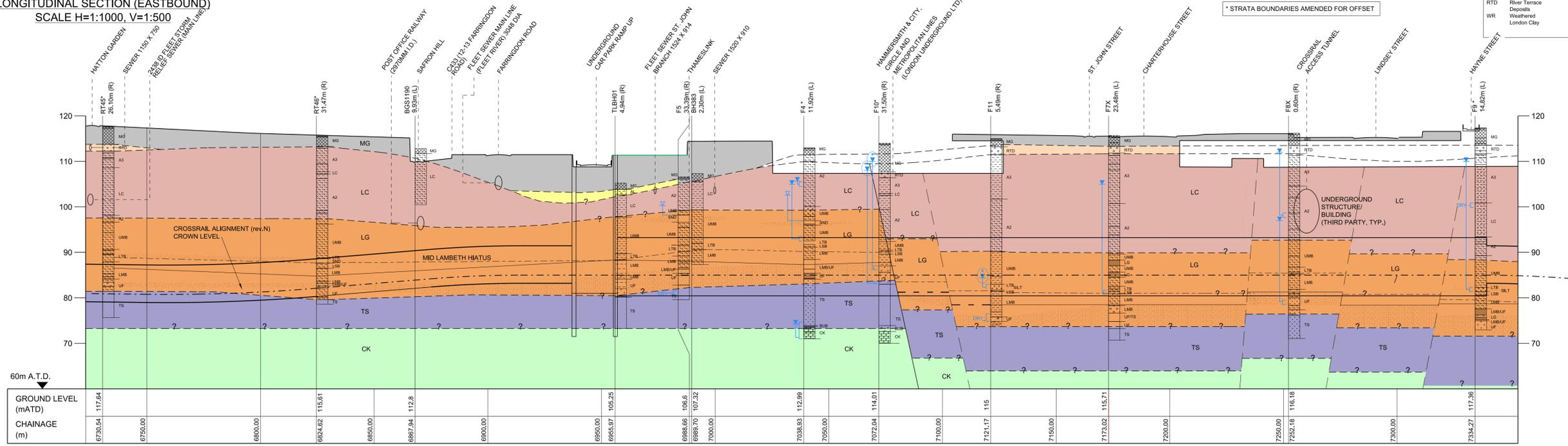
CONTRACT No. / CONSULTANT:
 1199 / MOTT MACDONALD
 TITLE:
**FARRINGDON STATION
 NON-LISTED BUILT HERITAGE
 LOCATION PLAN**
 SCALE: 1:1000 @ A1
 DRAWING AND CAD FILE No: P30103-C1M10-E00-D-50004
 REV: A02

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

RESTRICTED



LONGITUDINAL SECTION (EASTBOUND)
SCALE H=1:1000, V=1:500



Stratigraphic Units		London Clay Formation		Lower Mottled Beds	
MG	Made Ground	A2, A3, B	Sub Strata	LMB	Lower Mottled Beds
AL	Albionium	LC	Undersilted London Clay	LG	Undersilted Lambeth Group
LS	Langley Silt	HF	Harwich Formation	UF	Upper Formation
RTD	River Terrace Deposits	USB	Upper Shelly Beds	TS	Thames Sand Formation
UMB	Upper Mottled Beds	LMB	Laminated Beds	SLB	Silted Beds
WR	Weathered London Clay	LTB	Lower Mottled Beds	CK	Chalk
		LSB	Lower Shelly Beds		

