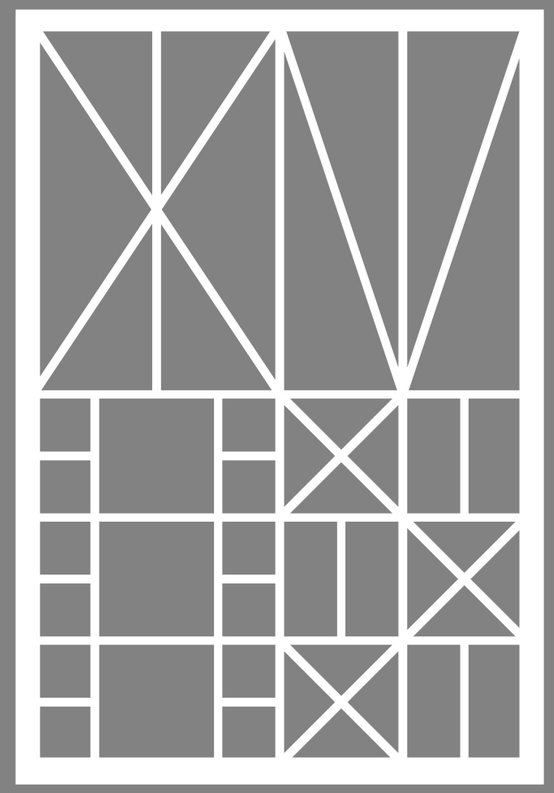

NEW CITY COURT

Basement Impact Assessment - Addendum

AKT II

3948 New City Court

Basement Impact Assessment

July 2021

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Contents

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B	09.07.2021	INFORMATION
A	15.04.2021	INFORMATION
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1 Introduction

AKT II have been commissioned to undertake a basement impact assessment in support of the proposed redevelopment of New City Court, 4-26 St Thomas Street, London, SE1 9RS ('the Site').

This report is intended to cover only the impact of the proposed basement expansion within the New City Court redevelopment scheme.

The following report provides a summary of the work undertaken to date in assessing the impact of the proposed basement expansion within the New City Court redevelopment scheme. The report also outlines the work that is required in order to achieve the necessary third party approvals and the design philosophy to be applied in completing this work.

The report sets out the preferred strategy based on the information currently available. It is noted that a site specific geotechnical and fabric investigations with detailed information will be available at later design stages. As such, the proposals outlined here are preliminary and based upon recorded information for this and adjacent sites obtained following a comprehensive desk study.

This information is to be read in conjunction with and forms part of, the planning application and responds to the requirements outlined by Southwark Council for basement construction and expansion.

This report has been updated and re-submitted in July 2021 to reflect revisions to the detailed design of the proposals since the planning and listed building application submission in April 2021. This latest revision updates the figures and drawings to reflect the revised architectural drawings, but the analysis remains unaffected.

Figure 1.1 Architectural rendering of main Tower. (St Thomas Street view)

2 The Project

The Site to be redeveloped is located in the London borough of Southwark in the London Bridge area. The Site boundary lies directly along the south side of St. Thomas Street, between the cross roads of London Bridge Street, to the east; and Borough High Street, to the west. It is located adjacent to the Guy's Hospital accommodation and King's College Guy's Campus buildings. The Site is bordered by Kings Head Yard, to the south. Please refer to the next chapter for more information on the Site's location and surrounding land use.

The project comprises the construction of a 26-storey building (with mezzanine and two basement levels), adjacent to King's Head Yard, after demolishing the existing New City Court office building.

Keats House, a smaller building located in the northeast corner, will be reconstructed with a new internal structure intended to reflect the Venetian style of its facade. The existing Keats House front facade is to be relocated by approximately 6m to the West to allow for space for a servicing access.

The whole expansion of the existing level of basement and the construction of a second level across the Site is proposed, to accommodate extensive cycle parking in addition to servicing and plantrooms.

Additionally the proposed development will provide office floorspace, flexible office/retail floorspace, restaurant/café floorspace and a public rooftop garden, associated public realm and highways improvements, provision for a new access to the Borough High Street entrance to the Underground Station, cycling parking, car parking, service, refuse and plant areas, and all ancillary or associated works.

Finally, the project proposes to retain and refurbish the existing terrace houses located along St. Thomas Street (no. 4 to 16), following special requirements for listed buildings (Grade II).

This report provides reference to the preliminary findings of the available ground investigation results and desk study, together with outline Site constraint information. A summary of the assumed ground model is included as well as a description of the proposed superstructure and substructure works. Comprehensive structural and geotechnical basement impact assessment has been completed according to the current level of information available. Detailed assessment with calculations will be carried out in the next design stages.

Several third party interfaces are involved in the proposed development as described later in this report and preliminary comments/discussions carried out to date are included in this report.

Please note that this report is to be read in conjunction with all relevant documents supporting the planning application.

Figure 2.1 North-east perspective of New City Court (Miller Hare render)

Figure 2.2 View of New City Court from Southwark Street (AHMM render)

Figure 2.3 View of New City Court from the LUL side (AHMM render)

Figure 2.4 Southwark Cathedral, norh-west perspective of New City Court (Miller Hare render)

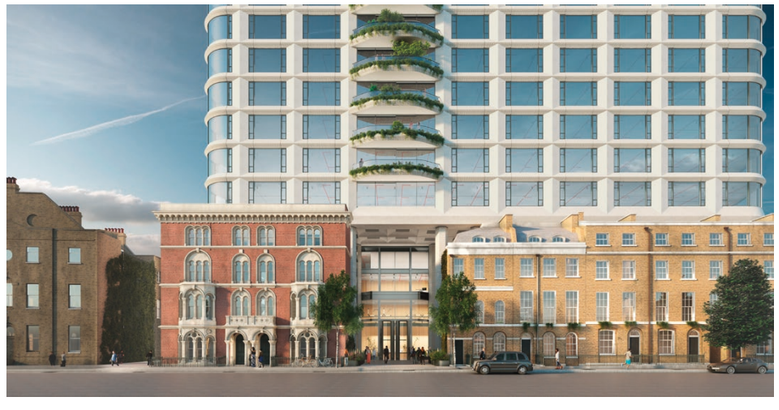


Figure 2.5 St. Thomas Street - axial view (AHMM render)

3 The Site

3.1 Site Location

The Site is located between St. Thomas Street (N); King's Head Yard (S); and occupied retail buildings running along Borough High Street (W) and Guy's hospital Buildings (E). It is located in close proximity to London Bridge station, the Shard and Borough Market. (Fig 3.1)

The Site is currently occupied by office blocks with pedestrian access from St. Thomas Street and vehicular access to the building from the carpark located on the SW corner, plus a loading bay on St. Thomas Street.

The wider contextual location (Fig 3.2) shows the Site located South to the River Thames.

Among the buildings along the High Street there is the London Bridge Tube station which serves the Jubilee and Northern Line.

Figure 3.1 Aerial image of The Site

3.2 Surrounding Land Use

The Site is surrounded by a series of low rise buildings and several buildings of interest.

Borough High street is lined by shops with limited residential units above. It also accommodates one of the entrances to the London Bridge underground Station, with access to the LUL tunnels, which cut across the NW boundary of the Site. On the western edge of the Site a large ventilation grill enclosure can be seen.

Directly west of the St. Thomas Street properties is a public house called 'Bunch of Grapes', which was built in 1819.

To the east of Keats house are the Guy's and St. Thomas Hospital accommodation buildings and Kings College Guy's campus. Also adjacent is the Guy's Chapel, which was completed in 1780. The Chapel borders the existing Site boundary and has had an extension added, although it is not believed to be part of the chapel building itself. Existing record drawings show this to be a computer suite for the college campus with basement bar and art store above. The extent of the Site boundary of the proposed development here is uncertain due to the extent of the extension, existing chapel and constraints of the party walls as much of this area was previously connected and changed over time.

On King's Head Yard, there is another public house, ' Old King's Head' which burnt down in the borough fire of 1676 and was later rebuilt. The pub itself has a cellar located on the King's head Yard cobbled street and close to the Borough High Street egress point.

Figure 3.2 The Site Location highlighted above (wider view)

4 Proposed Structure

4.1 Overview

The project comprises the construction of a 26-storey building (with mezzanine and two basement levels), adjacent to King's Head Yard, after the demolition of the existing New City Court office building. Different structural frame options have been also considered at this stage such as steel frame with metal deck however the preferred option at the time of authoring this report is the reinforced concrete frame with PT slabs.

Keats House, a smaller building located in the northeast corner, will be recreated, with the construction of a new internal structure intended to reflect the Venetian style of its facade.

The Keats House facade will be relocated to its new permanent location (approximately 6m to the West). This will improve the circulation of pedestrians and vehicles as part of the proposed redevelopment of the New City Court Site.

The expansion of the existing level of basement and the construction of a second level is proposed to accommodate extensive cycle parking in addition to servicing and plantrooms.

Additionally, the scheme will create a public space at the ground floor as part of the redevelopment project, providing an enhanced entrance from St. Thomas Street to New City Court, and a direct passage from Borough High Street to New City Court through London Bridge Underground Station is also part of the project.

Finally, the project proposes to retain and refurbish the existing terrace houses located along St. Thomas Street (no. 4 to 16), following special requirements for listed buildings (Grade II).

4.2 Deconstruction and Demolition

The demolition works are related to:

- the office building of New City Court which was built in the early 1980's;
- the structure forming Keats House erected at the same time;
- The extension of the Georgian Terrace Buildings from number 4 to number 12 which was carried as part of the developments in the 1980's.
- part of the Georgian Terrace Buildings number 16 to align with the rest of the Georgian Terraces townhouses (number 4 to 12; on the south face)

General Considerations

The demolition works will need to consider:

- Site constraints – Ability to access and manoeuvre in and around the Site. Specific consideration will need to be given to tower cranes i.e. location, over sailing, jib length, collapse radii etc. Please refer to the AKTII Site constraint plan.
- Public Safety – Demolition produces large amounts of debris and dust. The existing structure would need to be clad in scaffolding and monoflex sheeting (debris netting) and consideration would also need to be given to crash decks where demolition poses a high risk to the public.
- Integrity of retained and adjacent structures – Demolition generally produces varying degrees of vibration depending on choice of demolition technique. Full consideration needs to be given to adjoining structures and Site retained structures such that damage does not occur as a result of excessive vibration. It may even be necessary to utilise differing demolition techniques in areas of high risk.
- Noise – Demolition operations generally generate a great deal of noise and consideration will need to be given to surrounding environment. Restrictions may also be placed on operating hours especially given proximity to Guy's Hospital and the other buildings which are part of the hospital such as Conybeare House and the structures belonging to King's College.
- Protection of the infrastructure such as the sewer running underneath Keats House, which is to be diverted before of the works for the construction of the new basement.

