Chapter 16

Route Window C7: Liverpool Street West – Moorgate
16 Route Window C7: Liverpool Street West – Moorgate

Location Plan of Liverpool Street Station

16.1 Summary of Residual Impacts

16.1.1 The following significant residual adverse impacts will occur temporarily during the utilities works, in addition to those reported in the main ES:

- **Visual Amenity:** Impacts for workers and residents in flats and offices in the vicinity of the Moorgate enabling works worksite. Affected receptors are along the southern side of London Wall, the eastern side of Bloomfield Street, and the junction of London Wall and Moorgate.

- **Townscape and Built Heritage:** These additional utility works will result in temporary adverse impacts on the setting of the Grade II listed buildings at 59–73 and 83 Moorgate.

- **Townscape and Built Heritage:** There will be significant impacts on the setting of the Grade II listed Carpenters’ Hall at 1 Throgmorton Avenue.

- **Traffic and Transport:** Traffic delays due to works at the Moorgate/London Wall junction.

- **Traffic and Transport:** Buses on route 133 and N133 will be diverted from their normal routes leading to significant additional walking distances for passengers.

16.2 The Utility Works

Overview

16.2.1 An overview of the utility works is included in the introductory text in Section 1.3. In this route window the utilities works will be undertaken in seven stages. The timings of each of these stages are shown in Figure 16.1 and the stages are represented graphically in the maps in the SES2 mapping volume (S2a).
16.2.2 The specific assumptions adopted for the assessment of these works (in addition to those listed in paragraph 2.1.3) are detailed below:

**Moorgate Enabling Works**

- Pedestrian access to Moorgate station and the elevated walkway (Highwalk) network will be maintained at all times; and
- Works at the junction of Moorgate and Finsbury Circus will not take place at the same time as works in Blomfield Street.

Aerial view looking north along Moorgate

**Scheme Description**

**Stage 1 (Duration 11–18 Months) Enabling Works**

16.2.3 Stage 1 is the diversion of existing utilities from Moorfields and Moorgate to the surrounding roads. This excludes utilities that have to remain in Moorfields and Moorgate due to connections to existing properties. The works will be undertaken on a rolling programme basis. That is, not all the roads will be excavated at the same time. Works will be planned to occur in phases between road junctions or other suitable points so that the impacts of each phase can be limited. Each phase is assumed to last approximately 2–3 months. The only exception to this is the Moorgate station sewer...
diversion in Fore Street Avenue. This is programmed to last for 9 months but within the total duration of stage 1. The sewer works have already been assessed and is reported within the main ES, *Volume 2, Chapter 8, (paragraph 8.9.16)*.

16.2.4 It is noted that the London Wall/Moorgate junction is an important location. Where possible, utilities will be diverted via the pedestrian area to the north of London Wall, to limit the impact on this junction.

16.2.5 The diversion of the telecom cables in Blomfield Street could instead be diverted via Finsbury Circus to reduce the impact in Blomfield Street. However, it is envisaged that any civil works (ie excavations, duct laying, and reinstatement) in Blomfield Street would be undertaken at the same time as the utility diversions for Liverpool Street so that there would be no additional impacts.

16.2.6 This stage also includes gas diversions at the junction of Silk Street with Moor Lane and Ropemaker Street with Finsbury Street.

**Stage 2 (Duration 4–6 Months) Enabling Works**

16.2.7 Stage 2 involves diversion works in Moorgate and in particular the junction of Moorgate with Finsbury Circus and Moor Place. The diversions across this junction will be undertaken in two halves to keep a minimum of one lane open at all times. It is assumed that all works associated with stage 2 will be undertaken overnight.

**Stage 3 (Duration 9–35 Months) Enabling Works**

16.2.8 Stage 3 is the pulling and jointing of telecom and electrical cables only, some of the jointing will occur for 24 hours per day. Whilst this stage will not involve civil works (ie excavation, reinstatement, etc.) generators will be required at specific locations. Once this stage is complete many of the existing services in Moorfields and Moorgate can be decommissioned.

**Stage 4a (Duration 2–3 Months) Enabling Works**

16.2.9 Stage 4a is the diversion of existing utilities in the east side of Moorgate to the west side of Moorgate. On completion the main civil contractor can commence excavation in the east side of Moorgate. It is assumed that utility connections that cross the centre of Moorgate will occur overnight.

**Stage 4b (Duration 9 Months) Concurrent with the Main Civil Works**

16.2.10 Stage 4b is preparatory works for the temporary diversion of the London Bridge sewer. The works will involve the construction of two chambers to allow connection into the existing sewer. These works will involve the placing of concrete. All the works will happen within the main civil works and have already been assessed and reported in the main ES, *Volume 2, Chapter 8, (paragraph 8.9.16).*
Stage 4c (Duration 2–4 Months) Separate to the Main Civil Works

16.2.11 Stage 4c is the diversion of utilities from the west side of Moorgate to the east side of Moorgate. On completion of this stage the main civil contractor can commence excavation on the west side of Moorgate. It cannot be started until the completion of stage 4b and must be completed prior to commencement of stage 5. It is assumed that utility connections that cross the centre of Moorgate will occur overnight.

Stage 5 (Duration 7 Months) Concurrent with the Main Civil Works

16.2.12 Stage 5 is the diversion of the London Bridge sewer under the temporary road deck in Moorgate. The sewer will be diverted temporarily (3 months duration) after which the main civil contractor will construct the escalator shaft. On completion of the escalator shaft the sewer will be permanently reinstated along its original line and profile. The temporary and permanent diversions have previously been assessed in the main ES, Volume 2, Chapter 8, (paragraph 8.9.16).

Stage 6a (Duration 2–3 Months) Concurrent with the Main Civil Works

16.2.13 Stage 6a is the temporary diversion of a small diameter water main in Moorfields. The works will be concurrent with the main construction works at Moorfields and will be within the main worksite.

Stage 6b (Duration 2–3 Months) Concurrent with the Main Civil Works

16.2.14 Stage 6b is the temporary diversion of a small diameter water main in Moorfields. The works will be concurrent with the main construction works at Moorfields and will be within the main worksite.

Stage 7a (Duration 2–4 Months) Concurrent with the Main Civil Works

16.2.15 Stage 7a is the permanent reinstatement of utilities in the west side of Moorgate. Works will take place within the main worksite

Stage 7b (Duration 2–4 Months) Concurrent with the Main Civil Works

16.2.16 Stage 7b is the permanent reinstatement of utilities in the east side of Moorgate.

London Wall Diversions

16.2.17 If it is not possible to locate all utilities in London Wall due to the location of the Scheduled Ancient Monument, alternative routes will have to be found for some diversions. The proposed alternative is to divert utilities south of London Wall via Moorgate/Lothbury/Throgmorton Street/Old Broad Street.

16.2.18 The diversions will be limited to telecom cables with excavations kept to a maximum depth of 1.5 m to 2 m in depth. The civil elements will coincide with stage 1 of the assessment in the main ES whilst the cable pulling and jointing will coincide with stage 3.
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Figure 16.1 Programme for Moorgate
16.3 Impacts on Townscape and Built Heritage

Liverpool Street (west)

Baseline

16.3.1 The utility worksites are generally located in a townscape of high sensitivity and high quality, although the streets to the west of Moorgate are generally of moderate quality and moderate sensitivity. The streets to the east of Moorgate are within either, the Finsbury Circus Conservation Area, Bank Conservation Area or New Broad Street Conservation Area. Works in Finsbury Circus are adjacent to the Finsbury Circus Gardens, protected under the London Square Preservation Act and registered as a Grade II garden in the English Heritage Register. The streets adjacent to, and within, these conservation areas contain a number of listed buildings. The full baseline assessment of the sensitivity of the townscape within the Liverpool Street route window can be found in the main ES, Volume 2, Chapter 8, (paragraph 8.9.27).

16.3.2 All stages of the utility works include works adjacent to townscape resources of high or moderate sensitivity for example listed buildings, conservation areas or historic parks and gardens. The works within Finsbury Circus are particularly sensitive on account of the concentration of high sensitivity resources in this area.

Direct Impacts on Listed Buildings

16.3.3 There will be no additional impacts on listed buildings as a result of the utilities diversions at Moorgate enabling works worksite.

16.3.4 All excavations will be kept to between 1.5 m and 2 m in depth. Provided that the excavations are carried out in the highway (road or pavement), the risk of significant impacts to listed buildings appears to be fairly low. As the detailed design of the works progresses checks should be carried out to confirm the presence of vaults or other structures under the roads and pavements and appropriate assessments carried out. If necessary, mitigation such as the temporary removal of listed bollards should be undertaken in order to avoid the risk of damage to listed structures.

16.3.5 Provided that the excavations are carried out in the highway (road or pavement), there are unlikely to be any significant impacts on listed buildings.

Assessment, Mitigation and Residual Impacts

16.3.6 Utilities works in Moor Lane and Ropemaker Street will be of short duration, and the impacts on the townscape will not be significant. Works at Fore Street Avenue were assessed and reported in the main ES.

16.3.7 Utilities works in Moorgate, which occur during all stages of the works, will occur partly within and adjacent to the main Moorgate construction worksite. When considered in addition to the main construction works, these will result in an increased duration of impact (of between 28 and 60 months) and a larger area of worksite during some periods, but only a minor increase in intensity. This is not considered to result in any change to the level of significance of impacts on the local townscape resources. However, these additional utility works will result in temporary adverse impacts on the setting of the Grade II listed buildings at 59–73 and 83 Moorgate.
16.3.8 Utilities works in London Wall, Blomfield Street and around Finsbury Circus will occur during stages 1 and 3. Although of short duration during stage 1, the works are of longer duration (between 9 and 35 months) during stage 3. When considered in addition to the main construction works in Moorgate, Finsbury Circus and Blomfield Street, these works will cover a wider area, extending into the Bank Conservation Area in addition to the Finsbury Circus and New Broad Street Conservation Areas. Although there would also be a minor increase in the duration and intensity of the impacts on these townscape resources, conservation areas or listed buildings (as already identified in the main ES), the additional utility works would not result in any increase in the level of significance of those impacts. The impact on the Bank Conservation Area is not considered to be significant. There will be significant impacts on the setting of the Grade II listed Carpenters’ Hall at 1 Throgmorton Avenue.

**London Wall Diversion**

*Baseline*

16.3.9 The utility diversion works are located within a townscape of generally high quality and high sensitivity. They are largely located within the Bank Conservation Area and abut a number of listed buildings. The utility works extend up to the southern edge of the Finsbury Circus Conservation Area and up to the southern edge of the New Broad Street Conservation Area.

16.3.10 The diversion works would be carried out in streets that are largely within the Bank Conservation Area and are also lined by many buildings of high architectural quality, including one Grade II* listed building, four Grade II listed buildings and a Grade II listed telephone kiosk.

**Direct Impacts on Listed Buildings**

16.3.11 The utilities works proposed for the London Wall diversions will be kept to 1.5 m to 2.0 m depth. Provided that the excavations are carried out in the highway (road or pavement), there are unlikely to be any significant impacts on listed buildings.

*Assessment, Mitigation and Residual Impacts*

16.3.12 The utility works will be of short duration and consequently the impacts on the townscape resources will not be significant.

**16.4 Impacts on Visual Amenity**

**Liverpool Street (west)**

*Baseline*

16.4.1 Visibility of the utility worksites is restricted by the buildings that line the frontages of the streets where the works would take place. The zone of visual influence for the utility works extends along London Wall, Blomfield Street, Finsbury Circus, Moorgate, Moorfields, Moor Lane, Fore Street Avenue, Circus Place and Ropemaker Street. A mixture of high and medium sensitivity visual receptors are located in or around these streets.
Assessment, Mitigation and Residual Impacts

16.4.2 Utilities works in Moor Lane and Ropemaker Street will be of short duration, and the impacts on visual amenity will not be significant. Works at Fore Street Avenue were assessed in the main ES.