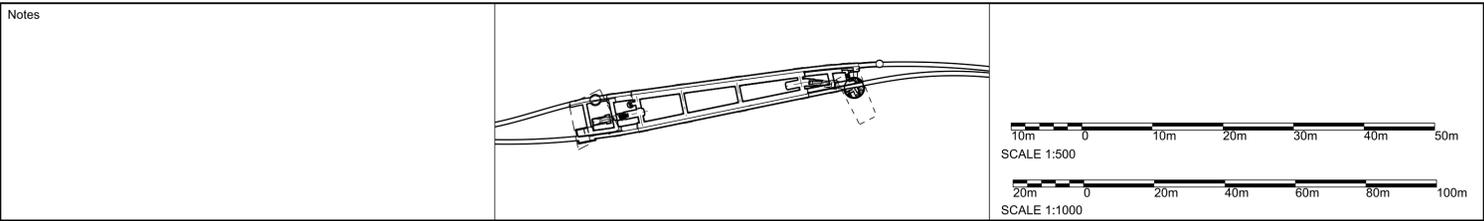
- KEY**
- CROSSRAIL BOREHOLES PACKAGE C (FES) (1992)
 - ⊕ CROSSRAIL ADDITIONAL BOREHOLES (SM) (1994-1996)
 - CROSSRAIL TRIALPITS
 - THIRD PARTY BOREHOLES
 - ⊕ PRELIMINARY PACKAGE 13 BOREHOLES (2009)
 - 18.32m (L) OFFSET FROM CENTRE LINE (LEFT OR RIGHT)
 - - - INTERPRETED GEOLOGICAL BOUNDARY
 - EXISTING GROUND LEVEL
 - COHESIONLESS LAYERS POTENTIALLY WATER BEARING (PRINCIPLE PARTICLE SIZE SILT, SAND OR GRAVEL) WITHIN LC AND LG
 - RECORDED WATER LEVEL DURING WATER STRIKE
 - WATER STRIKE LEVEL
 - MAXIMUM RECORDED GROUNDWATER LEVEL (PIEZOMETER)
 - PIEZOMETER TIP LEVEL AND SAND FILTER ZONE
 - ? INDICATES UNCERTAINTY IN STRATUM BOUNDARY LEVEL AND/OR EXTENT
 - BASE OF LOWEST IDENTIFIED AQUITARD IN LG (interpolated)
 - BASE OF LOWEST IDENTIFIED AQUITARD IN LG (extrapolated)
 - POSSIBLE MINOR FAULTS
 - F10 FAULT

- NOTES**
- The survey grid detailed on the plan layout is in Ordnance Survey grid.
 - This drawing presents the existing geotechnical information provided by GCG and third party information gained from other sources. Where required Scott Wilson has re-interpreted the existing data for the purposes of the ground model construction.
 - The geotechnical long sections have been interpreted principally from the boreholes closest to the section line. However, the overall geological structure has been interpreted from all the data available. Where exploratory holes are offset from the section line, strata boundaries shown on the long section may not coincide with the strata boundaries within individual exploratory holes.
 - For detailed information regarding material type, reference should be made to the factual exploratory hole records.
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 - The quality of the logging of the CTBH boreholes is poor, the ground levels for these boreholes are also assumed. Therefore, low reliance has been put on these boreholes.
 - Chainages shown on plan and sections are indicative only, and subject to change. Both sections chainages increase running West to East.
 - Most reliance has been placed on the Arup Farringdon ground investigation boreholes (F prefix). Third party boreholes have been used generally where they are within close proximity of the alignment only, although the reliability of the boreholes is less than the Arup Farringdon boreholes, and alternative interpreting may be possible. Shallow boreholes have generally not been included unless they have informed the interpretation of the geological structure.
 - A detailed review of the piezometric profile within the Farringdon station area has been carried out. Within the Farringdon area the groundwater monitoring data is limited to 1992-3 readings.
 - The alignment of the possible minor faults is indicative only. Insufficient data is available to determine precise alignments, although a north south trend is anticipated.
 - Package 13 borehole data is preliminary only and have not been included in the geological section.
 - Boreholes with prefix 'WSA, TLH, TLWS and OAP' not available and locations have been taken from CR-SD-CTI-RT-00003.

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Rev.	Date	Description	By	Chkd	App
P01	12/10/2009	First Issue			