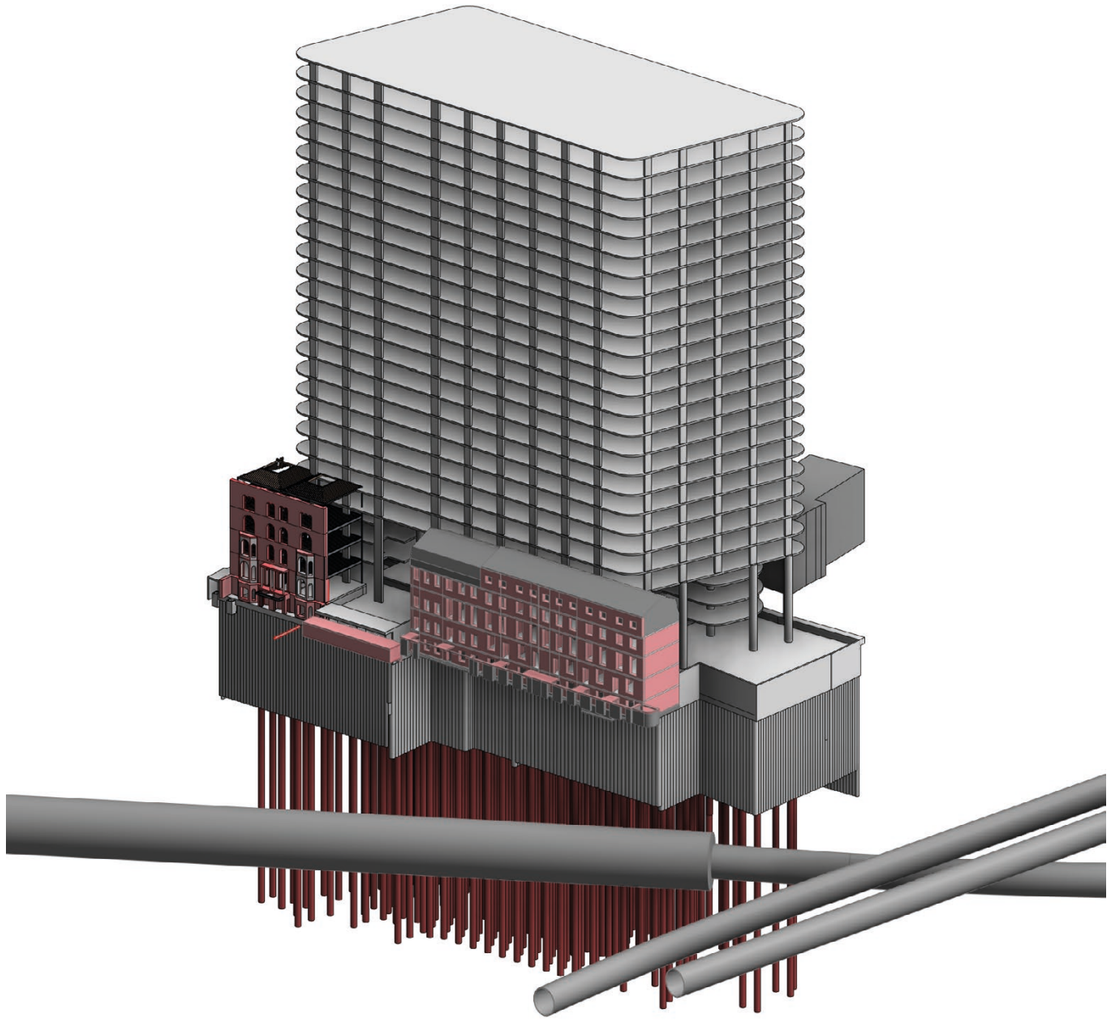


Figure 4.1 New City Court porposed scheme (transfers & balconies structure not shown for clarity)

4.3 Basement Construction

Structural solutions for basement construction have been investigated according to Site information available at present. Preliminary information about ground conditions and related design parameters have been determined based on the findings of the previous Site investigations, deskstudy and record searches.

Further investigations, including geotechnical and environmental, will be required in the next stages to determine the final design of the basement.

The proposed substructure encompasses the construction of two basement levels B1 and B2 respectively at -0.150m (SSL) and -4.65m (SSL). These levels are intended to provide plant room and cycle storage space.

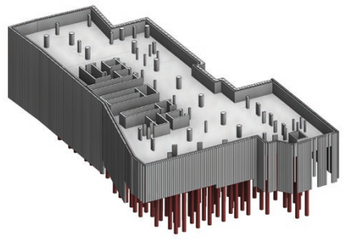


Figure 4.2 Proposed basement 3D view

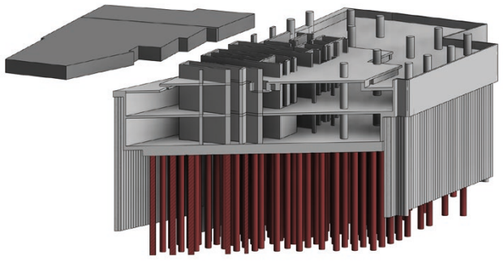


Figure 4.3 Proposed basement section

4.4 Underpinning

AKT II has carried out extensive research on the structures of the buildings adjacent to the development.

The construction of the new basement will require the underpinning of most of the foundations which are currently sitting above the proposed B1 level assuming that piling will take place from the proposed B1 level (worst case scenario for the Georgian Terrace buildings, St Thomas Street No. 4 to 16). The underpinning will also include the original foundations along the south face of the Georgian Terraces.

The proposed B2 level will be formed using secant piles which will be designed to support the surcharge loads from the existing building. The construction of the new basement will require a careful design of the temporary works to allow for the excavation.

Alternative options where underpinning may not be required and or reduced/limited for the Georgian Terrace buildings have been also explored i.e. piling from existing B1 level or piling from existing GF level.

For the purposes of this basement impact assessment report the worst case scenario has been assumed and is presented herein (piling from proposed B1 level).

4.5 Retaining Walls

The New City Court development encompasses the demolition of the existing office basement level and the construction of an additional basement, to provide 2 basement levels on the proposed scheme. The typical depth of excavation beneath the existing basement level will be approximately 6.50m to 7.50m for the proposed 2 storey basement.

The formation of the new basement will be achieved with the use of a secant piled wall which is the most suitable solution in terms of cost/effective width, construction sequence, adjacent buildings and other Site constraints, as well as programme.

This secant piled wall is an inherent stiff construction, conducive to a robust temporary works scheme. The interlocking construction provides resistance to the penetration of water into the excavation during the temporary condition and limits the risk of washing fines from under the adjacent structures. The piling line is set such that adequate clearance to the adjacent structures is maintained with typical minimum clearance of 1200mm from the centre line of the pile to the adjacent high-level obstruction (assuming CFA piles, for rotary piles the clearance can be reduced to 1000mm from the centre line of the pile to the adjacent high-level obstruction; this clearance can be achieved typically up to 750mm diameter piles).

The secant piled wall proposed to date will be designed to support the surcharge load from the adjacent buildings and/or roads, soil surcharge and water pressure.

Generally, a uniform secant pile wall diameter has been considered along the perimeter of the proposed location. In some areas where the secant pile will need to pick up vertical loads in addition to the lateral earth pressures a larger pile diameter will need to be used.

There are also some localised areas, on the east side of Keats House and on the southeast corner, where the proposed retaining wall diameter could be reduced. At this location the use of mini-pile contiguous wall to interlock with existing 450mm diameter piles located in the perimeter is proposed.

Please note that all information shared above is subject to further changes, analysis/design and review which will take place at the next design stage.

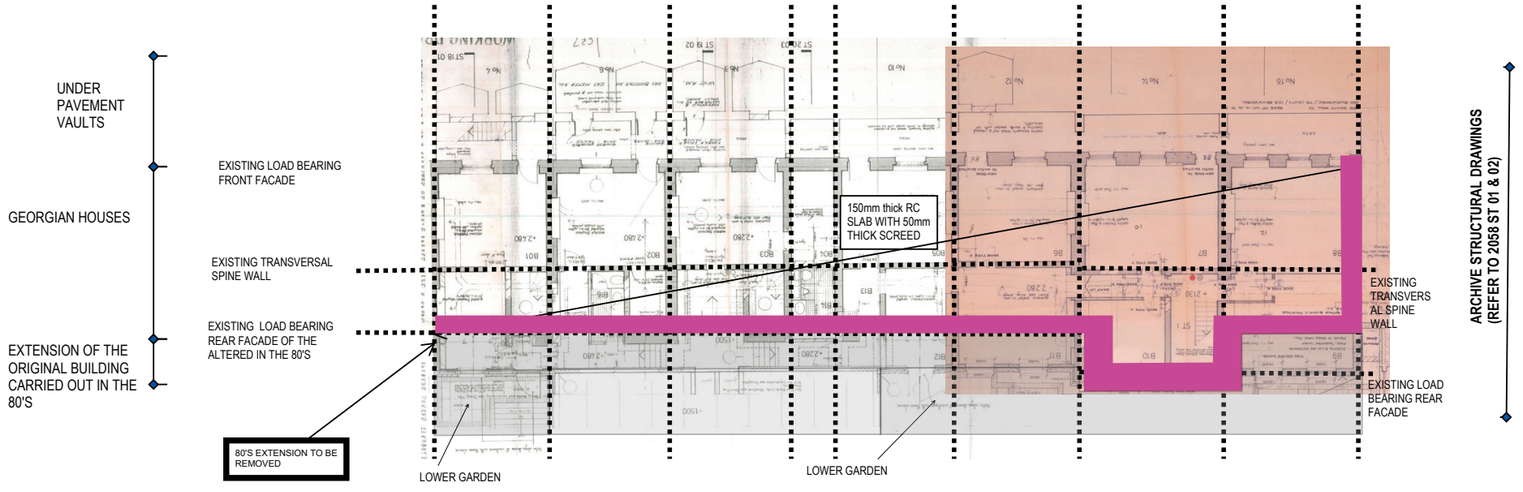


Figure 4.4 Underpinning extent along St. Thomas Street ; Georgian Terrace buildings No. 04 to 16 (assuming piling from proposed B1 Level)

4.6 Foundations

Given the magnitude of the vertical loads applied, together with the anticipated ground conditions, the proposed foundations consists of a piled raft right below the main tower. A raft thickness of circa 1500mm to spread the loads onto the CFA piles wih varied diameter through London Clay until the Lambeth layer, to achieve the desired bearing capacity/limit settlements of underlying strata has been analysed at this stage for the tower's core walls. For the remaining area outside the tower footprint the main option is a suspended slab between pile caps that support the columns under either the public realm or Keats House.

The current proposed foundations will be subjected to confirmation in the next stages after review of the ground investigation results as well as the construction sequence, maximum CFA pile depth and diameter with the appointed contractor.

Ground heave will occur in the underlying thick layer of clay due to the unloading of the existing building demolition and the excavation of the additional proposed basement.

Heave can be considered as divided in two parts:

- The short-term heave (the more relevant), which for such big sites usually occurs during demolition, excavation/ construction and therefore does not represent generally an issue in terms of foundation design or impact on the structure itself but may have an impact in terms of movements on the surrounding assets.
- The long-term heave, which occurs over the life of the building and, as a consequence, the structure has to be designed to accommodate it.

A more detailed assessment of the impact of heave movements will be undertaken in the next stages of design.

It should be noted that there are several existing RC piles (450mm diameter) across the Site. Additional surveys to confirm the actual position of these piles will be required to verify against the information shown on the archive drawings available to date. It is expected that some of the proposed piles will need to be relocated to avoid clashes.

The compensation grouting (please refer to the relevant Appendix attached in this report and to the Structure Statement report) was also considered and advice has been taken from piling contractors to make sure that the CFA rig would be capable to drill through the grouting without an impact on the programme.

4.7 Assumed Construction Sequences

Outline construction sequences related to the formation of the basement as assumed. The sequence will be improved further in the next stages of design and coordinated with the Contractor once appointed.

The expansion of the existing basement will require different excavation/retaining wall solutions depending on the constraint, which could be the Site boundary, face of adjacent building, existing foundations, surrounding services and others. The additional basement level will be formed based on a secant pile wall around which will be installed either from the existing B1 level on the north and west sides, or from the ground floor on the south and east sides, where a berm is to be made as part of the temporary works.

The existing basement level is also a constraint and temporary works will need to be considered to allow for the demolition of the GF and B1 slabs. The existing basement wall may need to be kept in some areas.