16.4.3 Stages 1, 4, 5, 6 and 7 in Moorgate, Moorfields, London Wall, Blomfield Street and Finsbury Circus will not result in any significant residual impacts on visual amenity. When considered in addition to the main construction works, the additional utility works in these stages will result in a minor increase in either the extent or duration of visual impacts or a minor increase in intensity for visual receivers. This would not change the level of significance of impacts for receptors in the vicinity of these works. The stage 2 and 3 works will result in additional significant temporary adverse visual impacts on workers and residents at flats, retail units and offices along the southern side of London Wall (between Coleman Street and Great Winchester Street), along the eastern side of Blomfield Street (between Broad Street Place and London Wall), at the junction of London Wall and Moorgate (ie 72 Moorgate and 115 London Wall), at 118–118a London Wall and 83–87 Moorgate).

London Wall Diversion

Baseline

16.4.4 Visibility of the South of London Wall utility works is restricted by the buildings that line the frontages of the streets where the works will take place. The zone of visual influence for works will extend along sections of Moorgate, Lothbury, Throgmorton Street, Old Broad Street and also into some adjacent passageways. Visual receptors in the buildings along the above streets are generally of moderate sensitivity.

Assessment, Mitigation and Residual Impacts

16.4.5 The works will be of short duration and consequently the impacts on visual amenity receptors will not be significant.

16.5 Impacts on Archaeology

Baseline

16.5.1 The baseline resources (excluding those specific to the gardens of Finsbury Circus), are described in the main ES, Volume 2, Chapter 8 (paragraph 8.9.61), potentially including the below-ground remains of the Roman and medieval city wall, a Scheduled Ancient Monument, beneath London Wall and the southern end of Moorgate; and also the former burial ground of the Bethlehem Hospital burial ground near the junction of Blomfield Street and Liverpool Street.

Assessment, Mitigation and Residual Impacts

Roman and Medieval City Wall Scheduled Ancient Monument

16.5.2 It is proposed that utilities from Moorgate, Finsbury Circus and Blomfield Street will be diverted along London Wall, potentially affecting the remains of the Roman and medieval city wall, a Scheduled Ancient Monument running beneath London Wall and
the southern end of Moorgate. The exact location and depth of the remains of the wall within London Wall are not fully known, but it is understood to be located underneath the northern third to half of the street at between around 0.5 m to 2 m depth to the top of the remains. The diversions will require that utilities are routed both across the remains of the wall (from north of the wall to the south of the wall) and alongside the wall (in an eastwest direction in the southern half of London Wall).

16.5.3 Site specific mitigation measures will be applied to these works to ensure that damage to the scheduled area of the city wall is avoided. These works would be carried out in consultation with the Inspector of Ancient Monuments and the City of London. Advanced exploratory works will be undertaken under archaeological supervision (informed by analysis of any ground-penetrating radar surveys conducted) to accurately locate the extent and depth of the city wall remains. Based on the results of this survey work, during the detailed design of the works the trenches will be located to avoid the scheduled area of the city wall (ie the services will be in the southern part of London Wall). Where this is not possible (ie where utilities are required to cross the wall), a route will be selected where there is sufficient depth of modern material above the monument for a service trench, eg along previous service trenches, and in addition the depth of the service trenches where they cross the monument may need to be reduced, so that they pass over the wall, with suitable protective measures.

16.5.4 The space available within London Wall for the diversion of utilities is constricted by the presence of the Scheduled Ancient Monument as well as many existing services. At the level of design that has been undertaken to date (and prior to the results of exploratory work to accurately locate the extent and depth of the city wall remains), it is not possible to determine whether there is sufficient space within London Wall to accommodate all of the diverted utilities, whilst avoiding impacts on the Scheduled Ancient Monument. This issue will be clarified during the detailed design of the works, and through consultation with the Inspector of Ancient Monuments and the City of London. Should it not prove possible to locate all of the utilities within London Wall, an alternative route will be utilised as detailed in paragraph 16.2.17 & 18. This alternative route runs along Moorgate, Lothbury, Throgmorton Street, and Old Broad Street.

16.5.5 Even if the alternative route is utilised, it will be necessary for utilities to cross the Scheduled Ancient Monument in a north to south direction. It is also likely that some of the utilities may be diverted along London Wall if sufficient space can be identified. Therefore the mitigation measures as set out above will still apply to these works. With this mitigation in place, no significant residual impacts on the Scheduled Ancient Monument are predicted.

Other Archaeological Remains

16.5.6 The diversions of electricity, telecoms, gas, and water services have potential to partially remove archaeological remains.

16.5.7 Utilities in Blomfield Street have potential to remove burials from the 16th to 18th century Bethlehem hospital burial ground. The preferred mitigation would be that the routes and depths of these service trenches were designed in detail so as to reduce the risk of encountering such burials, with the objective of producing preservation in situ. If this is not possible, or if despite this burials are encountered, then the
incorporated mitigation measures, as set out in the main ES, Volume 1, Chapter 3, (paragraph 3.7.13 onwards), will be applied to produce preservation by record; this is likely to require localised archaeological excavation.

16.5.8 The incorporated mitigation measures will also be applied to the works affecting other resources, to produce preservation by record, probably as an archaeological watching brief. With this mitigation, no significant residual impacts are predicted.

16.5.9 In the event that it is not possible to route utility diversions along London Wall, the preferred alternative route runs along Moorgate, Lothbury, Throgmorton Street, and Old Broad Street. The baseline resources that might be affected by these alternative diversions are substantially the same as those described in paragraph 16.6.1 although in addition, the alternative route lies within the Roman and medieval city, south of London Wall. These resources include Roman through to post-medieval occupation sequences, and also Austin Friar’s friary and burial ground that lay in the Old Broad Street and Throgmorton Avenue area. They may also include the earlier St. Olave’s church and burial ground, thought to have been located on the same site. There is also some potential for earlier remains of St. Margaret Lothbury Church and its burial ground, and for St. Peter le Poor church and its burial ground. Any remains that might be affected by these alternative diversions are of moderate importance.

16.5.10 The diversions of utilities along the alternative route has the potential to partially remove archaeological remains as described above. Mitigation measures for the burials, and other resources are the same as those for the main utilities works, see paragraph 16.6.6.

16.6 Traffic and Transport Impacts

Baseline: Liverpool Street (west)

16.6.1 Moorgate and London Wall both carry high volumes of traffic. The impacts of traffic diversions as a result of the main construction works have been assessed in the main ES. The enabling works though, require works in all streets to which utilities will be diverted. Bus routes in the area are shown in Figure 16.2 and parking bays are noted below where they are provided. The affected streets are:

- **Fore Street Avenue.** This is a narrow two-way road, with a low volume of traffic. This road has frontage properties which need servicing. Bollards are placed at the junction with Moorfields to prevent through traffic.

- **London Wall (between Fore Street Avenue and Blomfield Street).** This is a busy two-way route. In November 2004 the City Corporation remodelled its junction with Moorgate and changed London Wall between Moorgate and Circus Place from one-way westbound to two-way. London Wall to the west of the junction with Moorgate is a dual carriageway.

- **Blomfield Street.** This road is one-way southbound carrying a reduced volume of through traffic since the remodelling of the London Wall/Moorgate junction described above. However, the reduced capacity of the local network has resulted in traffic queuing (in busy periods) in Blomfield Street, while waiting to turn right into London Wall, where traffic backs up from the junction with Moorgate. There are parking bays for cars and motorcycles in this street.
• **Circus Place and Finsbury Circus (southwest quarter plus the west arm connecting Moorgate).** Circus Place is a two-way road connecting Finsbury Circus and London Wall. Finsbury Circus is one-way clockwise, and the west arm one-way westbound. Although the overall traffic levels are low in both roads, Finsbury Circus contains a taxi rank, many parking bays for cars and motorcycles and the south side forms part of bus routes 133 and N133. There is a taxi rank in Finsbury Circus and many parking bays for cars and motorcycles.

• **Moor Place.** This one-way eastbound road is short and little used by vehicles but is important for pedestrians. Parking bays previously on the south side have been removed.

• **Moorfields.** This road is a cul-de-sac busy with pedestrians, the section south of 12 Moorfields being pedestrianised. There are bollards at the junction with Fore Street Avenue to prevent through traffic. Moorfields south of Moor Place is a pedestrian zone, which prohibits all traffic except vehicles servicing frontage properties.

• **Moorgate.** This is a two-way road busy with traffic and pedestrians for most of the day. It contains a central reserve for part of its length, which is associated with a security point for the City security cordon.

• **Moor Lane (at junction with Silk Street).** This is a two-way road with a fire station to the northwest side of the junction. Traffic management measures have been employed to keep traffic flows relatively light, especially northbound. There are parking bays for cars, motorcycles and the disabled in this street.

• **Ropemaker Street (at the junction with Finsbury Street).** Ropemaker Street is a two-way road connecting Moorgate and Moor Lane. It has a relatively low traffic level as does Finsbury Street which carries traffic one-way southbound from Chiswell Street.

![Figure 16.2 Route Window C7 bus routes](transport-for-london)
Assessment, Mitigation and Residual Impacts: Liverpool Street West

Moorgate Enabling Works: Stage 1 – Links

16.6.2 London Wall (between Fore Street Avenue and Moorgate). The road has very little frontage activity. There are currently two lanes on the eastbound approach to the London Wall/Moorgate junction but since the remodelling of the junction the left turning filter lane is not heavily used and would be available for these further utilities works on the approach to the junction. There is a bus stop in each direction close to the junction with Fore Street Avenue. It is unlikely that the westbound bus stop will be affected, but the eastbound bus stop may need to be relocated further west. The relocation will not cause any significant impact to passengers.

16.6.3 London Wall (between Moorgate and Blomfield Street). There are frontage properties on both sides that require servicing, but no bus stops. Due to the high volume of traffic in busy periods, especially westbound, any reduction in capacity would cause serious delays. In order to close one lane for major utilities work it will be appropriate temporarily to revert the section of London Wall between Moorgate and Blomfield Street to one-way westbound only. Eastbound traffic will follow the route used before the remodelling in November 2004, that is via Moorgate, South Place, Eldon Street and Blomfield Street. The overall arrangement is similar to that prior to the remodelling work, except that the one-way working is extended to the junction with Blomfield Street. As all traffic from Circus Place will turn right into London Wall drivers wishing to turn left will use Blomfield Street instead. In order to maintain kerbside access to the north side of London Wall, trenching would be undertaken in sections to allow servicing vehicles to stop in front of, or behind, the trench. These arrangements are not expected to cause any significant impacts, and provided that signal stages and timings are modified and that there are no utilities works or other works taking place in surrounding streets and junctions.

16.6.4 Finsbury Circus and Circus Place. This section carries a small volume of traffic. The use of one lane for diversion of utilities is not expected to cause any significant impacts on moving traffic but will result in the suspension of a large number of parking spaces. No significant parking problems are expected but it is likely that compensating changes will be made to other parking places in the area such as the conversion of some general parking bays to motorcycle parking, to ensure that the supply of parking meets demand.

16.6.5 Blomfield Street. Utilities works in this road will be undertaken at the same time as the utilities works for Liverpool Street enabling works worksite and are not expected to cause additional impacts. The effects of utilities diversion for these works have been assessed in paragraph 17.6.4.

16.6.6 Moor Place. Vehicles will no longer be able to use Moor Place to service nearby properties in Moorfields but through traffic will be maintained to ease local circulation in the Moorfields area. Both footways will be available for pedestrians, although one may be temporarily narrowed by the trench. No significant impacts are expected.

16.6.7 Moorfields (Moor Place to New Union Street). To use one lane for utilities works, it will be necessary to temporarily make this section one-way southbound. All vehicles in the southern part of Moorfields will leave via Moor Place. No significant impacts are expected.
16.6.8 **Fore Street Avenue.** This is a narrow two-way road with bollards at the junction with Moorfields to prevent through traffic. The servicing bays for the new Moor House development are situated off the east-west arm. The utilities works will close the road to vehicles north of Fore Street but the work will be carried out in sections so that access will be maintained to servicing bays from one end or the other as appropriate. This will require the temporary removal of the bollards. The closure is therefore not expected to cause significant impacts. It is likely that one lane will remain open northbound between London Wall and Fore Street. Pedestrian access to Moorfields Highwalk will not be affected by the closure.