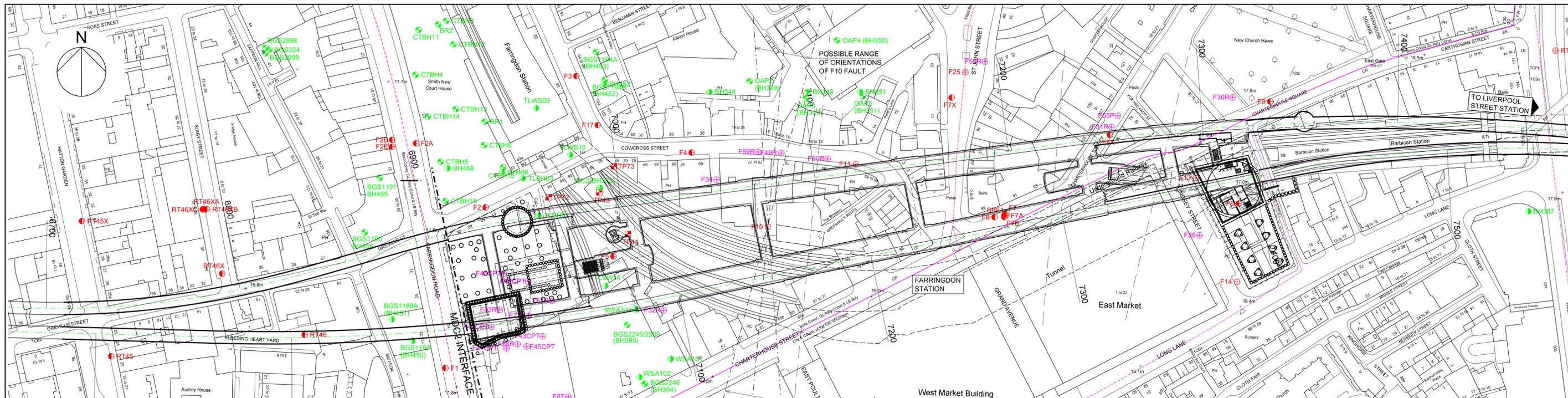
Contract: Farringdon Station Design
Originator: Scott Wilson Limited
Location: Farringdon Stn
Title: Geological Section Eastbound Tunnel

By: D. OUTEN
Chk: MALHAMRANY
App: S. BEALES

Scale: 1:1000@A1
Drawing and CAD file No.: C136-SWN-C2-DDL-M123_Z-00003
Rev: P01
Suitability: S4

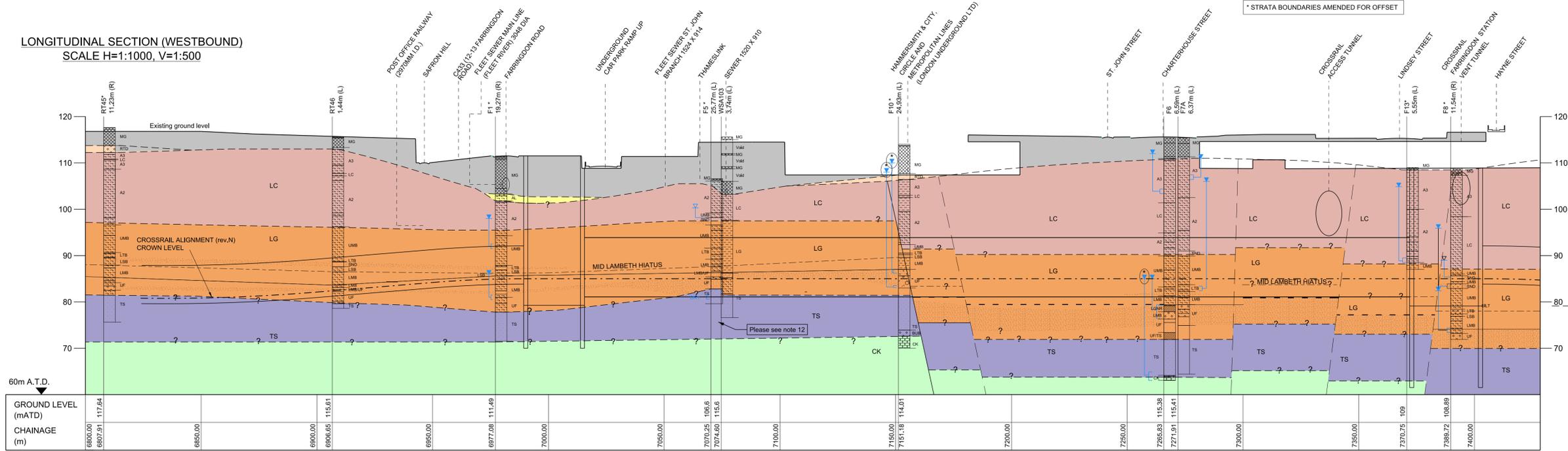
Copy Approved for Design - Created: 14-OCT-2009