Figure 4.5 Architectural drawing of the proposed B1 Basement Level (AHMM amendments, July 2021)

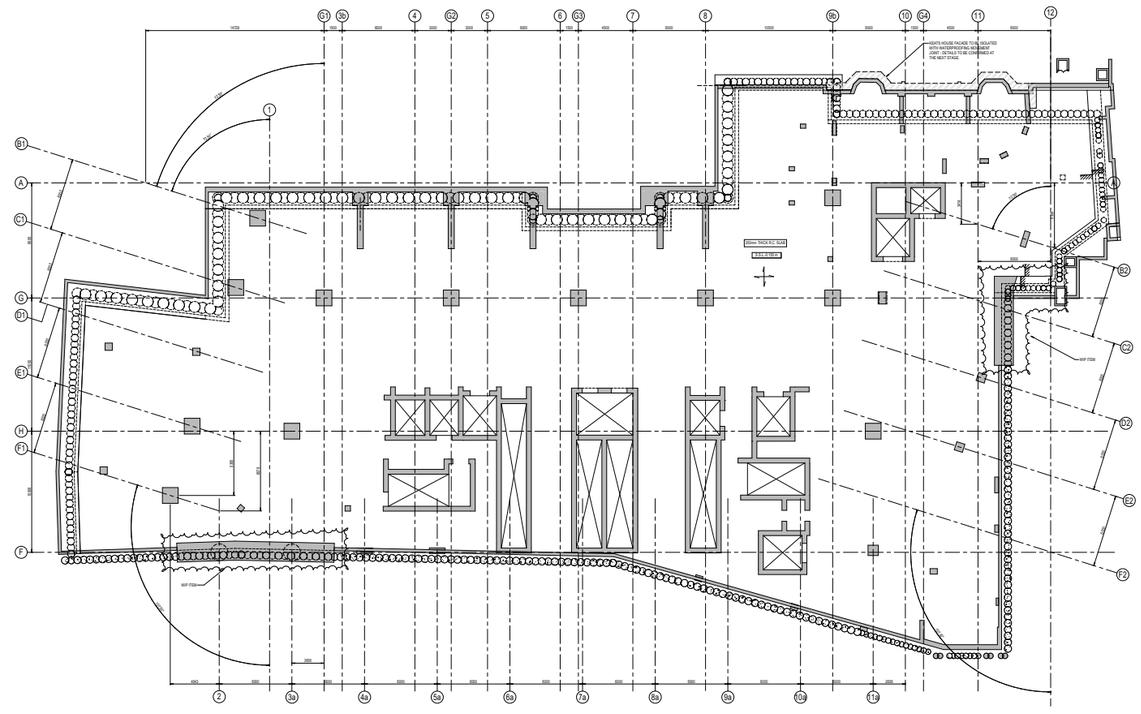


Figure 4.6 Structural drawing (indicative) of the proposed B1 Basement Level

5 Impact Assessment

The impact assessment will be carried out in stages appropriate to the current level of of design. At this stage, there are a number of assumptions that require validation in subsequent design stages, further to additional investigations. Comprehensive calculation packages will be prepared by AKT II for Building Control approval at the relevant stage of design.

The following section gives an outline of these assumptions and the process which will be followed in order to gain necessary Third Party approvals.

Adequate analyses have been completed to this date based on conservative assumptions i.e. soil profile and soil properties in the absence of a Site Investigation report for the Site and based on the BGS borehole logs which can be found in the relevant Appendix attached to this report.

The most critical interfaces with all of the assets in the vicinity of the Site have been checked and assessed to have the confidence that the proposal will not have a negative impact on these assets.

5.1 Analysis and Process

5.1.1 Data and Assumptions

The key information required to finalise the design can be broken into the following sub-categories. The current assumptions within each category are defined below.

Form and Loads

The building has undergone a coordination process within the design team which has resulted in the proposed layout and height. The usage of the various floors has been also coordinated and fixed.

Construction Sequence

The construction phasing is considered in the assessment of time dependant effects. At this stage, a realistic construction sequence has been assumed, however it will require confirmation together with the appointed contractor in further stages.

Ground Conditions

At the date of this report an initial picture of the ground conditions has been made based on deskstudy of adjacent boreholes and available literature. However, a Site investigation will need to be carried out in further stages in order to confirm the design assumptions.

Third Party Assets

At time of writing, the location of Third Party assets has been assumed according to statutory information received.

As dialogue continues with Third Parties, assumptions relating to location, fabric and condition of adjacent/underground structures may change. All these assumptions are subjected to final acceptance and approval by the Third Party involved.

Fabric Survey

A fabric survey is to be carried out to establish the form and condition of the existing basement. This will allow an understanding of the structural scheme of the existing basement to be retained in some areas as well as an assessment of the extent and weight of existing foundations on Site to be either removed or avoided, which needs to be accounted for by the contractors in terms of cost and risks.

5.1.2 Initial Modelling

Based on the design at planning, initial modelling has been completed. Once the form and construction has been finalised via the award of planning permission further modelling of the impacts on adjacent structures and assets will be carried out.

The aim of this initial modelling is to establish the likely magnitude of the impact on any surrounding structures as well as assets and provide values which can be used as a basis for the initial discussions with the parties to be notified of the works.

The initial assessment of ground movements will typically comprise the following analysis types, adressing both vertical and horizontal movements:

- Review of predicted ground movements against empirical derivations case study data (eg CIRIA C580 and CIRIA C760 data). The results will be assessed against relevant acceptance criteria in order to secure the formal approvals for the works to be undertaken. Any resulting requirements with regard to the Contractors' methodology will be detailed and enforced through the project specifications and preliminaries.
- Elastic halfspace model to assess vertical ground movements below and adjacent to the excavation in both short-term and long-term conditions.

The results of this preliminary but still rigorous analysis have been the base for the 'Damage Criteria Assessment' on the adjacent buildings and on the infrastructures such as Thames Water, LUL, Highways and SGN gas.

The Assessment demonstrates that the settlements and movements caused by the new development during construction and after completion will not cause damage to these assets.

This analysis will undergo more detailed studies which will form the base of the Approvals to be submitted to the utility companies whose assets are close to the Site such as Thames Water, SGN Gas, Highways Division of the London Borough of Southwark and London Underground.

However, a monitoring regime will be put in place before the works commence and will last for a period after the completion of the project to make sure the limits on the movements and of the settlements are not exceeded. This process will be discussed and agreed with the utility companies above mentioned and with the party wall surveyors.

5.1.3 Detailed Modelling

Where detailed analysis is considered necessary, the initial calculations will be expanded upon through more rigorous analytical processes.

The key elements of this stage will consist of elastic plane-strain 2D section cut analysis for assessment of lateral and vertical ground movements in regions adjacent to the excavation. A full 3D analysis of the ground may be required in some cases.

The requirements of the analysis are varied depending on the approvals process of the asset in consideration, and the scope will be discussed and agreed with the relevant parties as necessary.

5.2 Basement Impact Assessment

Following the outcome of the analysis described in the previous section, and appropriate consultation with Third Parties, the following aspects will be consequently addressed.

5.2.1 Impact on Adjacent Buildings

The impact of the proposed development on the adjacent buildings is to be assessed and approvals secured via party wall awards where required.

A package of relevant drawings, calculations and reports will be prepared to be reviewed by the adjacent owners appointed structural engineer and relevant third parties.

Assumed temporary works designs shall be prepared prior to the Contractor completing the final design.

5.2.2 Damage Criteria Assessment

A halfspace model to assess the ground movements was developed at this stage and will be revised and combined with those movements resulting from the retaining wall analysis as appropriate in order to develop the predicted vertical and lateral ground movement contouring. This contouring shall be used to assess the impact on the adjacent buildings. At this stage, as a preliminary check, the impact on the adjacent buildings was analysed. An impact assessment took also place which showed that all of the surrounding assets are well within the accepted limits for curvature, rotation and CIRIA C760 damage criteria categories for ground movements.

It is proposed to use the classification of visible damage to walls scheme as outlined in CIRIA C760 with reference to Burland et al, 1977, Boscardin and Cording, 1989; and Burland, 2001 (Figure 10.3). Subject to the approval of adjacent owners' party wall surveyor and relevant LBC, Damage Category 1 (very slight) and Category 2 (slight) shall be assumed acceptable.

Vertical and horizontal ground movements calculations will be reviewed and combined in the next stage.

Note that a detailed ground movement analysis will be required for the next stage to assess with greater accuracy the impact of the proposed development to the Georgian Terraces and the rest of the assets i.e. LUL, Thames Water, SGN etc. in the vicinity of the Site.

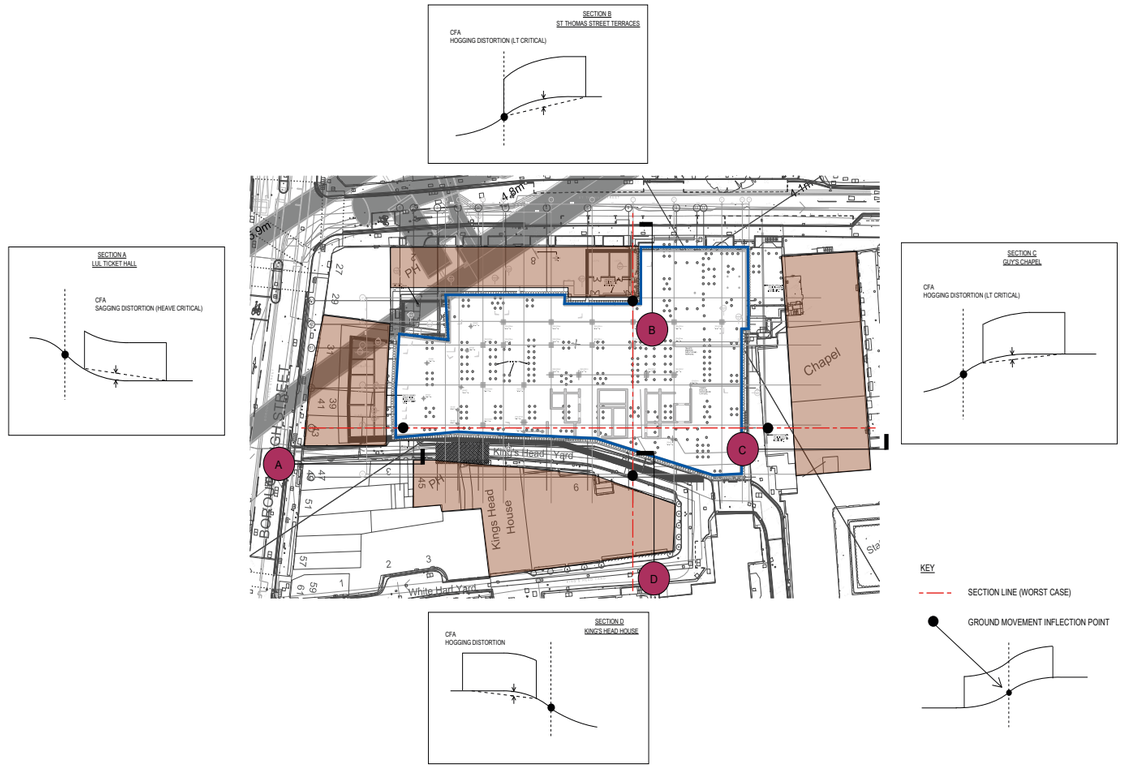


Figure 5.1 Adjacent buildings behaviour due to settlement plot of NCC development

5.2.3 Surveys and Monitoring

A regime of surveys and monitoring of the surrounding building, third party assets, proposed/existing retaining walls and adjacent pavements may need to be implemented depending on the results of the movement analysis and the condition of assets.

Appropriate green, amber and red trigger levels shall be set with reference to relevant CIRIA guidance documents on the observational methodology.

The scope of monitoring is likely to include the following:

- Movement monitoring of party walls via targets surveyed using electronic levels.
- Vibration monitoring using transducers placed on the foundations of the adjacent buildings .
- Crack monitoring via the use of graduated tell-tales.
- Movement monitoring of retaining wall/capping beams via targets surveyed using electronic levels.
- Monitoring of adjacent pavement levels via studs surveyed using electronic levels.
- Monitoring of retaining wall movements via use of Inclinometers cast in secant piles.
- Potential use of extensometer bored in place to monitor heave movements in clay.