**Stage 1 – Junctions**

16.6.9 **London Wall/Moorgate.** This junction is an important location as it is used by a high volume of traffic. This part of the work will therefore be done in sections at nights and weekends with one lane maintained in each direction at all times. With this method of working no significant traffic delay is expected. As the trench reaches the eastern side of the junction it will be necessary to implement the diversionary routes described for London Wall in paragraph 16.6.3. Night work will continue to be necessary until the trench is clear of the junction.

16.6.10 **London Wall/Circus Place.** Only one utility (a telecom provider) will cross the mouth of Circus Place, all other utilities will turn into Circus Place from London Wall. By programming the works so that a trench will not occupy more than half the width of Circus Place at a time no significant impact is expected.

16.6.11 **London Wall/Blomfield Street.** Utilities works at this junction will be carried out at the same time as the utilities works for Liverpool Street enabling works. This has already been assessed in Liverpool Street enabling works paragraph 17.6.10. With the proposed mitigation measures there is not expected to be a significant impact.

16.6.12 **Finsbury Circus/Blomfield Street.** There is sufficient room within the junction to maintain access for all traffic, including the westbound buses, between Blomfield Street and Finsbury Circus while the trench is excavated in stages across the mouth of the junction. However, depending on the size of the trench it may be necessary to temporarily make this arm of Finsbury Circus one-way westbound. This will not create a significant impact as vehicles can use Circus Place to reach London Wall.

16.6.13 **Moorfields/Moor Place.** The traffic volume at this junction is low as it is largely confined to vehicles servicing, or parking at, nearby properties. Access through the works will be maintained and servicing can take place from the adjacent unaffected sections of Moorfields so work at this junction is not expected to cause any significant impact. The built-out kerb to the southeast side of the junction will be temporarily removed and other adjustments will be made to kerbs as required. As described above one lane for through traffic will be maintained in Moor Place. This will enable vehicles to leave the area when Moorfields is reduced in width at the junction. No significant impact is expected.

16.6.14 **Moor Lane/Silk Street.** This junction is immediately to the south of the fire station, therefore it is essential to ensure that full access is maintained at all times. Work through the junction will be undertaken in sections and, if necessary, temporary traffic signals will be provided to facilitate safe two-way working. The roads are sufficiently wide to ensure that there will be no significant impact. If possible, the work will be programmed to take place when there are no diversions in place at other sites (particularly Aldersgate Street).
16.6.15 **Ropemaker Street/Finsbury Street.** The situation here is similar to Moor Lane/Silk Street. Work through the junction will be undertaken in sections and, if necessary, temporary traffic signals will be provided to facilitate safe two-way working. The roads are sufficiently wide to ensure that there will be no significant impact. If possible, the work will be programmed to take place when there are no diversions in place at other sites (particularly Aldersgate Street).

**Stage 2**

16.6.16 While work is undertaken to the southern part of Moorgate, north of the junction with London Wall, Moorgate will be reduced in width close to the important Moorgate/London Wall junction. This may require night-time or weekend working, but depends critically on the location of the trenches. These works also interfere with the southbound bus stop, which can be relocated northwards opposite the northbound bus stop.

16.6.17 The work in the section of Moorgate by Finsbury Circus and Moor Place will be carried out at night in two phases:

- when work is undertaken on the east side, Moorgate will be reduced to one lane in each direction on the west side and the central reserve will be temporarily removed. The junction with Finsbury Circus will be closed overnight while the works are in progress. Any traffic leaving Finsbury Circus will use Circus Place or Blomfield Street instead but due to turning restrictions at the junction of London Wall and Moorgate, diverted traffic cannot travel directly to Moorgate southbound. This is not expected to have a significant impact upon the general traffic, as the number of vehicles affected will be very small. However buses on routes 133 and N133 will be diverted and this will have a significant impact for bus operators and passengers. This diversion will also be necessitated by the main works and has been identified in the main ES, Volume 2, Chapter 8, (paragraph 8.9.81). The busy eastern footway will be maintained at a width appropriate for its usage.

- when work is undertaken on the west side, Moorgate will be reduced to one lane in each direction on the east side, with the central reserve temporarily removed. The junction with Moor Place will be closed at night while the works are in progress; traffic in Moorfields will leave via Ropemaker Street instead. The restricted width in Moorgate may mean that buses on routes 133 and N133 will not be able to turn from Finsbury Circus into Moorgate so they will continue to be diverted as described above. This is likely to be the only significant impact caused by this stage of the works with the mitigating measures described. The western footway will be reduced in width. This footway is less busy than the eastern footway and Moorfields runs parallel to it.

**Stage 3**

16.6.18 The main impact will be from the presence of the working areas, in some cases with associated plant, in locations which may affect capacity. Some of the jointing will occur 24 hours per day. In the absence of further information it is impossible to make specific predictions but it can be assumed that the impacts of this work, and the mitigation measures, will be comparable to the impacts of a trench in the equivalent position, as described in the assessment for stages 1 and 2. In the worst case, at locations where excavation works have to take place at night and the jointing has to be a continuous 24 hour process, it is likely that the traffic impacts will be significant. This is the case at the Moorgate/London Wall junction and it is therefore likely that a significant impact will arise in this location during this stage.
Stage 4a

16.6.19 The main works will be carried out on the west side, with connections across the centre of the road as required. The central reserve will be temporarily removed and if necessary part of the width of the western footway will be taken into the worksite. The western footway is less busy than the eastern footway and an easy diversion exists via Moorfields. With these measures in place it is expected that it will be possible to have one northbound lane and two southbound lanes. Connections across the centre of Moorgate will be carried out overnight, during that time Moorgate can be reduced to one lane in each traffic direction or if necessary a single alternate lane under signal control. The night-time working and other measures described should generally eliminate significant impacts, although the location of trenches during night-time working, may restrict the turn out of Finsbury Circus and result in the diversion of bus routes 133 and N133 already described in stage 2.

16.6.20 Relocation of bus stops in Moorgate is not required during the daytime but may be necessary during the more extensive works that will take place at night. This will not lead to a significant impact.

Stage 4b

16.6.21 This stage is for the temporary diversion of the London Bridge Sewer which has already been assessed within the main ES, Volume 8b, (paragraphs. 8.30–8.38), as it was classified a major utility diversion.

Stage 4c

16.6.22 These works will be undertaken under the same temporary traffic management as stage 4b. There will, however, be a period when the utilities works will affect the junction of Moorgate and Finsbury Circus which would mean that the diversion of traffic through Finsbury Circus will not be possible. This will result in serious traffic delays and a significant impact on general traffic and public transport. This significant impact will be mitigated if the works at the junction were undertaken at night and weekends when traffic flows can be accommodated in the remaining road width of Moorgate. The night-time and weekend working will generally eliminate significant impacts, although the location of trenches during night-time and weekend working, will restrict the turn out of Finsbury Circus and cause the diversion of bus routes 133 and N133 already described in stage 2.

16.6.23 It has been assumed that the major part of the width of the busy eastern footway can remain open during this stage. If this is not possible there will be a significant impact for pedestrians.

Stage 5

16.6.24 Both temporary and permanent works on the diversion of the London Bridge sewer have already been assessed and are reported within the main ES.
Stages 6a & 6b

16.6.25 The works will be concurrent with the main construction works which are expected to take 12 months, during that time at least one pedestrian route would remain open (either one side of Moorfields or the west side of Moorgate). With careful phasing this stage can be incorporated into the main construction work so that there would be no additional significant impacts.

Stage 7a

16.6.26 The works are all within the main worksite, and are not likely to have any additional traffic impact. However if there is a need for road crossings these will need to be done at night to avoid significant impacts.

Stage 7b

16.6.27 This stage is for permanent reinstatement of utilities on the eastern side of Moorgate. It will be undertaken when the west side of the road has been reopened and there will be impacts as for stage 4a.

Summary

16.6.28 Based on the above, the following mitigation measures will be required.

16.6.29 During stage 1, while works affect the relevant section of road, it will be necessary to undertake the following mitigation measures:

- move the eastbound bus stop in London Wall, west of Moorgate, further west;
- temporarily make London Wall (between Moorgate and Blomfield Street) one-way westbound. The diversion route will be Moorgate, South Street, Eldon Street and Blomfield Street;
- suspend parking facilities in Finsbury Circus, Circus Place and Moor Place;
- temporarily reopen vehicular access from Moorfields to Fore Street Avenue;
- undertake the works at the London Wall/Moorgate junction at nights and weekends; and
- temporarily make Moorfields one-way southbound between New Union Street and Moor Place.

16.6.30 Also during stage 1 it is likely that the following measures will be required:

- temporarily make the eastern arm of Finsbury Circus one-way westbound; and
- provide temporary traffic signals at the junctions of Moor Lane/Silk Street and Ropemaker Street/Finsbury Street.

16.6.31 During stage 2, while works affect the relevant section of road, it will be necessary, depending on the extent and location of the trenches, to remove the central reserve in Moorgate and undertake utilities work overnight. During the working hours the following will apply:

- the road will be reduced to a single lane in each direction;
• at separate times the junctions of Moorgate with Finsbury Circus and Moor Place will be closed;
• the southbound bus stop will be temporarily relocated to the north; and
• buses on routes 133 and N133 will be diverted away from Finsbury Circus. This also occurs during the main works and has been reported as a significant impact in the main ES.

16.6.32 During stage 3 significant impacts may occur at locations where the stage 1 and stage 2 utilities works will take place at night or weekends, this is particularly likely at the junction of Moorgate and London Wall. The stage 3 works occur during the working day because of the 24 hour jointing operation.

16.6.33 During stage 4a the central reserve in Moorgate will be temporarily removed and the road will be configured as one northbound and two southbound lanes. Part of the western footway would be incorporated into the utilities worksite. As part of the works during this stage connections will have to be made across the road. To avoid a significant impact on general traffic these connections will be made overnight. Buses on routes 133 and N133 will be diverted during the night works as described in earlier stages, and the southbound bus stop will be moved further north.

16.6.34 Stage 4b was assessed as part of the main ES.

16.6.35 During stage 4c the temporary traffic management measures developed for stage 4b could continue in operation unless the junction of Moorgate and Finsbury Circus is obstructed by the works, in which case traffic would remain in Moorgate but the works will be undertaken overnight and at weekends. This stage of the works will also result in significant impacts for bus routes 133 and N133.

16.6.36 Stage 5 was assessed as part of the main ES.

16.6.37 Stages 6a and 6b will be incorporated within the main construction works in Moorfields. Pedestrian routes will be maintained and no additional impacts are likely.

16.6.38 Stage 7a will be largely contained within the main worksite and will not lead to additional impacts unless road crossings are required. If these are needed they will be carried out at night.

16.6.39 Stage 7b will require the same mitigation measures, and result in the same impacts, as stage 4a.

**Alternative Routes to Avoid London Wall:**

**Baseline**

16.6.40 The impacts of traffic diversions as a result of the main utilities diversions were assessed where it was proposed that a number of utilities would be diverted via London Wall. However, due to the location of the Scheduled Ancient Monument under parts of this street, some of the utilities may need to be diverted elsewhere. An alternative route is proposed and the affected streets are described below. This diversion, if adopted, will be undertaken during stages 1 and 3 of the programme described for the main assessment. Parking bays, where they are provided, are noted below. Bus routes are shown in Figure 16.2.
16.6.41 **Moorgate (between London Wall and Lothbury).** This is a two-way road which carries less traffic than the section north of London Wall but is narrower. It is also used by a number of main bus routes. There are properties on both sides of the street requiring servicing.

16.6.42 **Lothbury.** This is a two-way road that is wide at the west end narrowing eastwards. It also provides vehicular access to the Bank of England.

16.6.43 **Throgmorton Street.** This is a very narrow road that runs one-way westbound with properties requiring servicing.

16.6.44 **Old Broad Street (between Throgmorton Street and London Wall).** This road is two-way and is not heavily trafficked, but forms part of two main bus routes.