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Stratigraphic Units		
MG	Made Ground	A2, A3, B London Clay Formation Sub Strata
AL	Alluvium	LC Unclassified London Clay
LS	Langley Silt	HF Harwich Formation
RTD	River Terrace Deposits	USB Upper Shelly Beds
WR	Weathered London Clay	UMB Upper Mottled Beds
		LTB Laminated Beds
		LSB Lower Shelly Beds
		LMB Lower Mottled Beds
		LG Unclassified Lambeth Group
		UF Unpor Formation
		TS Thanet Sand Formation
		BUB Bulhead Beds
		CK Chalk

LONGITUDINAL SECTION (WESTBOUND)
SCALE H=1:1000, V=1:500



KEY	DESCRIPTION
●	CROSSRAIL BOREHOLES PACKAGE C (FES) (1992)
⊕	CROSSRAIL ADDITIONAL BOREHOLES (SM) (1994-1996)
⊕	CROSSRAIL TRIALPITS
●	THIRD PARTY BOREHOLES OBTAINED
⊕	PRELIMINARY PACKAGE 13 BOREHOLE DATA (2009)
18.32m (L)	OFFSET FROM CENTRE LINE (LEFT OR RIGHT)
- - -	INTERPRETED GEOLOGICAL BOUNDARY
—	EXISTING GROUND LEVEL
⊕	COHESIONLESS LAYERS POTENTIALLY WATER BEARING (PRINCIPLE PARTICLE SIZE SILT, SAND OR GRAVEL) WITHIN LC AND LG
—	RECORDED WATER LEVEL DURING WATER STRIKE
—	WATER STRIKE LEVEL
—	MAXIMUM RECORDED GROUNDWATER LEVEL (PIEZOMETER)
—	PIEZOMETER TIP LEVEL AND SAND FILTER ZONE
?	INDICATES UNCERTAINTY IN STRATUM BOUNDARY LEVEL AND/OR EXTENT
—	BASE OF LOWEST IDENTIFIED AQUITARD IN LG (interpolated)
—	BASE OF LOWEST IDENTIFIED AQUITARD IN LG (extrapolated)
—	POSSIBLE MINOR FAULTS
—	F10 FAULT

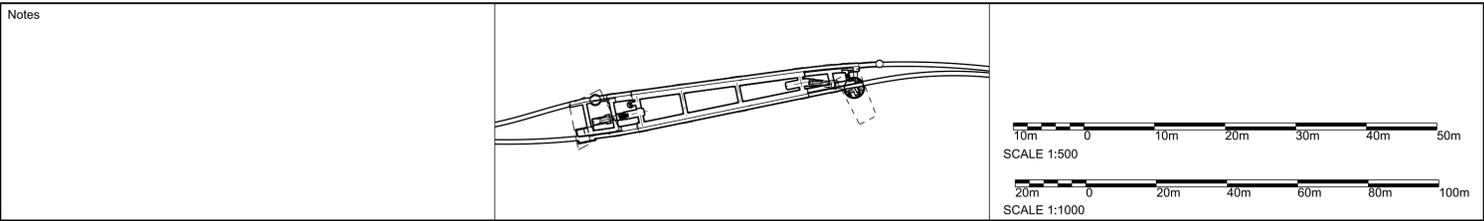
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- Borehole data log for WSA103 not available and have been taken from report CR-SD-CTI-RT-00003
- Boreholes with prefix 'WSA, TLH, TLWS and OAP not available and locations have been taken from CR-SD-CTI-RT-00003

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Rev.	Date	Description	By	Chkd	App
P01	14/10/2009	First Issue	PD	MA	SB



Contract: Farringdon Station Design
 Originator: Scott Wilson Limited
 Location: Farringdon Stn
 Title: Geological Section Westbound Tunnel

By: P.DAVIS
 Chk: MALHAMRANY
 App: S.BEALES

Scale: 1:1000@A1
 Drawing and CAD file No: C136-SWN-C2-DDL-M123_Z-00004
 Rev: P01
 Suitability: S4

Copy Approved for Design - Created: 15-OCT-2009

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