Table 6.4 Classification of visible damage to walls (after Burland et al, 1977, Boscardin and Cording, 1989, and Burland, 2001)

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain, ε_{lim} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	**Fine cracks that can easily be treated during normal decoration.** Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	**Cracks easily filled. Redecoration probably required.** Several slight fractures showing inside of building. Cracks are visible externally and **some repointing may be required externally** to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	**The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.** Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	**Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.** Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Services pipes disrupted.	15 to 25, but also depends on number of cracks	>0.3
5 Very severe	**This requires a major repair, involving partial or complete rebuilding.** Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

Notes
1 In assessing the degree of damage, account must be taken of its location in the building or structure.
2 Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

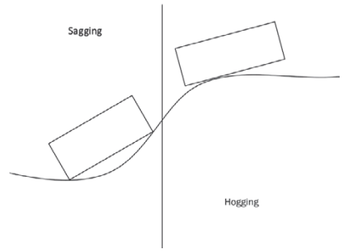


Figure 6.25 Sagging and hogging deformation modes (after Korff, 2009)

Figure 5.2 Ciria C760 damage criteria for ground movements

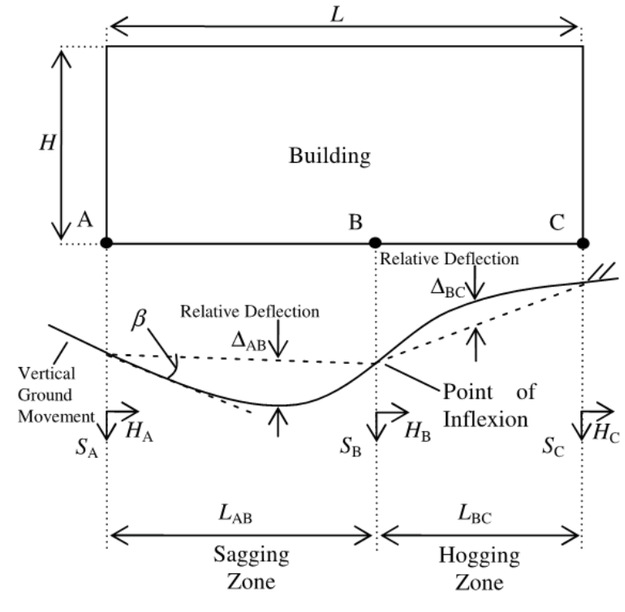


Figure 5.3 Burland parameters for adjacent buildings subjected to ground movements

5.3 London Underground (LUL)

As mentioned in chapter 6, there are some LUL tunnels such as the Northern Line and the Westbound Jubilee Line, as well as London Bridge Station nearby the proposed development which requires earlier discussions with LUL and preliminary ground movements assessments.

At this stage several conversations have been conducted with LUL in order to understand the impact of New City Court onto LUL structures. Also, a preliminary ground movement assessment was completed based on an halfspace model. The results appear to be well within the limits normally accepted by LUL based on the tunnel/station construction materials anticipated from archive information.

However the results will be reviewed by LUL and further analysis may be required in subsequent stages as well as condition surveys to ensure that the structures are not affected by the proposed development.

A preliminary meeting with LUL has already taken place in March 2021 before this planning submission where the preliminary results (settlement and curvature plots) were presented and discussed. It was acknowledged that adequate analyses have been completed for this stage of design to have the confidence that the proposal will not have a negative impact on LUL's assets (refer to the curvature plot below for the Jubilee Line).

The discussions will progress with LUL for the next design stage to ensure that any changes to the proposed scheme in terms of loading, ground conditions or construction sequence can be captured.

5.4 Thames Water

At this date, discussions have already been carried out with Thames Water to understand the requirements in terms of ground movements limits for surrounding assets as well as the potential for sewer diversions, under Section 185 of the Water Industry Act 1991.

A preliminary analysis has been done to assess the movements of the surrounding sewers (refer to the Site Constraints drawing attached to this report), based on an halfspace model. The results showed that the most affected sewer appears to be the one on the east side that runs below the existing basement of Keats House, although this appears to be within the limits stated by Thames Water for a 300mm cast iron sewer.

However is proposed the diversion of the sewer close to Conybeare House. The proposal for the diversion shown in the relevant Appendix attached in this report. The proposal will form part of the Section 185.

5.5 Highways

Contact with Highways Division of the London Borough of Southwark have already been made, as the basement will be done adjacent to King's Head Yard.

In the preliminary analysis, an allowance of 10kN/m² has been assumed as a surcharge from adjacent roads.

Not material issues are anticipated in terms of ground movements, although, depending on the construction sequence and temporary works that will be further reviewed together with the appointed contractor, the potential extent of works that require agreement with Highways Division will be further discussed.

An Approval In Principle (AIP) document shall be prepared in accordance with the provisions of the Highways Agency and the London Borough of Southwark. Where appropriate assumptions on temporary works shall be outlined within the AIP. Final methodologies shall be determined by the Contractor who shall be expected to adhere to the specifications of the permanent works. The Contractor will be expected to liaise with the third parties as necessary to obtain the necessary licenses for temporary works supporting adjacent highway structures.

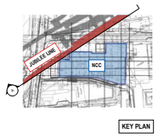
5.6 SGN Gas

SGN Gas assets have been identified below St. Thomas Street at north and King's Head Yard at the south.

Preliminary analysis to the assets was undertaken based on the halfspace model. Although the movements appear to be minimal, SGN Gas will provide the acceptance limits for the assets based on the construction materials and further reviews will be undertaken.

A preliminary meeting with SGN Gas has already taken place in May 2021 following the planning submission (April 2021) where the preliminary results (settlement and rotation plots) were presented and discussed. It was acknowledged that adequate analyses have been completed for this stage of design to have the confidence that the proposal will not have a negative impact on SGN's assets.

Conversations with SGN Gas will progress for the next stage to ensure that any changes to the proposed scheme in terms of loading, ground conditions or construction sequence can be captured.



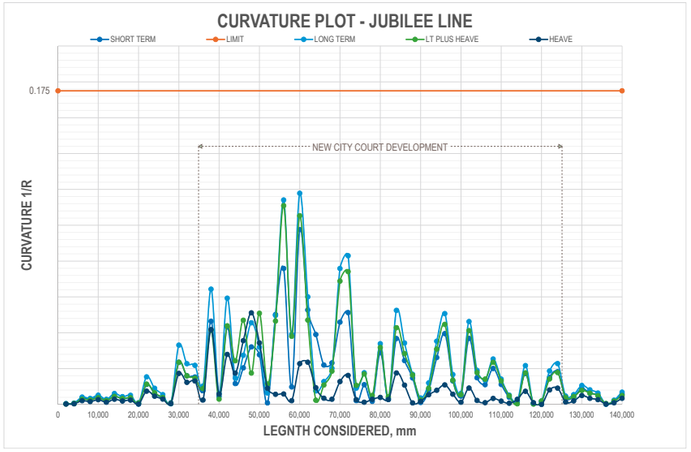


Figure 5.4 LUL Jubilee Line preliminary analysis findings (conservative soil properties have been assumed at this stage - heave due to demolition was not considered conservatively)

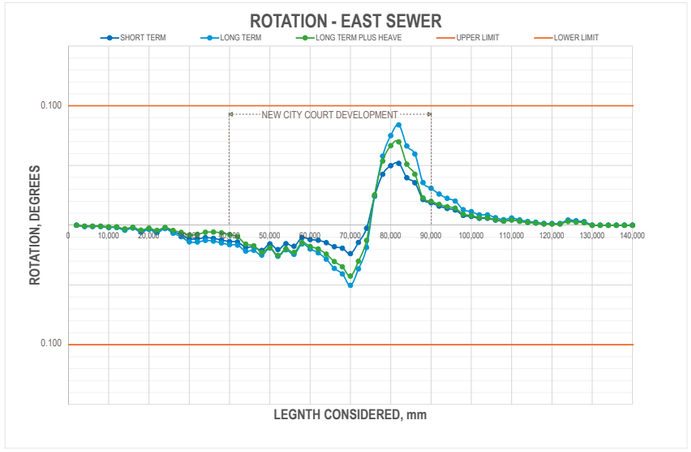
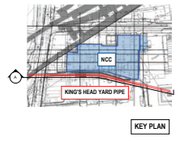


Figure 5.5 East Sewer preliminary analysis findings (conservative soil properties have been assumed at this stage - heave due to demolition was not considered conservatively)



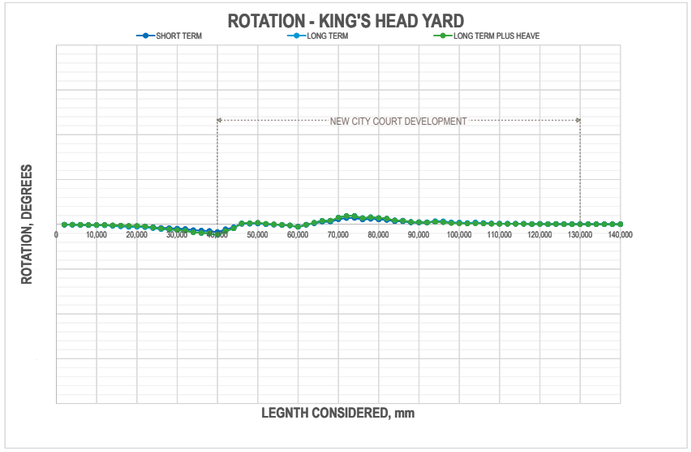


Figure 5.6 King's Head Yard SGN gas pipe preliminary analysis findings (conservative soil properties have been assumed at this stage - heave due to demolition was not considered conservatively)

5.7 Groundwater Flow

Although the depth of groundwater is unknown at the present time while a specific Site Investigation is pending, the water strikes in near-by borehole records suggest a perched water table within the gravels approximately 5m below ground level. Thus, the retaining walls will be designed accordingly taking into account the appropriate hydrostatic load as well as accidental loading due to the unlikely event of a burst water main.

It is likely that the London Clay stratum below will also have a hydrostatic profile and this will be interpreted following the Site investigation. Once the basement is formed, over time the hydrostatic profile will find its equilibrium and the building as a whole will need to resist any associated uplift loads. Without more detailed Site data, we have assumed at this stage that a drainage blanket is not required. It should be noted that on the basis of statutory searches no major aquifer has been identified on the Site.

The groundwater flows are therefore unlikely to be affected by the proposed development. Short term effects on the groundwater flow are considered to be negligible.

5.8 Surface Water Flow

The impact of the development on surface water flow and flooding has been mitigated by collecting, controlling and attenuating the storm water run-off from the Site. Refer to the AKT II Flood Risk Assessment report dated July 2021.

5.9 Local Water Features

The River Thames is located approximately 180m away from the Site. There are no anticipated ponds in the local proximity of the development. Further details can be found in the AKT II Flood Risk Assessment report dated July 2021.

5.10 Flood Risk

The development Site of New City Court has an acceptable flood risk within the terms and requirements of the National Planning Policy Framework (NPPF). Refer to the AKT II Flood Risk Assessment report dated July 2021 for further details.

5.11 Land / Slope Stability

The levels adjacent to the Site boundary range from approximately 4.25m Above Ordnance Datum (AOD), at the north east corner of the Site, to 3.50m AOD at the south east corner of the Site on King's Head Yard/ White Hart Yard. The elevation of Borough High Street parallel to the Site on the western side ranges from 5.34m AOD to 4.96m AOD with a slope towards the south. St. Thomas Street to the north ranges from 4.97m AOD to 4.25m AOD with a slope in westerly direction, towards Borough High Street.

Searches from the Landmark Information Group have not indicated any known historic land instabilities or geological faults beneath the Site.

5.12 Archaeology

The development Site of New City Court has been identified as having a very limited archaeological survival potential. The majority of the Site, including much of the post-medieval graveyard of St Thomas' Hospital, was cleared for the construction of the existing New City Court building in 1982-3. Reference should be made to the independent Site specific archaeological documentation included in the relevant submittal for further information.

5.13 Conclusion

The information presented in this document provides an overview of the proposed development of the New City Court scheme with emphasis on the substructure and the basement impact assessment.

As noted in the previous sections of this report, the framework, design philosophy, and procedures set out will form the basis for the detailed analysis and assessment works that will subsequently be required to secure the necessary third party approvals prior to commencing works on Site.