**Assessment, Mitigation and Residual Impacts: Alternative Routes to Avoid London Wall**

16.6.45 The works will be undertaken on a rolling programme in advance of the main construction works. The assessment of each link (ie each street, but with important junctions omitted) is addressed below. The assessments for main junctions, which are likely to present more significant problems, follow at the end.

**Links**

16.6.46 **Moorgate.** This road operates as one lane in each direction and there is a string of refuges along the centre. As the diverted utilities consist of telecoms equipment it is expected that it should be feasible to maintain one lane of traffic in each direction, with the refuges temporarily removed where necessary. Both footways will be retained unless the services are provided beneath one of them, in which case an adequate temporary footway will be provided. The work will be done in sections, which will enable the bus stops to be retained and frontage buildings to be serviced. No significant impacts are expected although the narrowing of the carriageway will worsen conditions for cyclists. Access to side roads will be maintained during the working day by working across their junctions at night-time or weekends.

16.6.47 **Lothbury.** Two-way traffic can be maintained in the western half of this street, with the central island adjusted as necessary. For works undertaken further east, Lothbury will be temporarily made one-way eastbound, and Bartholomew Lane one-way southbound. Tokenhouse Yard will be closed while work is undertaken across the junction. Access for servicing will be via King’s Arms Yard. Vehicular access to Bank of England will be maintained.

16.6.48 **Throgmorton Street (including its junctions with Lothbury and Old Broad Street).** This street will be closed while work is undertaken in this section. Servicing to Warnford Court, and any servicing currently taking place from Throgmorton Street will use Bartholomew Lane, Threadneedle Street or Old Broad Street. Footways will be maintained for pedestrians.
Old Broad Street (between London Wall and Throgmorton Street). While work is undertaken one lane will be maintained in each direction where possible; however the southern section of the road is narrower and so it will be necessary to use single alternate line working under signal control in that section. Works across the junction of Great Winchester Street and Austin Friars will be carried out overnight or at weekends to maintain full access at the busiest times. Detailed arrangements will be discussed with affected stakeholders. It is likely that no significant impacts will result from the works in this road although the single alternate line working will cause some delays for buses. Pedestrian access will be maintained at all times.

No work will take place in Moorgate or Old Broad Street north of London Wall while work is undertaken in this street.

Junctions

Moorgate/London Wall. It would be appropriate to phase this work to coincide with the main utilities works at the same junction and apply the same mitigating measures, which consist of carrying out the works in sections and at night times. It is likely that the period required for the completion of the works at this junction will be extended as a result of this additional work.

Old Broad Street/London Wall. Work at this junction will take place while the main utilities works for Liverpool Street (east) cross the same junction. No work will take place in Moorgate south of London Wall or Old Broad Street while work is undertaken at this junction. It is likely that significant impacts will be avoided if night-time or weekend working is adopted as proposed for the main utilities works. As in the case of the Moorgate/London Wall junction it is likely that the period required for the works will be extended.

Summary

Based on the above, the following mitigating measures will be required, generally avoiding significant impacts except where noted:

- temporary removal of central refuges in Moorgate as required for the works;
- undertake works at the junction of London Wall and Moorgate concurrently with the main utilities in Moorgate SES and apply the same mitigating measures (this may lengthen the period during which the works take place);
- Lothbury made one-way eastbound and Bartholomew Lane one-way southbound;
- single alternate line working under signal control in Old Broad Street south of London Wall;
- overnight and weekend working across side road junctions to maintain access during the working day;
- undertake works at the junction of London Wall and Old Broad Street concurrently with the main utilities in Liverpool Street (east) SES when works there affect the same junction (this may lengthen the period during which works take place);
- no work will take place in Moorgate or Old Broad Street north of London Wall while work is undertaken to the southern section of the latter named street.

With the mitigation measures described above it is likely that additional significant impacts will be avoided.
16.7 Noise and Vibration Impacts

Baseline

16.7.1 The noise-sensitive receptors that will potentially be impacted by the utility works in this location are limited to the following:

• London Metropolitan University;
• residential parts of Globe public house, 83 Moorgate and adjacent public house, 85 Moorgate (east facade);
• residential parts of public house, 85 Moorgate/6 Moorfields (west facade);
• residential parts of public house, London Wall/Fore Street (east facade);
• flats at Willoughby Highwalk, Moor Lane; and
• Milton Court (flats above fire station), Moor Lane.

16.7.2 Baseline noise levels were identified for the London Metropolitan University (CL04) in the main noise assessment and are reported in the main ES, Volume 2, Chapter 8, (paragraph 8.9.91, Table 8.23). Baseline noise levels for the other receptors have been estimated based on baseline measurements carried out at Moorfields Highwalk (CL03) and two subsequent surveys undertaken specifically for this utility assessment, at the corner of Speed House and Willoughby House, Moor Lane (CL12) and at 8 Moorfields (CL13). The baseline noise levels are presented in Table 16.1.

Table 16.1 Baseline Noise Levels at Representative Noise-Sensitive Receptors (Moorgate)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Daytime Baseline Noise Level $L_{Aeq, 12 \text{ hour}}$ dB</th>
<th>Evening/Weekend Baseline Noise Level $L_{Aeq, 4, 10 \text{ or 16 hour}}$ dB</th>
<th>Night-time Baseline Noise Level $L_{Aeq, 8 \text{ hour}}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moorfields Highwalk (CL03)</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>London Metropolitan University (CL04)</td>
<td>74, 72, 70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed House Willoughby House, Moor Lane (CL12)</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Moorfields (CL13)</td>
<td>67</td>
<td></td>
<td>63</td>
</tr>
</tbody>
</table>

1 Short-term monitoring location ($L_{Aeq, 1,3}$)

16.7.3 Ambient noise levels are relatively high at all of these locations. This is due to the degree of road traffic noise.
Assessment, Mitigation and Residual Impacts

16.7.4 The relevant mitigation measures set out in the main ES, Volume 6a, Appendix B1 will be employed to reduce construction noise impacts. The potential noise impact at each receptor or group of receptors, from the various construction stages, is considered below.

16.7.5 **London Metropolitan University.** This location would be impacted by stages 2, 4a, 4b, 4c, 7a and 7b works on Moorgate. The noise levels and durations of all of these stages are likely to result in significant residual impacts. The main ES already identifies that the university will be subject to a significant residual noise impact from three phases of the main construction works. Therefore, the effects for this facility will to be to extend the total duration of the significant residual noise impacts; that is these stages of the utilities works would fall into category 3. The proposals to carry out some of the utilities works at night to minimise traffic disruption are not likely to cause any significant residual night-time noise impacts at the university (defined as 2300–0700) because it is assumed that this building is not in use at night.

16.7.6 **Globe public house, 83 Moorgate and the adjacent public house, 85 Moorgate (east facade).** Stage 1 works would fall into category 1 (ie no significant residual impact) for these receptors if the works were carried out in the daytime. However, in order to mitigate traffic impacts it is proposed that work on Moorgate and at the junction of Moorgate and London Wall (stages 1, 2, 4, 5 and 7) include night-time and evening working. On the basis that noisy night-time works are likely to continue for at least 10 days in a 15 day period or for 40 days in any 6 month period, then these properties would be subject to significant residual night-time noise impacts. However, it is considered likely that night-time total noise levels will exceed baseline levels by at least 5 dB and that the baseline levels are higher than the night-time noise insulation threshold, then these properties will be likely to qualify for noise insulation. Therefore, with the noise insulation in place there will be no significant residual noise impact.

16.7.7 **Public house, 85 Moorgate/6 Moorfields (west facade).** Stage 1 works fall into category 1. The stage 6a and 6b work will principally be carried out on normal weekdays, with some evening work. Given the relatively high baseline levels and that the works are not directly outside this receptor, the works are not likely to give rise to significant residual noise impacts, and so also fall into category 1.

16.7.8 **Public house, London Wall/Fore Street (east facade).** Stage 1 works on London Wall and Fore Street would not give rise to any significant residual noise impacts and fall into category 1.

16.7.9 **Flats at Willoughby Highwalk, Moor Lane and Milton Court (flats above fire station), Moor Lane.** These locations will potentially be impacted by stage 1 works in Moor Lane. These works are likely to be of relatively short duration and daytime only. It is considered unlikely that they would give rise to any significant residual noise impacts and they therefore fall into category 1.

16.7.10 **Alternative route for utility diversions.** If it is not possible to locate all utilities in London Wall due to the location of the Scheduled Ancient Monument and an alternative route will have to be found for some diversions associated with stage 1 and stage 3. The proposed alternative route does not pass near to any noise sensitive properties, so there would be no additional noise impacts as a result of these proposals.
16.7.11 The results of the utilities noise assessment for the various stages of work at this location are summarised in Table 16.2.

Table 16.2 Summary of Noise Impacts by Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This generally falls into category 1 and therefore no significant residual noise impacts are considered likely. The only exception to this is for receptors that are likely to be affected by work at the junction of Moorgate and London Wall, where it is likely that night-time and evening working will be required in order to minimise traffic impacts. This is likely to result in significant residual night-time noise impacts and the affected receptors would include the residential parts of the Globe public house, 83 Moorgate and the adjacent public house (Residential Component), 85 Moorgate (east facade). It is likely that these properties will qualify for noise insulation, which will mitigate the impacts. Hence, no significant residual noise impacts would occur.</td>
</tr>
<tr>
<td>2</td>
<td>For London Metropolitan University, these works fall into category 3, ie the total duration of significant residual impacts from the main works would be extended by the utilities works. Night-time working would result in night-time noise impacting the residential parts of the Globe public house, 83 Moorgate and the adjacent public house, 85 Moorgate (east facade). It is likely that these properties will qualify for noise insulation, which will mitigate the impacts. Hence, no significant residual noise impacts will occur at these properties.</td>
</tr>
<tr>
<td>3</td>
<td>This falls into category 1, ie no significant residual impacts.</td>
</tr>
<tr>
<td>4a, 4b and 5</td>
<td>As for stage 2.</td>
</tr>
<tr>
<td>6a and 6b</td>
<td>These fall into category 1, ie no significant residual impacts.</td>
</tr>
<tr>
<td>7a and 7b</td>
<td>As for stage 2.</td>
</tr>
</tbody>
</table>

16.7.12 The results of the utilities noise assessment by receptor are summarised in Table 16.3. Only properties qualifying for noise insulation, temporary re-housing or predicted to experience a significant residual noise impact, under either of categories 2 or 3, are included.
16.7.13 Residential parts of the Globe public house, 83 Moorgate and the adjacent public house (residential component) at 85 Moorgate (east facade) are likely to qualify for noise insulation to mitigate noise from the utilities works. The period for which the London Metropolitan University is subject to a significant residual impact will also increase.

16.7.14 It is unlikely that there will be any additional properties with significant residual noise impacts in this area beyond those already identified from the main construction works and reported in the main ES. The total period of significant residual noise impacts experienced at London Metropolitan University will be extended by the utilities work. As noted in the main ES, Volume 1, Chapter 3, it is recognised that there are some educational facilities which are predicted to experience construction noise impacts that may potentially affect their use. When further details of the construction methods, timing and duration of the works are available (during and after the detailed design), any nominated undertaker will take the necessary steps to ensure that any residual impacts are minimised.

Table 16.3 Summary of Noise Impacts by Receptor

<table>
<thead>
<tr>
<th>Property</th>
<th>Noise Insulation</th>
<th>Temporary Rehousing</th>
<th>Significant Residual Impact</th>
<th>Stages from Main Works</th>
<th>Impact</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Metropolitan University</td>
<td></td>
<td></td>
<td></td>
<td>2, 4a, 4b, 4c, 7a and 7b</td>
<td>Significant residual impact</td>
<td>3</td>
</tr>
<tr>
<td>Globe public house, 83 Moorgate and the adjacent public house, 85 Moorgate (east facade).</td>
<td>✔</td>
<td></td>
<td></td>
<td>3</td>
<td>None</td>
<td>2</td>
</tr>
</tbody>
</table>
Chapter 17

Route Window C7: Liverpool Street East
17 Route Window C7: Liverpool Street East

17.1 Summary of Residual Impacts

17.1.1 The following significant residual adverse impacts will occur temporarily during construction, in addition to those reported in the main ES:

- **Visual Amenity:** Impacts for workers at retail units and offices at 17 The Arcade, Liverpool Street; and
- **Traffic and Transport:** Relocation of bus stops and bus diversions due to possible off-peak closures of the bus station.