6 Design Standards

Since March 2010 Eurocodes and their associated National Annexes (providing country-specific design parameters), have superseded British Standards as the principle design codes for structural elements in the United Kingdom. Reference will be made to British Standards and other technical guidance where topics are not adequately addressed in the Eurocodes. It is of note that while no longer current, the superseded British Standards generally remain cited within UK Building Regulations.

The following codes and design guides will be used principally in preparing the structural design for the project. For the sake of brevity National Annexes are not listed:

Eurocode 0: Basis of structural design

BS EN 1990:2002

Eurocode 1: Actions on structures

BS EN 1991-1-1:2002, BS EN 1991-1-2:2002, BS EN 1991-1-3:2003, BS EN 1991-1-4:2005, BS EN 1991-1-5:2003, BS EN 1991-1-6:2005 and BS EN 1991-1-7:2006, (BS EN 1991-3:2006)

Eurocode 2: Design of concrete structures

BS EN 1992-1-1:2004 and BS EN 1992-1-2:2004, (BS EN 1992-3:2006)

Eurocode 3: Design of steel structures

BS EN 1993-1-1:2005, BS EN 1993-1-3:2006, BS EN 1993-1-4:2006, BS EN 1993-1-5:2006, BS EN 1993-1-7:2007, BS EN 1993-1-8:2005, BS EN 1993-1-10:2005, BS EN 1993-1-11:2006, BS EN 1993-5:2007 and BS EN 1993-6:2007

Eurocode 7: Geotechnical design

BS EN 1997-1:2004, BS EN 1997-2:2007

BS8102 2009 Protection of below ground structures against water from the ground

SCI P354 Design of floors for vibration: A new approach

BS6472-1:2008 Evaluation of human exposure to vibration in buildings

The Concrete Centre: A design guide for footfall induced vibration of structures

CIRIA C580 Embedded retaining walls – guidance for economic design

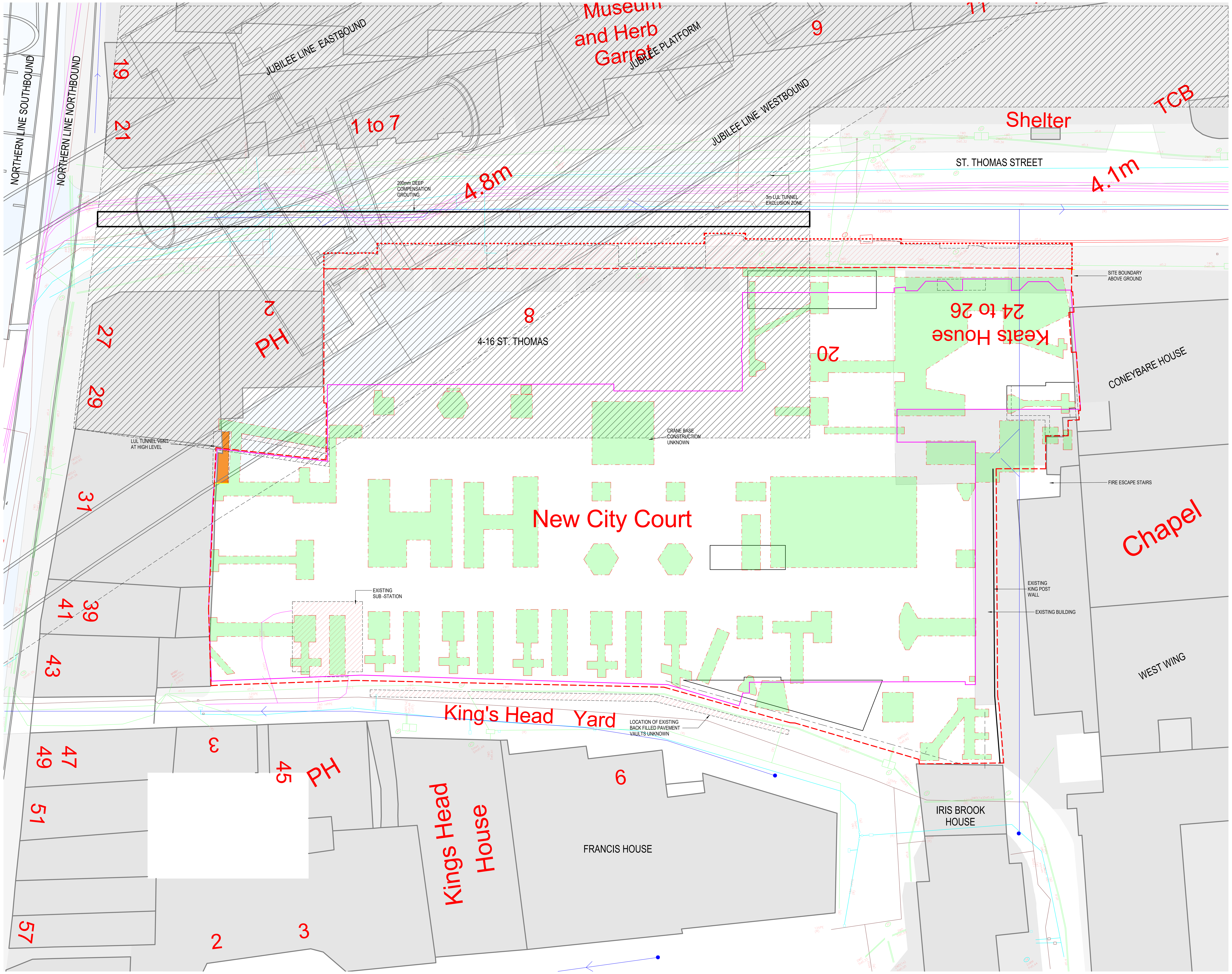
CIRIA C760 Guidance on embedded retaining wall design

Building Regulations: all relevant sections, including Approved documents A & B concerning structure and fire safety

The assessment of existing structures shall generally follow the principles outlined in the iStructE publication entitled "The Appraisal of Existing Structures".

Appendix 1

Site Constraints



SITE CONSTRAINS PLAN
1 : 150

0 2 4 6 8 10 m
SCALE 1:200

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TITLE	:-	TOPO SURVEY	
EXISTING STRUCTURE			
FILE NAME	:-	VARIOUS	
ORIGIN	:-	THE HALPERN PARTNERSHIP	ISSUED DATE :- 23.05.2016
TITLE	:-	VARIOUS	
UTILITIES & SERVICES			
FILE NAME	:-	35722T-01A (FULL) OS	
ORIGIN	:-	AHMM	ISSUED DATE :- 21.07.2017
TITLE	:-	35722T-01A (FULL) OS	
LUL LONDON BRIDGE STATION			
FILE NAME	:-	14032_LULSTATIONBOX_LU AND OS_PLANS_1st FLOOR LEVEL	
ORIGIN	:-	AHMM	ISSUED DATE :- 28.17.2017
TITLE	:-	14032_LULSTATIONBOX_LU AND OS_PLANS_1st FLOOR LEVEL	
FILE NAME	:-	14032_LULSTATIONBOX_LU AND OS_PLANS_GROUND LEVEL	
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ORIGIN	:-	AHMM	ISSUED DATE :- 28.17.2017
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LUL JUBILEE LINE TUNNEL			
FILE NAME	:-	35722T-01A (FULL) OS	
ORIGIN	:-	AHMM	ISSUED DATE :- 21.07.2017
TITLE	:-	35722T-01A (FULL) OS	
LUL NORTHERN LINE TUNNEL			
FILE NAME	:-	LONDON BRIDGE LUL STATION	
ORIGIN	:-	LUL	ISSUED DATE :- 22.07.2017
TITLE	:-	LONDON BRIDGE LUL STATION	

EXISTING BUILDING PLANS ARE TAKEN FROM 'PLOWMAN CRAVEN' SURVEY DRAWINGS ISSUED 24.07.2017.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS & THE SPECIFICATIONS.
2. NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.
3. NORTHERN LINE RUNNING TUNNEL PLAN POSITION TAKEN FROM XXX DRAWING DATED XXX. DIAMETER AND DEPTH EXTRAPOLATED FROM ARCHIVE DRAWING: WESTON WILLIAMSON 104/A/02/40/207 REV C DATED 1995.
4. LOCATION OF COMPENSATION GROUTING TAKEN FROM CIRIA BUILDING RESPONSE TO TUNNELLING VOLUME 2 DATED 2001, FIGURE 32.4 & DEPTH FROM FIGURE 32.3 5.
5. SITE BOUNDARY POSITION TAKEN FROM XXX-XXX. SURVEY INFORMATION TAKEN FROM XXX-XXX.

- REFER TO ARCHIVE DRAWING FOR INFO ABOUT THE EXISTING BUILDING IN THE DEMISE
- REFER TO SKETCHES 3948-SK-114 TITLE BUILDING IN INTERFACES FOR INTERFACES WITH OF ADJACENT BUILDING HIGHWAYS AND RED ROUTES.
- 3948-SK-196 TITLE NEIGHBOURING BUILDINGS FOR FURTHER INFORMATION ABOUT ADJACENT BUILDING

EXISTING STRUCTURE NOTE

EXISTING STRUCTURE ARE SHOWN INDICATIVELY AND ARE DRAWN ON THE BASIS OF EXISTING AND AVAILABLE RECORD INFORMATION. THE CONTRACTOR REMAINS RESPONSIBLE FOR CONFIRMING ALL THE DETAILS AND EXTENT OF THE EXISTING STRUCTURE AS REQUIRED TO CONSTRUCT THE PROPOSED BUILDING OR WHERE INDICATED TO ALLOW DESIGN OF THE PERMANENT WORKS TO BE COMPLETED IT SHOULD BE NOTED THAT SETTING OUT WHERE RELIANT ON THE CONFIRMED POSITION OR LEVEL OF THE EXISTING STRUCTURE MAY BE SUBJECT TO CHANGE REFER TO ARCHITECTS GRID DRAWINGS FOR FURTHER DETAILS.

LEGEND

- DENOTES SITE BOUNDARY BELOW GROUND FLOOR T.B.C.
- DENOTES SITE BOUNDARY ABOVE GROUND FLOOR T.B.C.
- VERIZON
- TELECOMMUNICATIONS
- THAMES WATER - SEWER
- THAMES WATER - ABANDONED SEWER
- THAMES WATER - MAIN WATER
- GAS MAIN
- UKPN (EXTRA HIGH VOLTAGE CABLES)
- 3m EXCLUSION ZONE
- LUL TUNNEL BELOW
- EXISTING VAULTS UNDER PAVEMENT
- DENOTES LARGE VENT
- EXISTING CONCRETE BASE
- DENOTES INDICATIVE EXTENTS OF TAMs (COMPENSATION GROUTING)
- EXISTING PILES

REV	DATE	DESCRIPTION	BY	CHECKED
P2	09.07.21	ISSUE FOR PLANNING ADDENDUM	IW	PG
P1	15.04.21	ISSUED FOR PLANNING	IW	NC

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GREAT PORTLAND ESTATES PLC
CLIENT

NEW CITY COURT
PROJECT

SITE CONSTRAINTS PLAN
TITLE

DRAWN BY	DRAWN DATE	CHECKED BY	SHEET SIZE
IW	JUN' 2021	PG	A0

PROJECT No.	PROJECT STAGE	SUITABILITY CODE	SCALE
3948	PLANNING		

PLANNING

PROJECT ID	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	DRAWING No.	REVISION
3948	AKT	XX	XX	DR	S	00400	P2