17.2 The Utility Works

Overview

17.2.1 An overview of the utility works is included in the introductory text in Section 1.3. In this route window the utilities works will be undertaken in three stages. The timings of each of these stages are shown in Figure 17.1 and the stages are represented graphically in the maps in the SES2 mapping volume (S2a).

Key Assumptions

17.2.2 The specific assumptions adopted for the assessment of these works (in addition to those listed in paragraph 2.1.3) are detailed below:

- works at the junction of Old Broad Street and Liverpool Street will not occur at the same time as any other works;
- the works will be undertaken such that bus access will be maintained to the Liverpool Street bus station at all times, except for some overnight and weekend closures; and
- the central reservation of London Wall and Bishopsgate can be taken for traffic management purposes.

Scheme Description

*Stage 1 (Duration 12–18 Months) Enabling Works*

17.2.3 Stage 1 is the diversion of utilities currently located in Liverpool Street into the surrounding roads: this excludes utilities that have to remain in Liverpool Street due to connections to existing properties. These works will include excavation, duct/pipe laying, chamber construction, pulling and jointing cables, connections commissioning and reinstatement. Works will be planned to occur in phases between road junctions or other suitable points so that the impacts of each phase will be minimised. Each phase is assumed to last approximately 1.5–2 months.
Stage 2 (Duration 6–10 Months) Enabling Works

17.2.4 Stage 2 is the same type of work as that described in stage 1 but limited to the junction of Old Broad Street and Liverpool Street (refer to Map C7(xi)). This is a pinch point for utility diversions due to the main Crossrail works and the number of existing services and a number of diverted services will need to pass from Old Broad Street to Liverpool Street. It is also noted as being a critical junction vital for the operation of the Liverpool Street bus station. It is assumed that access for buses must be kept open at all times, hence the diversions will be undertaken in two halves to keep a minimum of one lane open at all times.

Stage 3a (Duration 11–14 Months) Concurrent with Main Civil Works

17.2.5 Stage 3a is the same type of work as that described in stage 1 but the majority of the diversion works will be undertaken within the main civil works construction site. Many of these utilities need to stay within Liverpool Street to serve local buildings. Some of the services will have to be laid above ground and protected for the duration of the works. This is a temporary situation with the utilities being reinstated later in stage 3b.

17.2.6 Stage 3a also includes the diversion of the Thames Water sewer in Liverpool Street. This sewer is 6 m deep and will be diverted via a 1.2 m diameter tunnel including the sinking of shafts. The sewer diversion has already been assessed and is reported within the main ES, Volume 2, Chapter 8.

17.2.7 In addition to the diversions within the main worksite there will be diversions at the junction of Bloomfield Street and Liverpool Street. This stage of the works is to complete the diversions that were started in stages 1 and 2. As this junction is not as critical as the Old Broad Street/Liverpool Street junction it is assumed that these works will take place at the same time as the main civil works.

Stage 3b (Duration 2–5 Months) Concurrent with the Main Civil Works

17.2.8 Stage 3b involves the permanent reinstatement of utilities that were temporarily diverted under stage 3a. They will be coordinated with the permanent reinstatement of Liverpool Street and hence are contained within the main works.
Aerial view looking northeast along Liverpool Street
<table>
<thead>
<tr>
<th>STAGE</th>
<th>DESCRIPTION</th>
<th>Duration</th>
<th>DURATION (MONTHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 to 6</td>
</tr>
<tr>
<td>1</td>
<td>Enabling Works</td>
<td>12 months min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 months max</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Enabling Works</td>
<td>6 months min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 months max</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Concurrent with Main Civil Works</td>
<td>11 months min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14 months max</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>Concurrent with Main Civil Works</td>
<td>2 months min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 months max</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 17.1 Programme for Liverpool Street East**

**KEY**
- Minimum Duration
- Maximum Duration
17.3 Impacts on Townscape and Built Heritage

Baseline

17.3.1 The utility worksites are located in an area of high sensitivity and the townscape in the vicinity of the utility worksites is of moderate to high quality. Parts of the works are located within the New Broad Street Conservation Area. The streets adjacent to and within the conservation area contain a number of listed buildings. The full baseline assessment of the sensitivity of the townscape within the Liverpool Street route window can be found in the main ES, Volume 2, Chapter 8.

Direct Impacts on Listed Buildings

17.3.2 There will be no additional impacts on listed buildings as a result of the utilities diversions at Liverpool Street enabling works worksite.

Assessment, Mitigation and Residual Townscape Impacts

17.3.3 Stage 1 and stage 3 works are not likely to result in any significant impacts on landscape/townscape. The stage 2 works, when considered in addition to the main construction works, will result in an increased duration of impact (of between 6 and 10 months) and a larger area of worksite but only a minor change in intensity. This is not considered to result in any additional significant residual impacts on the local townscape, resources, conservation areas or listed buildings.

17.4 Impacts on Visual Amenity

Baseline

17.4.1 Visibility of the utility worksites is restricted by the buildings that line the frontages of the streets where the works will take place. The zone of visual influence for the utility works extends northwards along Sun Street Passage and into Broadgate Circle (to the north of Eldon Street), westwards into Finsbury Circus, eastwards into Liverpool Street and southwards into Old Broad Street and Blomfield Street. A mixture of high, medium and low sensitivity visual receptors are located in or around these streets.

Assessment, Mitigation and Residual Impacts

17.4.2 Stage 1 and stage 3 works will not result in any significant residual impacts on visual amenity. The stage 2 works will have a significant temporary visual impact on one additional group of visual amenity receptors, the workers at retail units and offices at 17 The Arcade, Liverpool Street. Other visual amenity receptors in the vicinity of the stage 2 works will experience minor increases in the duration of impact (of between 6 and 10 months) but the utility works will not result in any increase in the level of significance of impacts on these receptors.
17.5 **Impacts on Archaeology**

**Baseline**

17.5.1 The baseline resources are described in the main ES, *Volume 2, Chapter 8*, potentially including the below-ground remains of the Roman and medieval city wall, which is a Scheduled Ancient Monument, beneath London Wall and the southern ends of Blomfield Street, Old Broad Street, and Bishopsgate and the former burial ground of the Bethlehem Hospital at the western end of Liverpool Street.

**Assessment, Mitigation and Residual Impacts**

*Roman and Medieval City Wall Scheduled Ancient Monument*

17.5.2 It is proposed that utilities from Blomfield Street and Old Broad Street will be diverted along London Wall, potentially affecting the remains of the Roman and medieval city wall, a Scheduled Ancient Monument running beneath London Wall and the southern ends of Blomfield Street, Old Broad Street, and Bishopsgate. The exact location and depth of the remains of the wall within London Wall are not fully known, but it is understood to be located underneath the northern third to half of the street at between around 0.5 m–2 m depth to the top of the remains. The proposed mitigation measures are set out in paragraph 16.5.3 and with this in place, no significant residual impacts are predicted.

*Other Archaeological Remains*

17.5.3 The diversions of electricity, telecoms, gas, sewer, and water services have potential to partially or completely remove archaeological remains.

17.5.4 Utilities in Liverpool Street and its junctions with Old Broad Street and Blomfield Street, and possibly also in part of the northern side of Wormwood Street, have potential to remove burials from the 16th to 18th century Bethlehem hospital burial ground. The preferred mitigation will be that the routes and depths of these service trenches are designed during the detailed design phase so as to reduce the risk of encountering such burials, with the objective of producing preservation in situ. If this is not possible, or if despite this burials are encountered, then the incorporated mitigation measures, as set out in the main ES, *Volume 1, Chapter 3*, will be applied to produce preservation by record. This is likely to require localised archaeological excavation.

17.5.5 The incorporated mitigation measures would also be applied to the works affecting other resources, to produce preservation by record, probably as an archaeological watching brief. With this mitigation, no significant residual impacts are predicted.
17.6 **Traffic and Transport Impacts**

**Baseline**

17.6.1 The local traffic management system has resulted in traffic flows in this section of road being very light, so traffic diversions should be comparatively straightforward. The further utilities works will, however, require works in all the streets to which utilities will be diverted and so primary and secondary traffic impacts will be greater. Bus routes in the area are shown in *Figure 16.2* and parking bays are noted below where they are provided. The affected streets are:

- **Liverpool Street (between Old Broad Street and Bishopsgate).** Although the overall traffic level is low this road contains a busy taxi rank, a mixture of motorcycle, disabled and general parking bays and has frontage properties which need direct servicing.

- **Eldon Street and Blomfield Street.** This is now a single one-way street, the east to west arm being Eldon Street and the north-south arm Blomfield Street. Through traffic uses the route but the amount has reduced since the City Corporation remodelled the junction of Moorgate and London Wall in November 2004. However, the reduced capacity of the local network has resulted in traffic queuing (in busy periods) in Blomfield Street while waiting to turn right into London Wall, where traffic backs up from the junction with Moorgate. There are motorcycle, disabled and general parking bays in these streets.

- **London Wall and Wormwood Street (between Blomfield Street and Bishopsgate).** This is a busy two-way route that was built as a dual carriageway to form part of the planned northern ring road for the City of London. Although the dual carriageway links have high capacity the overall capacity is controlled by the junctions, which are fairly closely spaced.

- **Bishopsgate (between Wormwood Street and Liverpool Street).** This is part of one of the two main north to south routes through the City of London which has been designated as a Red Route and part of the Transport for London road network. It is busy with pedestrians as well as traffic for most of the day.

- **Old Broad Street (between London Wall and Liverpool Street).** This is a comparatively narrow two-way road that forms a very important link for buses and pedestrians between Liverpool Street station and its bus station facility and the heart of the City.

- **New Broad Street.** This road has been semi-pedestrianised with bollards near the western end and special paving. It is the current assumption that the street will be used for a compensation grout shaft (for the protection of buildings during underground excavation), in which case it will not be used for utilities diversions, and in fact will necessitate the transfer of some utilities out of this road into the other roads described above.

17.6.2 Two potential changes to this road network are planned. Firstly, the Corporation of London is currently considering proposals to impose a daytime point closure in Liverpool Street on the eastern side of Old Broad Street. This would mean that during the restricted hours all vehicles entering this section of Liverpool Street (mainly taxis) would have to exit onto Bishopsgate. If this is not implemented as a permanent scheme
before the Crossrail works start it would be necessary to introduce it as a temporary
scheme for the duration of the works. The design for the new junction of Bishopsgate
and Liverpool Street has not yet been agreed. Secondly, changes are proposed in the
layout of the junction of Bishopsgate and Wormwood Street as part of the Heron Tower
development which has planning consent.

Assessment, Mitigation and Residual Impacts

Stage 1 – Overview

17.6.3 New Broad Street is included in the roads affected during this stage. The most robust
assumption for the purposes of assessment is that New Broad Street could not be
used for diversions, and utilities equipment from the street would itself be re-located to
other roads. This is assumed for the purposes of this assessment. Some of the works
in this stage will require diversions as described in the following text. These diversions
are shown on Map C7(x).

Stage 1 – Links

17.6.4 Blomfield Street. The main works will use one lane adjacent to the worksite for
loading; the assessment of this link indicates that no significant traffic impacts are likely
to occur. Utilities works in the same location will have a similar effect. Use of the same
lane through the remainder of the street requires the suspension of all the on-street
parking and shared use of the remaining lane by traffic turning left and right at the
signalled junction with London Wall. As the utilities works will be carried out in advance
of the main works, the underused on-street car parking facilities in Finsbury Circus will
still be available. To accommodate displaced motorcycle parking it will be necessary to
convert some of the existing car parking in Finsbury Circus for use by motorcycles. No
significant parking problems are expected. The total traffic flow in the road can be
accommodated in a single lane however, as previously noted there are sometimes
tailbacks of right turning traffic at busy times. It is thought that this has been at least
partly caused by the initial settings of the new signals at London Wall/Moorgate not
being optimised and drivers taking time to adapt to the new layout. The probability
remains though, that left turning vehicles in Blomfield Street will be delayed, but not
significantly, by the need to queue at the signals with right turning traffic.