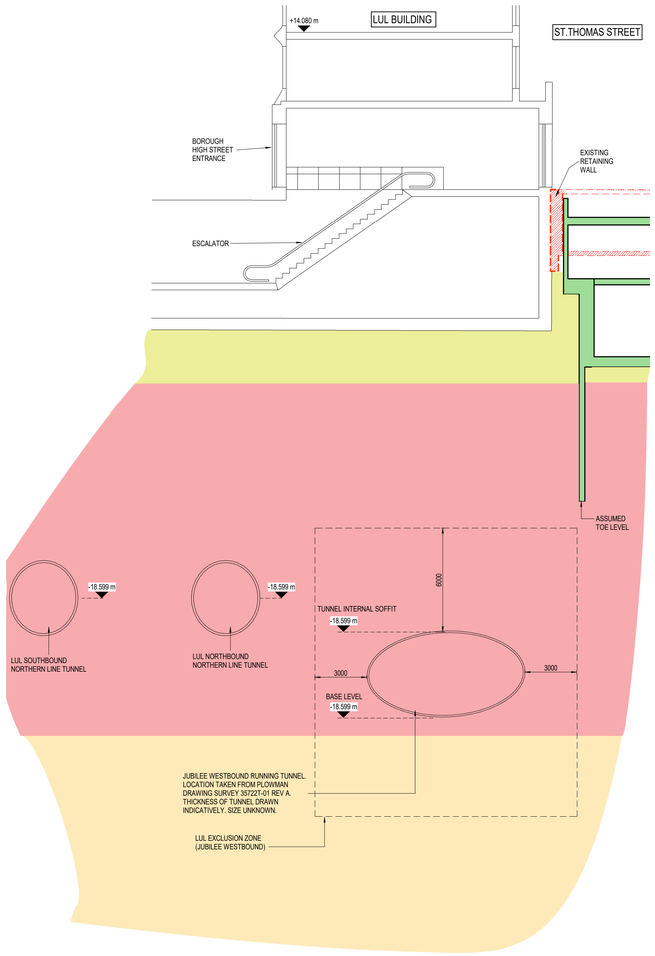
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS & THE SPECIFICATIONS.
2. NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.
3. NORTHERN LINE RUNNING TUNNEL PLAN POSITION TAKEN FROM XXX DRAWING DATED XXX. DIAMETER AND DEPTH EXTRAPOLATED FROM ARCHIVE DRAWING WESTON WILLIAMSON 104/A/02/40/207 REV C DATED 1995.
4. LOCATION OF COMPENSATION GROUTING TAKEN FROM CIRIA BUILDING RESPONSE TO TUNNELLING VOLUME 2 DATED 2001, FIGURE 32.4 & DEPTH FROM FIGURE 32.3 S.
5. SITE BOUNDARY POSITION TAKEN FROM XXX-XXX. SURVEY INFORMATION TAKEN FROM XXX-XXX.

LEGEND

- MADE GROUND
- TERRACE GRAVEL
- CLAY
- LAMBETH GROUP
- DENOTES EXISTING STRUCTURE

SOIL PROFILE INDICATIVE BASED ON DRAWING 3948-AKT-XX-XX-DR-S-00480 TO BE CONFIRMED BY GEOTECHNICAL INVESTIGATION.



SECTION A-A
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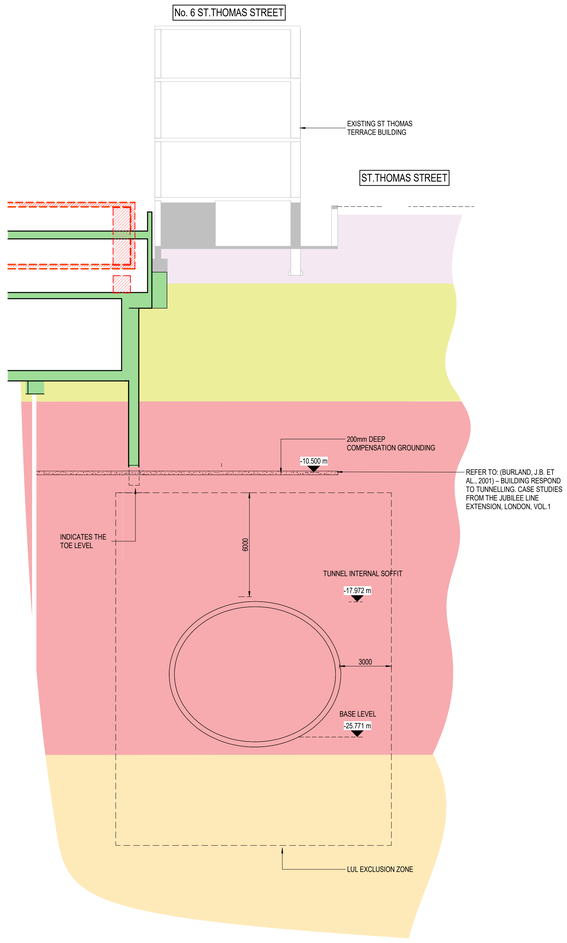

SECTION B-B
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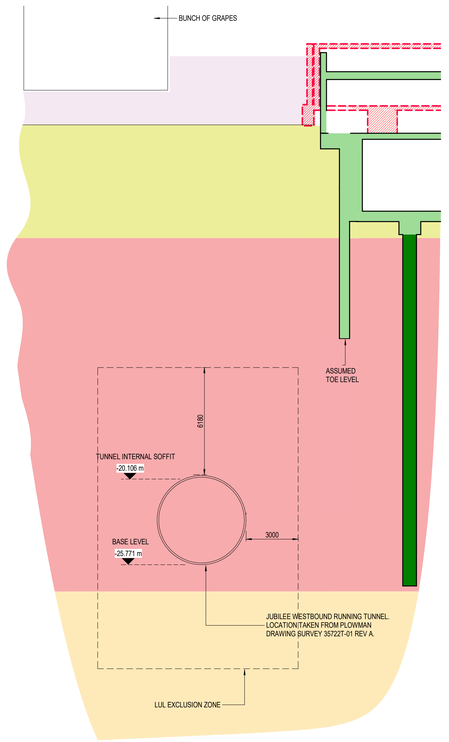

SECTION C-C
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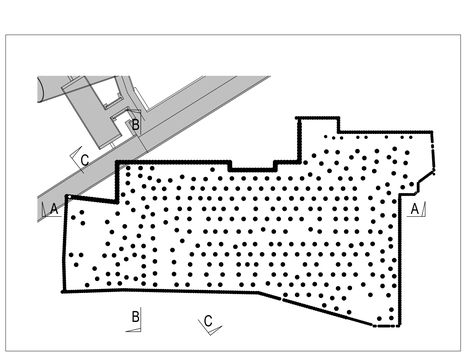

KEY PLAN
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SITE CONSTRAINTS SECTIONS
TITLE

IW	JUN 2021	PG	A0
DRAWN BY	DRAWN DATE	CHECKED BY	SHEET SIZE

3948	PLANNING					
PROJECT No.	PROJECT STAGE	SUITABILITY CODE				SCALE

PLANNING

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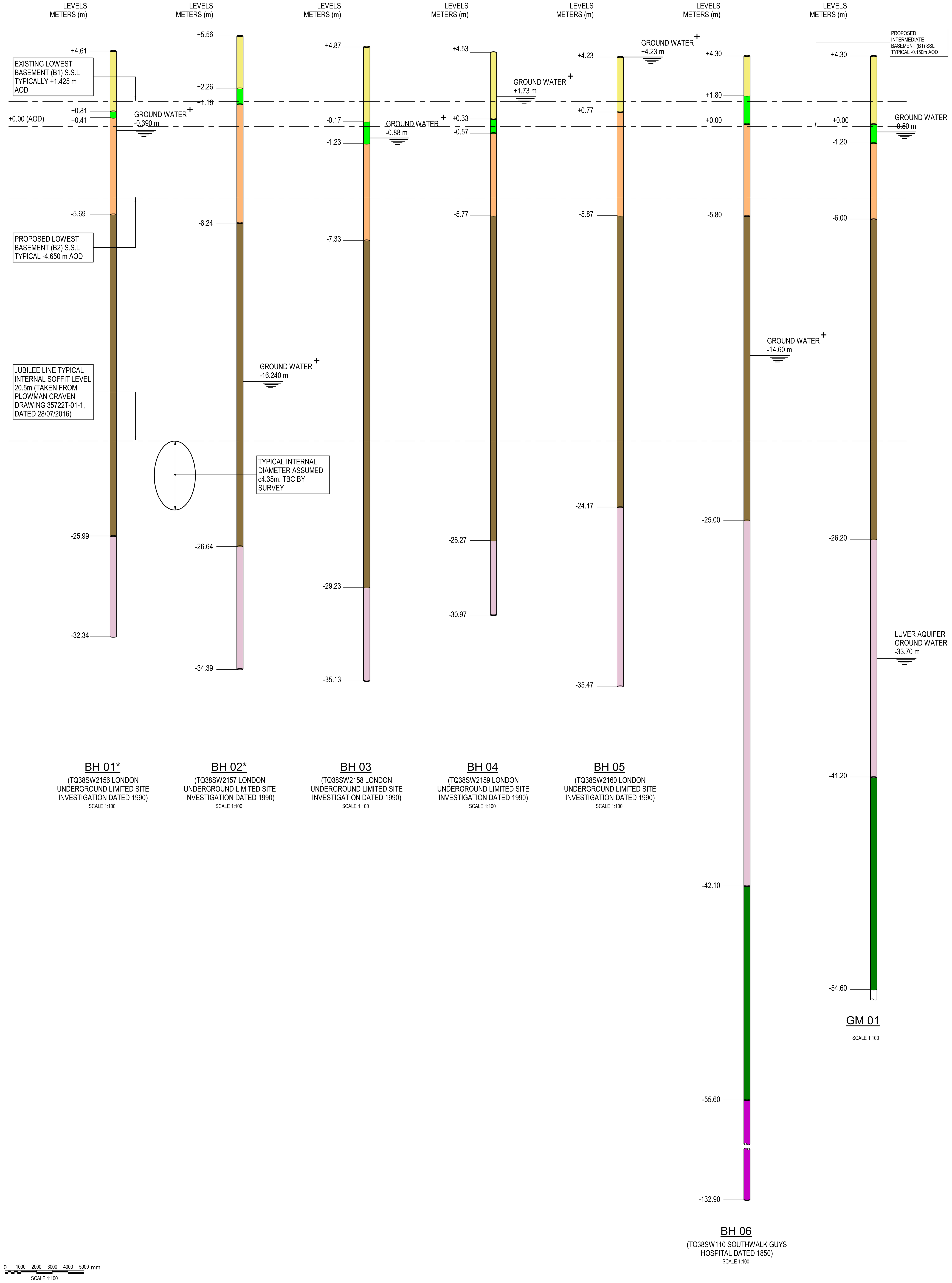
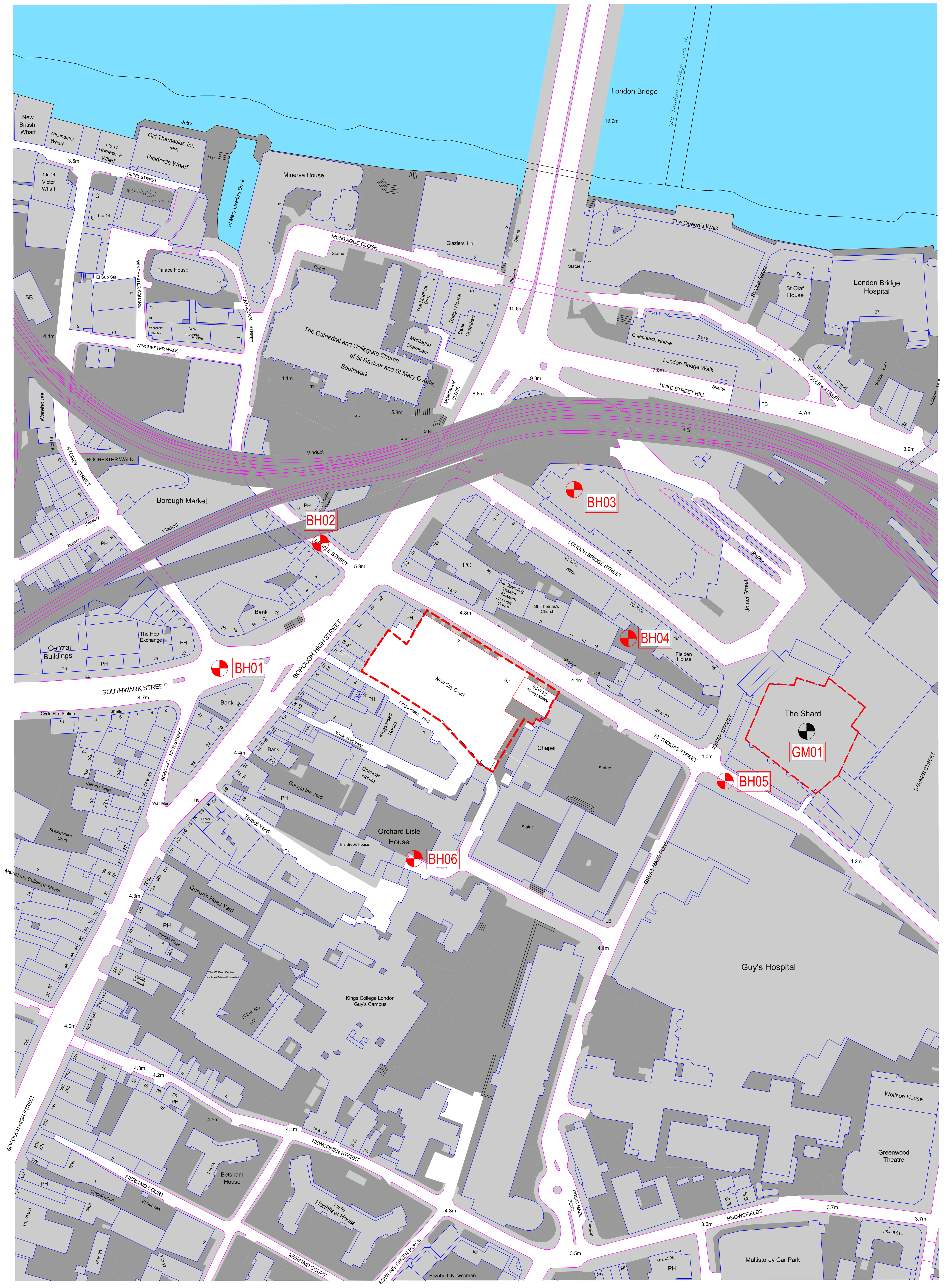
PROJECT ID	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	DRAWING No.	REVISION