17.6.5 London Wall. This road has very little frontage activity and no bus stops. Two lanes are
required in both directions to feed the junctions, but with narrowing of the lanes and
temporary removal of the central reserve (if necessary) it is likely that utilities equipment
could be installed without significant adverse impacts on traffic flow.

17.6.6 Wormwood Street. This street has frontage activity on the north side and single bus
stops (used by two daytime services) on each side of the road. As with London Wall it
will be satisfactory to use one lane for utilities works but it may be necessary to do the
work in shorter sections to maintain kerbside access. Storage space for the junctions
will also be maintained, again with the narrowing of lanes and temporary removal of the
central reserve if necessary.

17.6.7 Bishopsgate. The volume of traffic and the proximity of the junctions on this road
means that the link can only be sensibly considered along with the junctions.
17.6.8 **Old Broad Street.** The heavy use of this link by buses going to and from Liverpool Street bus station makes this a very sensitive route, although the amount of general traffic that uses it is comparatively small. As long as no works are occurring simultaneously in Liverpool Street (west), Blomfield Street or London Wall it will be possible temporarily to make Old Broad Street (north of London Wall) one-way northbound and divert southbound buses via the roads listed. Southbound buses on routes 11 and 23 would then have to make a right turn from London Wall into the southern section of Old Broad Street. Although this will reduce capacity at the junction the effect could be minimised by provision of detectors to provide priority for turning buses and thereby reduce the time during which buses would block ahead traffic movements. This is a standard technique to ensure that traffic capacity will not be significantly reduced. By undertaking the trenching in Old Broad Street in short sections servicing vehicles could stop before and/or after the trench.

17.6.9 **Liverpool Street (east).** It will be necessary to suspend either the parking and servicing on the southern side of the street, or the taxi rank on the northern side. The most satisfactory solution is to suspend the point closure and move the head of the rank to Liverpool Street (west), reduce the size of the rank in Liverpool Street (east) and turn it into a feeder rank. These changes to the taxi arrangements and a reduction in the number of parking places will enable enough space to be provided for a trench for utilities diversions. There will be no significant loss of ranking space for taxis. Taxi passengers coming from the station will have to walk up to 100 m further than at present on level ground. This will not be a significant increase.

**Stage 1 – Junctions**

17.6.10 **Blomfield Street/London Wall.** If a trench can be confined to the eastern side of Blomfield Street and the northern side of London Wall it will be possible to adjust the layout of the junction to ensure that there is not likely to be any significant impact on traffic. However if excavation occurs elsewhere in the junction it would be likely to cause a significant impact unless some traffic could be diverted away from the junction. This could be achieved by closing Blomfield Street at the junction and diverting traffic through Finsbury Circus, with temporary signals at the junction of Circus Place and London Wall. If the signals are carefully linked to the signals at the junction of London Wall and Moorgate there will not be a significant loss of traffic capacity.

17.6.11 **London Wall/Old Broad Street.** Trenches will cross this junction to and from three of the four arms. With careful phasing of the excavations it is likely that for part of the work period the effect on the capacity of the junction would not be significant. However, there are likely to be periods when the location of trenches could seriously reduce traffic capacity at the junction. As local traffic diversions are difficult, it is proposed that if necessary works during these periods be carried out at weekends and overnight. This is likely to avoid any significant impacts on traffic or pedestrians.

17.6.12 **Wormwood Street/Bishopsgate.** This is an important junction between two busy routes and any work within it is likely to lead to congestion. The approved Heron Tower development will adjust parts of the highway in the junction and in Bishopsgate to the north. If this development happens before or at the same time as Crossrail it may be possible to combine some of the Crossrail utilities works with the development works to minimise the adverse impacts. If the Heron Tower development is completed without the Crossrail utilities works having been undertaken it is likely that the impact of undertaking
those works would be greater than with the present road layout. This junction appears to be the location at which the impacts of the Crossrail utilities works would have the most significant impact on traffic. It is likely that weekend and overnight working will be necessary to overcome any significant impacts on traffic and pedestrians.

17.6.13 Bishopsgate/Liverpool Street. The pedestrian facilities at this junction are the most critical feature and the impact of utilities work depends upon how effectively modifications can be made to them. There is sufficient room within the junction to adjust the layout to ensure that the impact is not significant.

Stage 2

17.6.14 This stage is for the utility works at the junction of Liverpool Street and Old Broad Street. It is an important location because it is the way in and out of the Liverpool Street bus station. As buses must both enter and leave the bus station at this location there is no benefit in imposing partial restrictions (eg only some services are diverted elsewhere). All buses must either continue to use the bus station or be diverted elsewhere. It is proposed that full access to and from the bus station will be maintained at all times during the busiest times (0700–2000 approx Monday to Friday). Outside these times the bus station may have to close on occasion by agreement with all interested parties. London Buses would make suitable arrangements for each route as appropriate. Even though the number of buses and passengers using the bus station during these times is considerably less than in the working day it is likely that a significant impact would result.

17.6.15 The works in the junction should be undertaken in two main phases to minimise traffic delays.

17.6.16 Phase 1: As described under Old Broad Street in the assessment of stage 1 (refer to paragraph 17.6.8) it is possible to divert southbound buses to Liverpool Street, Blomfield Street and London Wall. This means that they will make a right turn out of the bus station. If this is also done for stage 2 it will enable the utilities work to be done in the eastern side of the junction without the need for signal control. This means that it will be possible to undertake the works in Old Broad Street (stage 1) at the same time. Vehicles servicing properties in Old Broad Street will travel north and turn left into Liverpool Street.

17.6.17 Phase 2: For the remaining time (when works will be undertaken on the west side of the junction) Old Broad Street will be returned to two-way operation catering for buses entering and leaving the bus station. Single alternate lane working on the east side of the junction under signal control will be utilised. Traffic flows are sufficiently low to make this feasible and although there will be some delays these are not likely to be significant.

17.6.18 During the morning and evening peak periods a large number of pedestrians leave and enter the national rail and LU stations and walk through this junction. Although the arrangements described above are likely to enable the works to be completed without a significant impact on traffic, detailed planning of the works will be necessary to ensure safety for pedestrians. This is likely to mean that worksites in use during the week will have to be kept reasonably small and works requiring larger excavations should be
undertaken at night-time and weekends to avoid creating significant impacts. Any operations that interfere with the flow of pedestrians will be avoided between 0700–0930 and 1600–1900 Monday to Friday.

Stage 3a

17.6.19 This stage is for work on the utility companies equipment in the area of the main worksite in Liverpool Street (as defined in the main ES, Volume 2, Chapter 8) and for the utilities works at the junction of Liverpool Street and Blomfield Street. It will be undertaken after the closure of this part of Liverpool Street has been implemented for the main works. The work on the utility companies equipment in the area of the main worksite has already been assessed within the main ES as it was classified as a major utility diversion. The assessment is detailed in the main ES, Volume 2, Chapter 8.

17.6.20 There is a large pavement build-out in Blomfield Street which reduces traffic flow to a single lane so there is scope (with the temporary removal of the build-out) for the works in that street to be undertaken in two stages while maintaining traffic flow. To minimise the impact on traffic and pedestrians this will be done after Liverpool Street has been closed, though before the full extent of the hoarding has been erected at the Blomfield Street/Liverpool Street junction. For the reasons set out above, the works associated with stage 3a will not give rise to any additional significant impacts.

Stage 3b

17.6.21 This stage is for the permanent reinstatement of utilities within the main worksite and is not likely to have any additional significant impacts.

Summary

17.6.22 Based on the above, the following mitigation measures will be required to avoid significant impacts.

17.6.23 During stage 1 it will be necessary to:

- undertake the works in the junction of Wormwood Street and Bishopsgate at night and weekends to avoid creating a significant impact;
- while works are being undertaken at the junction of Blomfield Street and London Wall it will be necessary to close Blomfield Street and divert traffic via Finsbury Circus and Circus Place, with temporary signals at the junction of Circus Place with London Wall;
- undertake some of the utilities works at the junction of London Wall and Old Broad Street at night-time and weekends; and
- while the works are taking place in Liverpool Street (east), suspend the point closure and the main part of the taxi rank will be moved to Liverpool Street (west).

17.6.24 For part of the time that utilities works are being undertaken at the junction of Liverpool Street and Old Broad Street (stage 2) and during the whole time that utilities work is being undertaken in Old Broad Street (part of stage 1) that street will be made one-way northbound from London Wall to Liverpool Street with southbound buses diverted via Liverpool Street, Blomfield Street and London Wall.
17.6.25 For part of the time that utilities works are being undertaken at the junction of Liverpool Street and Old Broad Street (stage 2) it will be necessary to undertake some works at night-time and at weekends. It may be necessary to close the station at these periods. The relocation of the bus stops and bus diversions will result in a significant impact.

17.6.26 During the part of stage 2 when southbound traffic is not diverted, temporary signals will be provided.

17.6.27 During the whole of stage 2 the amount of the junction of Liverpool Street and Old Broad Street given over to worksites must allow adequate space for pedestrians – major excavations at this junction should therefore be done at weekends.

17.6.28 For the duration of stage 3a and 3b the large build-outs in Blomfield Street at its junction with Eldon Street will be temporarily removed.

17.7 Noise and Vibration Impacts

Baseline

17.7.1 The noise-sensitive receptors that will potentially be impacted by the utility works in this location are limited to the following:

- the Railway Tavern, 15 Liverpool Street (residential part of public house);
- numbers 9, 10, 22–24 and 26 Wormwood Street (residential properties);
- St. Botolph-without-Bishopsgate Church, Bishopsgate; and
- All Hallows on the Wall Church, London Wall.

17.7.2 Baseline noise levels were identified at a location opposite to the Railway Tavern at 100 Liverpool Street (CL07) and at the Great Eastern Hotel (CL08) in the noise assessment reported in the main ES, Volume 2, Chapter 8. One further 3 hour measurement was undertaken specifically for assessment of the utility works at 21 Wormwood Street (CL14). At the other receptors the baseline noise levels were derived from data measured at the survey locations. The daytime baseline noise levels are presented in Table 17.1.

Table 17.1 Baseline Noise Levels at Representative Noise-Sensitive Receptors (Liverpool Street)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Daytime Baseline Noise Level LAeq, 12 hour dB</th>
<th>Evening/Weekend Baseline Noise Level LAeq, 4, 10 or 16 hour dB</th>
<th>Night-time Baseline Noise Level LAeq, 8 hour dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Liverpool Street (CL07)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Eastern Hotel (CL08)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Wormwood Street (CL14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>64</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>64</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Short-term monitoring location $L_{eq, 12h}$
17.7.3 Ambient noise levels are relatively high at all of these locations. This is due to the degree of road traffic noise.

**Assessment, Mitigation and Residual Impacts**

17.7.4 The relevant mitigation measures set out in the main ES, *Volume 6a, Appendix B1*, will be employed to reduce construction noise impacts. The potential noise impact at each receptor or group of receptors, from the various stages of the utilities works, is considered below.

17.7.5 **Railway Tavern, 15 Liverpool Street (north facade):** Stage 1 works fall into category 1. The stage 2 work will principally be carried out on normal weekdays, with some weekend work, which occasionally will include nights. The noise from the stage 2 utility works taking place during the daytime is considered likely to result in the property qualifying for noise insulation. With the noise insulation installed, no significant residual noise impacts will occur.

17.7.6 **Nos 9, 10, 22–24 and 26 Wormwood Street:** Stage 1 works in the area of the Wormwood Street/Bishopsgate junction will involve night-time working including excavation of trenches. On the assumption that the noisy work will last for at least 10 days in a 15 day period or at least 40 days over 6 months, there will be significant residual night-time noise impacts. However, given that night-time total noise levels are likely to exceed baseline levels by at least 5 dB and that the baseline levels are higher than the night-time noise insulation threshold, then these properties will be likely to qualify for noise insulation. Therefore, there will be no significant residual noise impact.

17.7.7 **St. Botolph-without-Bishopsgate Church:** This location will potentially be affected by stage 1 works in the area of the Wormwood Street/Bishopsgate junction, including night-time working. The baseline levels in the area are high even at night and a significant residual noise impact is not likely indicating a category 1 assessment.

17.7.8 **All Hallows on the Wall Church:** This location will potentially be impacted by stage 1 works in the area of the London Wall/Old Broad Street junction, including night-time working. The baseline levels in the area are high even at night and a significant residual noise impact is not likely indicating a category 1 assessment.

17.7.9 The results of the utilities noise assessment for the various stages of work at this location are summarised in *Table 17.2*. 
Table 17.2  Summary of Noise Impacts by Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This generally falls into category 1 and therefore no significant residual noise impacts are predicted. The only exception to this is for receptors that are likely to be affected by work at the junction of Wormwood Street and Bishopsgate, where it is likely that night-time and evening working will be required in order to minimise traffic impacts. This is likely to result in significant residual night time noise impacts and the affected receptors will include the residential properties at 9, 10, and 22–26 Wormwood Street. It is likely that these properties will qualify for noise insulation, which will mitigate the impacts. No significant residual noise impacts are therefore likely to occur.</td>
</tr>
<tr>
<td>2</td>
<td>The stage 2 work will principally be carried out on normal weekdays with some weekend work which will occasionally include nights. The noise from the stage 2 utility works taking place during the day is likely to result in the property qualifying for noise insulation. The property is already predicted as likely to qualify for noise insulation due to the main construction works. Consequently this stage falls broadly into category 3.</td>
</tr>
<tr>
<td>3a and 3b</td>
<td>This falls into category 3. The north facade of the Railway Tavern, 15 Liverpool Street, is the only location where there is potential for significant noise impacts to arise. However, it is considered likely that this property will qualify for noise insulation and consequently there will be no significant residual noise impact following this mitigation. The assignment of category 3 is because the property will also qualify for noise insulation under the main noise assessment.</td>
</tr>
</tbody>
</table>

17.7.10 The results of the utilities noise assessment by receptor are summarised in Table 17.3. Only properties which qualify for noise insulation, temporary rehousing or predicted to experience a significant residual impact, are included.
If the utilities works were to be undertaken during the day there would be no significant residual noise impacts at numbers 9, 10, 22–24 and 26 Wormwood Street. However, in order to mitigate the significant traffic impacts it is proposed to undertake the works at night which would result in a significant residual night-time noise impact. Notwithstanding this, they would then be likely to qualify for noise insulation to mitigate the noise from the night-time utilities works.

<table>
<thead>
<tr>
<th>Property</th>
<th>Noise Insulation</th>
<th>Temporary Rehousing</th>
<th>Significant Residual Impact</th>
<th>Stages</th>
<th>Impact from Main Works</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway Tavern (north facade)</td>
<td>✓</td>
<td></td>
<td></td>
<td>2a, 3a and 3b</td>
<td>Nose insulation</td>
<td>3</td>
</tr>
<tr>
<td>9, 10, 22–24 and 26 Wormwood Street</td>
<td>✓</td>
<td></td>
<td>1 (night work)</td>
<td>None</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
Chapter 18

Route Window C7: Liverpool Street Compensation Grout Shaft
18 Route Window C7: Liverpool Street Compensation Grout Shaft

18.1 Summary of Residual Impacts

18.1. The following significant residual adverse impacts will occur temporarily during construction, in addition to those reported in the main ES:

- Traffic and Transport: buses diverted from Old Broad Street will experience significant delays.

18.2 The Utility Works

Key Assumptions

18.2.1 The specific assumptions adopted for the assessment of these works (in addition to those listed in paragraph 2.1.3) are detailed below:

- The preparatory works will result in the main impacts whilst the commissioning works will require utility companies to return at a later date to undertake these activities at specific and local nodes.
- Compensation grout shafts not included in this section are not deemed to have a significant effect on existing known utilities and hence and have been scoped out.

Scheme Description

18.2.2 The likely location of the Liverpool Street compensation grout shafts are as stated in the main ES, Volume 2, Chapter 8. Table 18.1 cross-references those locations to this document and states whether utility works are required. If utility works are not required then an assessment has not been undertaken:

<table>
<thead>
<tr>
<th>Grout Shaft Location as Described in ES</th>
<th>SES Grout Shaft Number</th>
<th>Utilities Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the Moorgate worksite</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td>New Broad Street</td>
<td>2</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Shaft 2 (Duration 9 Months) Pre Shaft Construction, (Duration 2 Months) Post Shaft Construction

18.2.3 The proposed shaft (Figure 18.1) will occupy a large percentage of the width of New Broad Street. Essential utilities that serve properties in this street will be diverted locally around the proposed shaft location but due to the sheer number of services other utilities will have to be diverted away from New Broad Street via Old Broad Street, London Wall and Blomfield Street. Through pedestrian traffic will be maintained at all times but through vehicular traffic will be restricted. It is assumed that the Thames Water sewer which is approximately located along the centre of the street will be abandoned for the duration of the shaft. This will require alterations to the sewer connections into Blomfield Street and Old Broad Street.

18.2.4 On completion of the compensation grout shaft works some of the utilities (in particular the sewer) will be reinstated along their current alignment.
### Figure 18.1 Programme for Liverpool Street Compensation Grout Shaft

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SHAFT No.</th>
<th>DESCRIPTION</th>
<th>Duration</th>
<th>DURATION (MONTHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liverpool St Station</td>
<td>2</td>
<td>Pre Shaft Utility Diversions</td>
<td>9 months</td>
<td>5 to 6, 10 to 18, 20 to 24, 35 to 48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Great Shaft Construction</td>
<td>3 months</td>
<td>5 to 6, 10 to 18, 20 to 24, 35 to 48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Earliest Start Date for Deep</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excavations/Tunnelling at Great</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shaft Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grout Shaft Operation</td>
<td>29 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post Shaft Utility Diversions</td>
<td>2 months</td>
<td>5 to 6, 10 to 18, 20 to 24, 35 to 48</td>
</tr>
</tbody>
</table>

**KEY**

- Duration
18.3 Impacts on Townscape and built Heritage

Baseline

18.3.1 The compensation grout shaft utility works 2 is located within a townscape of moderate to high quality and high sensitivity. The utility works are located within the New Broad Street Conservation Area and abut a number of listed buildings. The full baseline assessment of the sensitivity of the townscape within the Liverpool Street station route window can be found in the main ES, Volume 2, Chapter 8.

Direct Impacts on Listed Buildings

18.3.2 There will be no direct impacts on listed buildings resulting from the additional compensation grout shaft utility works.

Assessment, Mitigation and Residual Impacts

18.3.3 The works will be undertaken on a rolling programme and it is assumed that the works in any one location will not exceed five months duration. There will be no change to the significance of impacts on townscape resources.

18.4 Impacts on Visual Amenity

Baseline

18.4.1 Visibility of the compensation grout shaft utility works is restricted by the buildings that line the frontages of the streets where the works will take place. The zone of visual influence for the utility works will extend along sections of London Wall, Blomfield Street, New Broad Street and Old Broad Street. A mixture of medium and low sensitivity visual receptors are located in or around these streets.

Assessment, Mitigation and Residual Impacts

18.4.2 The works will be undertaken on a rolling programme and it is assumed that the works in any one location will not exceed five months duration. Due to the short duration, there will be no additional significant impacts on visual amenity.

18.5 Impacts on Archaeology

Baseline

18.5.1 The baseline resources that might be affected by utilities diversions for the grout shafts at Liverpool Street (east) are the same as those for the other utility diversions at this site (see paragraph 17.5.1), in particular the below-ground remains of the Roman and medieval city wall, which is a Scheduled Ancient Monument, and also the former burial ground of All Hallows on the Wall, both in London Wall.

Assessment, Mitigation and Residual Impacts

18.5.2 The diversion of utilities for grout shafts at Liverpool Street (east) has the potential to partially or completely remove archaeological remains.
18.5.3 Utility diversions located in London Wall have potential to disturb the city wall, and at the junction with Old Broad Street have potential to remove burials from the burial ground of All Hallows on the Wall. Mitigation measures would be the same as for the main utilities works at Liverpool Street (east), see paragraph 17.5.2 to 17.5.4.

18.5.4 The mitigation measures will also be applied to the works affecting other resources, as set out in main ES, Volume 1, Chapter 3, (to produce preservation by record, probably as an archaeological watching brief. With this mitigation, no significant residual impacts are predicted.

18.6 Traffic and Transport Impacts

Baseline

18.6.1 Potential locations for grout shafts were identified when the main ES was prepared and their impacts on traffic and transport were considered at that time. The main ES described potential impacts from the grout shafts where these were likely to be significant. Some shafts will be sunk at locations where there are existing utilities, which will be diverted to surrounding streets either temporarily or permanently, so the impacts of these utility works have to be considered in the same manner as those directly caused by the main works. The affected streets are described in Chapter 17, Section 17.6.1.

Assessment, Mitigation and Residual Impacts

Shaft 2 – Pre Shaft Construction

18.6.2 This shaft is located in New Broad Street, which is semi-pedestrianised. Utilities that serve properties in this street will be diverted locally around the proposed shaft location; others will be diverted via Blomfield Street, London Wall and Old Broad Street. The sewer currently located in the centre of New Broad Street will be temporarily abandoned.

18.6.3 Before construction of the shaft, it is recommended that the utilities diversions for the shaft are incorporated within the same rolling programme as stage 1 of the main utilities works which will affect the same streets. The assessment of each link and where appropriate, junction, is addressed below.

18.6.4 New Broad Street. This is semi-pedestrianised so no significant traffic impacts are expected within the street. For the local diversion, a wide trench is likely to be required, but access for pedestrians and servicing vehicles will be maintained.

18.6.5 New Broad Street is narrower at its junctions with Blomfield Street and Old Broad Street than along the link, so in order to maintain access for servicing vehicles work will be undertaken in stages so that at least one end of New Broad Street will be open at all times. Pedestrian access will however be maintained from both ends of the street at all times.

18.6.6 Blomfield Street (between London Wall and New Broad Street) including junction with London Wall. In the main utilities assessment for Liverpool Street (east) it is assumed that one lane of Blomfield Street will be used for the enabling works. With additional utilities to be diverted as a result of the grout shaft construction, it is unlikely that this will be sufficient. The use of an extra lane will require closure of this street. The works will
need to be planned so that they can be undertaken at the same time as other utilities diversions at the Blomfield Street/London Wall junction. Traffic will be diverted via Finsbury Circus and Circus Place, as already proposed and works will have to be planned so that no works are occurring simultaneously in Old Broad Street, or London Wall between Moorgate and Blomfield Street. (The latter is part of the diversion for utilities works in Moorgate.) If this can be achieved no significant impacts are expected.

18.6.7 **Old Broad Street including junction with London Wall** (between London Wall and New Broad Street). As discussed in the assessment of the main utilities diversions in Liverpool Street (east), this street is a very sensitive route as it is heavily used by buses going to and from Liverpool Street bus station. Diverting extra utilities into this street will be likely to require more space than already proposed for the main utilities works; hence road closure is likely to be required. During closure, vehicles servicing properties in Old Broad Street, and buses entering Liverpool Street bus station will be diverted via Bishopsgate and the east arm of Liverpool Street, with kerbs and build-outs adjusted as necessary. Buses leaving the bus station would be diverted via Liverpool Street (west), Blomfield Street and London Wall.

18.6.8 To provide room for buses and taxis during these works all parking in Liverpool Street will be suspended and loading will be restricted to off-peak periods. The programming of the works will need to ensure that while the above arrangements are in place no works are undertaken in Liverpool Street, Bishopsgate, London Wall, Wormwood Street or Blomfield Street. The works at the junction of London Wall and Old Broad Street will, therefore, be carried out separately from the works in Old Broad Street itself. The works at the junction should not require any amendment to the arrangements described for the main utilities works although the extent of the works will be greater. No additional significant impacts are expected. It may be possible to carry out some of this work at night and plate over the trench during the day.