Appendix 2

Ground Conditions





KEY PLAN
1 : 1000

NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS & THE SPECIFICATIONS.
2. NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.

LEGEND

- MADE GROUND
- ALLUVIUM
- TERRACE GRAVEL
- CLAY
- LAMBETH GROUP
- THANET SANDS
- CHALK
- BGS BOREHOLES
- GROUND MODEL TAKEN FROM 'PILE TEST AT THE SHARD LONDON BRIDGE, GROUND ENGINEERING, JANUARY 2012, STRATA LEVELS WEST OF FAULT'.

NOTES

*	BOREHOLE ALSO DISCUSSED IN CIRIA SPECIAL PUBLICATION 200 "BUILDING RESPONSE TO TUNNELLING, VOLUME 2, 2001".
+	WATER LEVELS TAKEN AS THE HIGHEST RECORDED FROM WATER LEVEL OBSERVATIONS DURING BORING.

REV	DATE	DESCRIPTION	BY	CHECKED
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P1	15.04.21	ISSUED FOR PLANNING	IW	NC

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TOWER
BOREHOLE LOGS
TITLE

DRAWN BY	DRAWN DATE	CHECKED BY	SHEET SIZE
IW	JUN' 2021	PG	A0

PROJECT No.	PROJECT STAGE	SUITABILITY CODE	SCALE
3948	PLANNING		

PLANNING

PROJECT ID	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	DRAWING No.	REVISION
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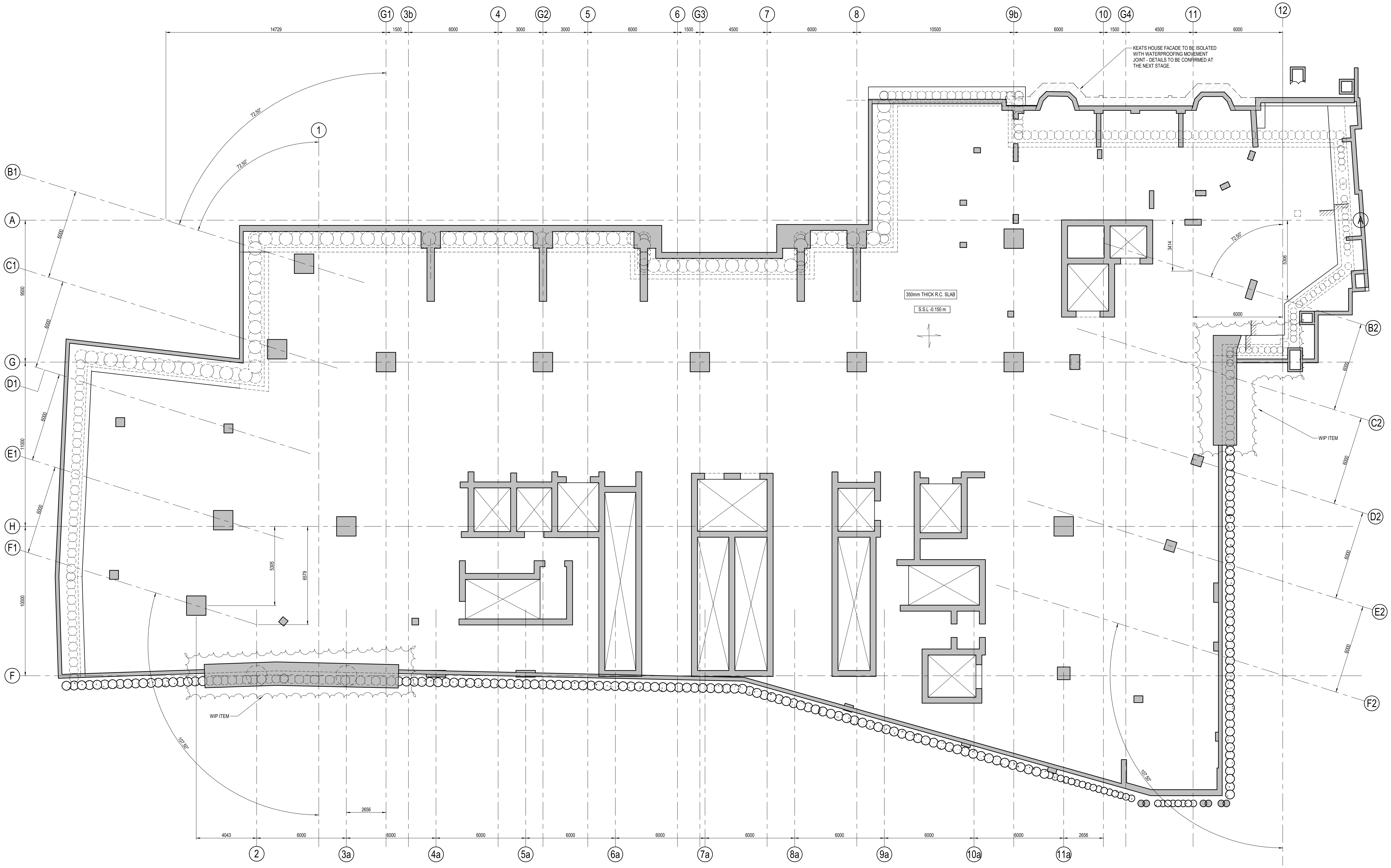
Appendix 3

Proposed Basement



NOTES
1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

REV	DATE	DESCRIPTION	BY	CHECKED
P2	09.07.21	ISSUE FOR PLANNING ADDENDUM	IW	PG
P1	15.04.21	ISSUED FOR PLANNING	IW	NC

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NEW CITY COURT

PROJECT

PROPOSED PLAN
LEVEL B1

TITLE

DRAWN BY	DRAWN DATE	CHECKED BY	SHEET SIZE
IW	JUN' 2021	IW	A0

PROJECT No.	PROJECT STAGE	SUITABILITY CODE	SCALE
3948	PLANNING		1:100

PLANNING

PROJECT ID	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	DRAWING No.	REVISION
3948	AKT	XX	B1	DR	S	20990	P2

Appendix 4

Proposal of Sewer Diversion under Keats House

New City Court

Proposal of Sewer Diversion under Keats House

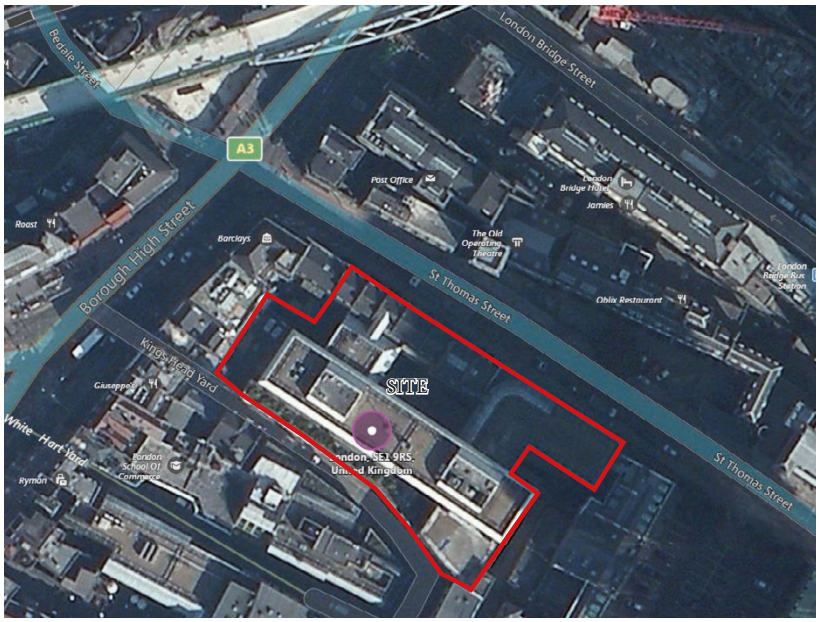
Consulting Structural and Civil Engineers

INTRODUCTION

The site to be redeveloped is located in the borough of Southwark in the London Bridge area. The site boundary lies directly along the South side of St. Thomas Street, between the cross roads of London Bridge Street, East; and Borough High Street, West. It is located adjacent to the Guys' Hospital accommodation and King College Guys' Campus buildings. The Site is bordered by Kings Head Yard, South.

The project proposes to retain and refurbish the existing Georgian terrace houses on 4-16 St. Thomas Street; to demolish New City Court, an existing 6 storey high office block with one level basement, in order to build a a 26-storey building (with mezzanine and two basement levels); and to relocate the facade of Keats House approximately 6 meters away from the adjacent building, Coneybare House, and build a new frame behind it.

The new double-storey basement will occupy the whole site (except under the Georgian terrace housing), replacing the existing single level basement.