18.6.9 The increase in journey distance during this stage of the works will not be a significant impact, but there will be additional delays for buses. This will be a significant impact for passengers and bus operators.

18.6.10 **London Wall** (between Blomfield Street and Old Broad Street). Diversion of utilities from New Broad Street is likely to require a wider trench than has been assessed in Chapter 17. However, with the removal of the central reserve and the closure of the junction with Blomfield Street it should be possible to maintain adequate capacity provided that no works take place on London Wall (east of Moorgate) or Wormwood Street at the same time.

*Shaft 2 (Duration 2 Months) Post Shaft Removal*

18.6.11 During this stage some of the utilities will be reinstated to their current alignment. As London Wall and Blomfield Street form part of the proposed lorry route for the works at Liverpool Street, the utilities diversions in these streets will be undertaken after the main works have been completed even if the compensation grouting shaft can be removed earlier. This part of the work will not require the removal of all the temporary equipment laid in the previous stage so the impact should be correspondingly less.
Summary

18.6.12 Based on the above, the following additional mitigating measures will be required to deal with the utility diversions required by the compensation grout shafts, generally avoiding significant impacts except where noted.

18.6.13 During both stages, it will be necessary to undertake the following mitigating measures:

- maintain access for servicing vehicles in New Broad Street by carrying out the works at the ends of the road at different times;
- remove central reserve in London Wall between Blomfield Street and Old Broad Street;
- apply the same traffic diversion as proposed for Blomfield Street/London Wall junction in the main utilities diversions for Liverpool Street (east) while Blomfield Street is closed;
- programme to avoid works in Old Broad Street, or London Wall between Moorgate and Blomfield Street while work is undertaken in Blomfield Street including its junction with London Wall;
- programme to avoid works in Liverpool Street, Bishopsgate, London Wall, Wormwood Street or Blomfield Street while works are carried out in Old Broad Street. In addition, works on Old Broad Street to be undertaken separately from works at its junction with London Wall; and
- programme to avoid works on London Wall (east of Moorgate) or Wormwood Street while work is undertaken in London Wall between Blomfield Street and Old Broad Street.

18.6.14 With the mitigation measures described above it is likely that additional significant impacts will be avoided except:

- buses diverted from Old Broad Street will experience significant delay.

18.7 Noise and Vibration Impacts

Baseline

18.7.1 The noise-sensitive receptors that will potentially be affected by the utility works in this location are limited to the following:

- All Hallows on the Wall Church, London Wall.

18.7.2 This is the only noise-sensitive property that directly overlooks and is in close proximity to the proposed utility works.

18.7.3 No baseline noise measurements have been undertaken at this property. However it is considered that the levels recorded at London Metropolitan University (CL04) are representative of the noise environment along London Wall Road. The daytime baseline noise levels are presented in Table 18.2.
18.7.4 Ambient noise levels are moderate to high in this area. Road traffic noise is the dominant noise source in the area.

**Assessment, Mitigation and Residual Impacts**

18.7.5 The relevant mitigation measures, as set out in the main ES Appendix B1, will be employed as appropriate to reduce construction noise impacts.

18.7.6 The potential noise impact from the various stages of the utilities works is considered below.

18.7.7 **All Hallows on the Wall Church:** This location would potentially be impacted by the utility works required for Liverpool Street shaft 2, taking place in London Wall. The baseline levels in the area are high and therefore a significant residual noise impact is not considered likely. This gives a category 1 assessment.

18.7.8 The results of the construction noise assessment for the various categories of impact are summarised in Table 18.3.

**Table 18.3 Summary of Predicted Noise Impacts by Stage**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft 2</td>
<td>This falls into category 1, ie no significant residual impact.</td>
</tr>
</tbody>
</table>

18.7.9 The results of the construction noise assessment by receptor are summarised in Table 18.4. Only properties qualifying for noise insulation or temporary rehousing or predicted to experience a significant residual impact are included.

**Table 18.4 Summary of Noise Impacts by Receptor**

<table>
<thead>
<tr>
<th>Property</th>
<th>Noise Insulation</th>
<th>Temporary Rehousing</th>
<th>Significant Residual Impact</th>
<th>Stages from Main Works</th>
<th>Impact Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18.7.10 No properties are predicted to experience a significant impact due to utility works for the Liverpool Street compensation grout shafts.
Chapter 19

Traffic and Transport
Cumulative Impacts
19 Traffic and Transport Cumulative Impacts

19.1 Summary of Residual Impacts

19.1.1 The following significant residual adverse impacts will occur temporarily during construction, in addition to those reported in the main ES.

- **Traffic and Transport:** The combined impact of the enabling works in route windows C6 (Farringdon station) and C7 (Liverpool Street station) will result in a significant impact of particular importance for general traffic and buses on many routes as congestion will occur over a wide area.

19.2 Introduction

19.2.1 The assessment has identified the impacts likely to be caused by utilities diversions at and around each worksite. There is, though, a risk that there will be cumulative impacts caused by diversion works taking place at adjacent worksites at the same time. This Section identifies and discusses these potential cumulative impacts, looking at all affected worksites from west to east. In all cases potential cumulative impacts for works in two or more route windows are considered in the note for the route window furthest west.

19.2.2 There will be opportunities in the detailed design and programming of the main construction and utilities works to mitigate some of the cumulative impacts identified.

19.2.3 In addition, the interaction of the utilities work described in this document with the construction of other major projects is considered. This takes account of the proposed later start of the main construction and the period of enabling works.

19.3 C2: Paddington Station

19.3.1 In route window C2, Craven Road will be made one-way southwest bound. In route window C3 (Hyde Park and Park Lane), North Carriage Drive may have to operate as a single alternate lane during two stages of the work and be made one-way eastbound during a third. The consequential traffic diversions (mainly to Sussex Gardens and Bayswater Road respectively) are for traffic going in different directions. Thus, although some additional delays are expected it is not anticipated that there will be any significant cumulative impacts as a result of traffic diversions in route windows C2 and C3.

19.4 C3: Hyde Park and Park Lane

19.4.1 In route window C3, works in Park Lane will reduce the available capacity but the road will remain open and it is unlikely that there will be a signed diversion. In order to mitigate potential adverse effects it is proposed that important elements of the works will be carried out at night-time. If this were not done some drivers would divert to West Carriage Drive, which is itself affected by the Hyde Park works (also in route window C3), and significant delays would therefore be likely to arise in that road. Other drivers would divert from Park Lane into roads in Mayfair (particularly Park Street). At the same
time in route window C4, Davies Street will be closed. Northbound buses on Routes 8 and N8 will be diverted to Park Street and it is expected that the other Davies Street traffic, which contains a very high proportion of taxis, will find a variety of routes through the area. This rerouting is, therefore, likely to lead to additional traffic in Park Street.

19.4.2 Night-time working on Park Lane is therefore necessary in order to avoid potentially significant cumulative impacts for buses and general traffic on Park Street. The route window C4 (Davies Street) works also require excavation in Oxford Street but neither the maximum nor minimum duration programmes show any overlap between these works and the traffic restrictions in Park Lane. Thus, it is unlikely that there will be any cumulative impact arising from the interaction of works in Park Lane and those in Oxford Street.

19.5 **C4: Bond Street**

Traffic flows on some roads in route window C4 will be likely to increase as a result of the displacement of traffic from Charing Cross Road in route window C5. This will mainly affect northbound traffic flows in Regent Street, but may also increase traffic levels in the Hanover Square – Holles Street, northbound route to the west of Regent Street. However the increased traffic levels are not expected to lead to a significant cumulative impact on either of these routes.

19.6 **C5: Tottenham Court Road**

19.6.1 It is not expected that any roads in route window C5 will experience any significant cumulative impact from works in other route windows although there will be some transfer of traffic between roads in C5. In particular, the reduced capacity of Charing Cross Road and Andrew Borde Street will be likely to cause some diversion of northbound traffic to the Kingsway – Southampton Row route and the various routes that are available through Bloomsbury. The nature of the impacts likely to arise from this redistribution of traffic were identified in the main ES but will cover an extended time period. The utilities diversion works are likely to extend the period when these impacts will be experienced.

19.7 **C6 and C7: Farringdon Station and Liverpool Street Station**

19.7.1 In route windows C6 and C7 major utility diversions are proposed on several roads giving rise to a likelihood of significant impacts. The precise start times and durations for these works are not known at the present time but all the works identified below have the potential to overlap.

- Major sewer works in Farringdon Road will reduce Farringdon Road to one narrow lane in each direction.
- St. John Street will be closed for utilities diversions for a grout shaft.
- The Aldersgate Street/Beech Street junction will be closed to enable many utilities to be diverted and subsequently Aldersgate Street will be made one-way northbound.
Moorgate will be reduced to a single lane in each direction for utilities diversions, including a major sewer and subsequently reduced to a single alternate line, with southbound light vehicles diverted via Blomfield Street.

London Wall, between Moorgate and Blomfield Street, will be made one way westbound and subsequently Blomfield Street will be closed at the junction with London Wall and traffic will be diverted through Finsbury Circus.

If all these works are assumed to take place at the same time, the cumulative impact resulting from the loss of highway capacity would be classified as a significant impact of particular importance both for general traffic and for buses on many routes. Traffic will divert over a wide area of the City of London and southern parts of the adjoining Boroughs of Islington and Camden. This is likely to cause traffic congestion and delays particularly at junctions. Bus services will be affected by diversions and congestion.

It is anticipated that given the nature of the works this degree of impact is likely to last between 5 to 10 months. There will be a further period however, when some but not all of the works identified are likely to overlap. During this period, anticipated to be a further 13 months, significant impacts will be experienced on a more localised basis.

Some mitigation of this cumulative impact may be possible in the detailed planning and programming of the works.

The remaining route windows where the impacts of utilities diversions have been assessed are to the east of Route Window C7: Liverpool Street station. Worksites are further apart and traffic impacts generally less than in the central London route windows. No cumulative impacts from adjacent worksites have been identified.

This SES is based on an assumed 2009 start date for the main works. This will mean that the interactions and possible cumulative impacts of the main works with other major projects will be as reported in the Supplementary ES of May 2005 which considered the likely implications of a later construction start. These were reviewed in paragraphs 2.3.15–16 and Box 2.1.

Enabling works carried out prior to the start of the main works will themselves interact with a number of projects which are planned to be under construction following Royal Assent (assumed to be in mid 2007). The possible impacts are considered below.

Paddington Station

It was indicated in the Supplementary ES that a delay in the main construction could provide an opportunity for the Span 4 development to commence so that a permanent transport interchange deck could be provided and the temporary taxi facility on the Red Star Deck would not be required. It is evident from the assessment of the enabling works for Paddington station above that it will not be possible for the taxi facility to
operate in Departures Road for some six months of the utilities diversion works. This would limit the time available for any Span 4 works and make the need for the temporary Red Star Deck more likely.

**Tottenham Court Road Station**

19.9.4 In the SES it was assumed that if the Crossrail works were delayed by two years the LU works for the construction of the ticket hall at Tottenham Court Road could commence immediately after Royal Assent. This would alter the staging of the works and the overlap of the Crossrail and LU works. It is likely, however, that many of the utilities diversions required for the Crossrail TCR eastern ticket hall will be undertaken by LU at the same time as their works. Overall the cumulative impacts of the two projects are expected to be reduced although the combined programme will be extended.

**Farringdon Station**

19.9.5 The cumulative impacts of the utilities works required at Farringdon and Liverpool Street stations were highlighted above such that a significant impact of particular importance may occur. This would coincide with the works for Thameslink 2000 at Farringdon station. Construction traffic for the Thameslink works will add to traffic levels in the vicinity of the Farringdon worksite in particular on Farringdon Road and exacerbate the cumulative impacts of works in the area.

**East London Line Extension**

19.9.6 The enabling works for Crossrail are expected to have little impact on the East London Line Extension.