Site Location

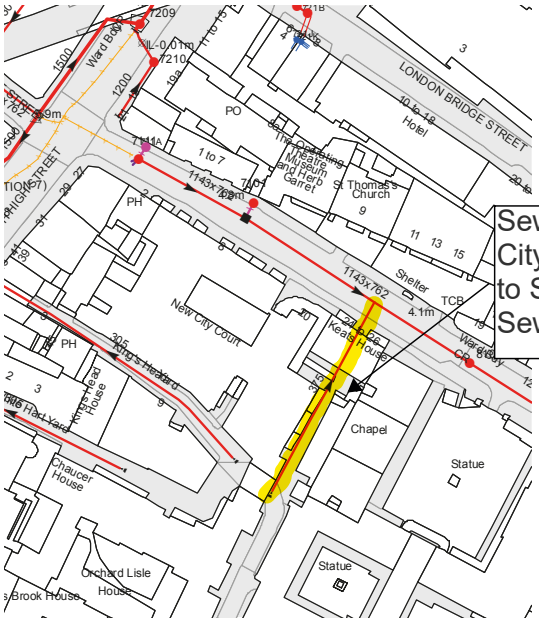
Site Description

EXISTING CONDITION

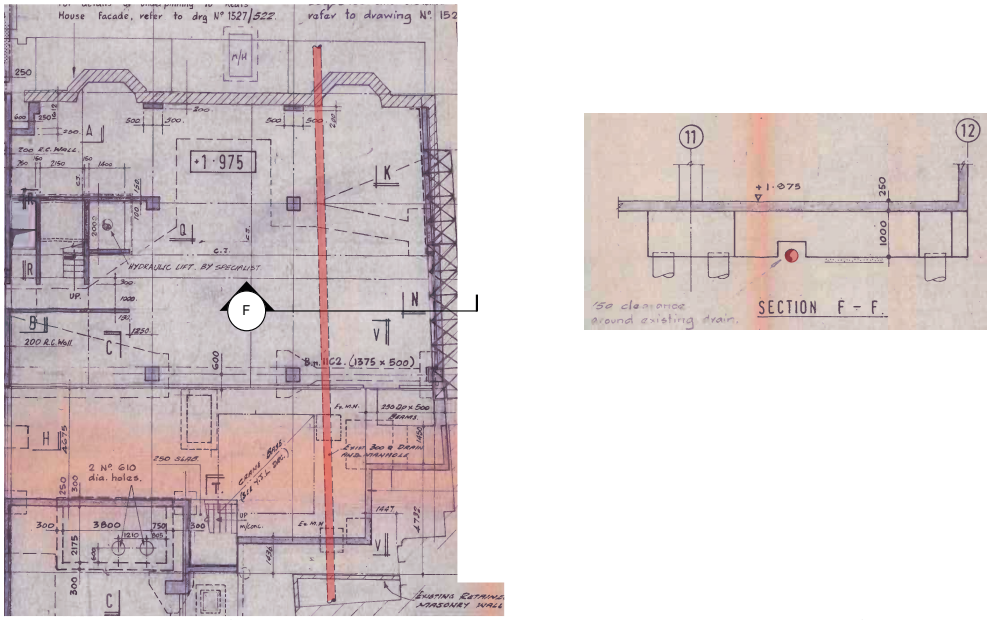
Under the basement of Keats House a 300mm diameter Thames Water sewer runs from the South to the North side, discharging into the main sewer located in St Thomas Street. The current basement slab is 250mm thick RC slab. A notch in the pile caps has been constructed in the previous scheme to allow for the sewer to run underneath.

The sewer runs from a manhole located on the South of building (manhole 39) underneath the building, goes through the manhole situated in the lightwell in front of the building on the north side and discharges into the sewer along St Thomas Street. Three sewers are discharging into the upstream manhole.

A CCTV survey has been carried out for the all pipes running across the site. The survey shows that the pipe underneath the basement is currently in use.



Existing Sewer Location

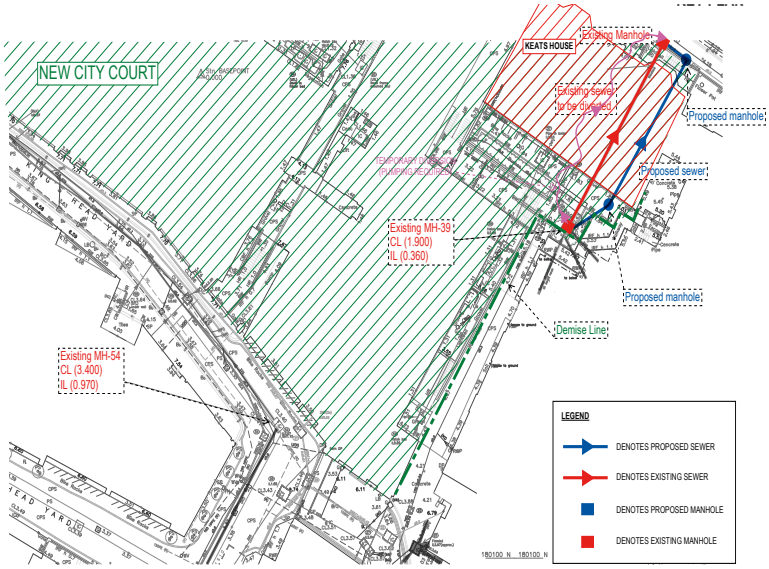


Structural drawings for the existing building showing the position of the sewer

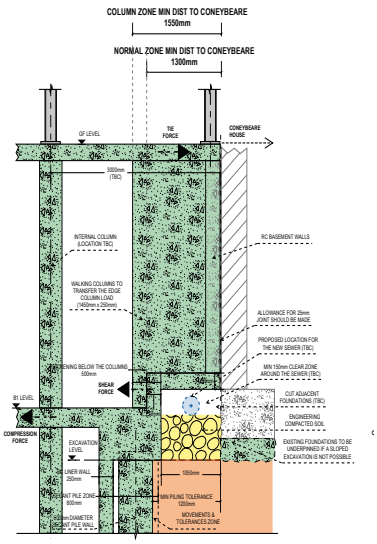
CURRENT PROPOSAL

The sewer is proposed to be diverted under section 185 agreement from manhole 39 (upstream manhole) closer to Conybeare House, it will run along the party wall and then will be reconnected to the existing manhole located in the lightwell.

The new sewer will be positioned along a corridor which will be approximately 1000mm wide, between the existing party wall and the proposed new structure. The ground floor slab of the new scheme will be cantilevering on top of the pipe.



Existing Sewer Diversion



Detail of the sewer in the new location along the party wall

ACCESSIBILITY

Three new inspection manholes will be constructed. Two of them will be on the South side of Keats House and one on the North.

The South side manholes will be available for inspection at ground floor. The existing manhole 39 is currently accessible from the lower garden which is at +1.850 m AOD. It will be then extended up to the proposed ground level to be accessible for inspection.

The North side manhole will be accessible from the pavement level of the lightwell as per the existing arrangement.

Access hatches may be provided in the slab to allow for inspection of the sewer along the segment from the south side to the north side of Keats House.

SEQUENCE OF WORKS

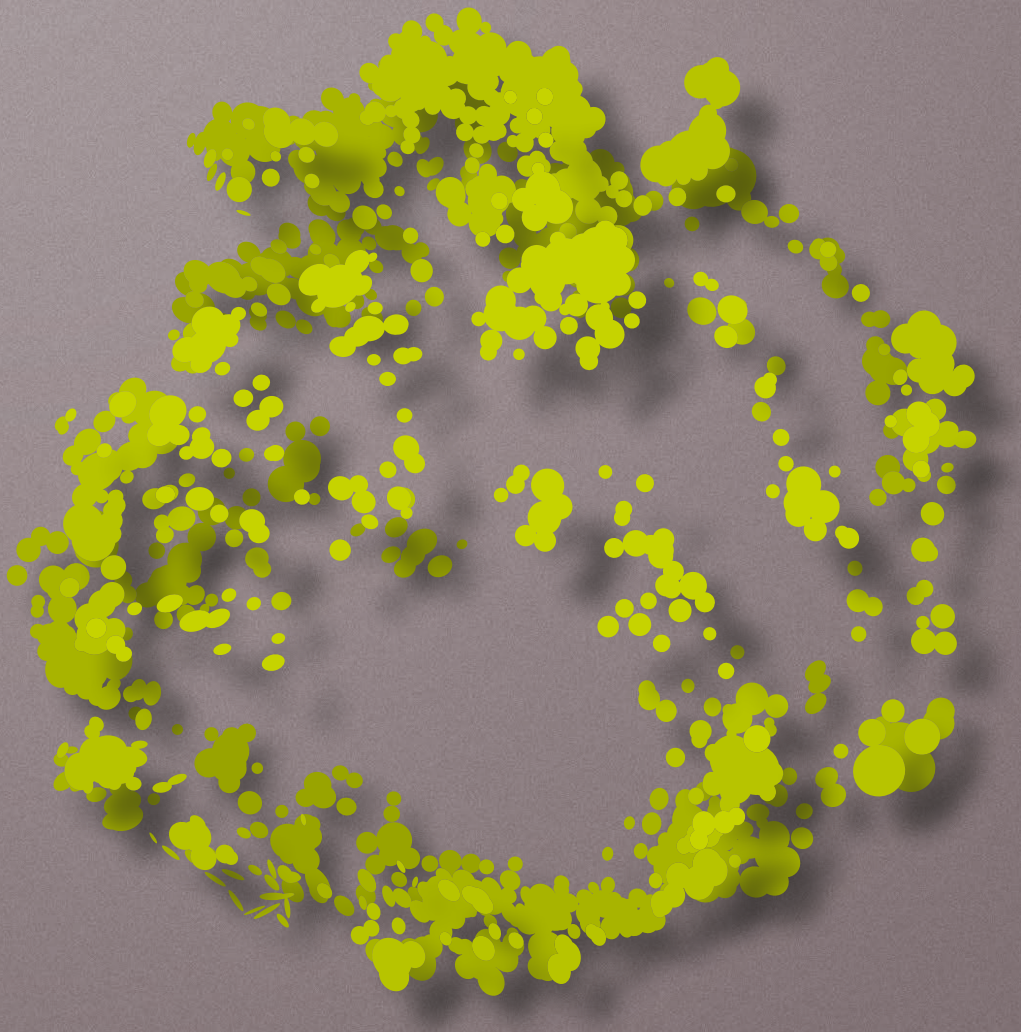
The internal structural frame of Keats House will be demolished down to the existing basement level and the existing facade will be relocated by approximately 6m to the West to its new location. Before proceeding with the removal of the basement slab on top of the sewer a temporary diversion will be provided to avoid any damage to the TW asset. A pump will be installed in the existing South manhole to divert the flow into a rising main. Once the secant piled wall and the excavation of the basement are completed, the installation of the permanent sewer will start together with the construction of the 3 new manholes.

GROUND MOVEMENTS AND MONITORING

A preliminary assessment of the settlement due to the new development has been carried for different assets and shows that the sewer which is located at sufficient distance from the main tower is experiencing very small movements.

More detailed analysis will be carried out in the next stages and submitted to Thames Water as part of the approval process.

During the construction works a monitoring regime of the movements of the secant walls will be monitored and a traffic light system will be implemented in accordance with Thames Water guidelines.



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Appendix 5

Deskstudy Extracts

3.3 Site History

Historical Background

The history of the Site and its surrounding area has been assessed using extracts of historical Ordnance Survey (OS) maps dating from 1875 to the present day. Note that the maps only indicate information on the date the survey was carried out, they do not give a continuous record of the development. Other sources used include archive information from the London Metropolitan archives and from reports commissioned for the local area and research online.

It is suggested that the area was first occupied as part of the Roman settlement. During this time the area was actually an islet sitting within the course of the Thames. During its peak, in around the 2nd century, it is estimated as many as 3000 people may have lived in this area.

The area's history is intrinsically connected with that of Guy's Hospital which was built on the site in the 18th century. During this time, the area to the east of Borough High Street from St Thomas Street in the north, down to Newcomen Street in the south and across to the Maze was within the demise of the Archbishop of Canterbury's manor.

Site History

The earliest map showing the Site dates from 1878-79 and shows St Thomas Street and King's Head Yard both flanked by rows of houses. This arrangement had not changed to any great extent by 1973. However, by 1991 the buildings along King's Head Yard had been demolished and replaced with the current building that occupies the Site, the New City Court office development.

The historical map shown in Figure 3.3 shows a graveyard to the south of numbers 4-16 St Thomas Street which was used by St Thomas Church (on the north side of St Thomas Street) and was accessed via a narrow lane between the houses.

Historic information collated as part of this desk study indicates that terraces 2-14 along St Thomas Street were constructed in 1819 at a cost of £7,000. No. 2 St Thomas Street which is now 'Bunch of Grapes' public house was formerly two houses that were combined, now adjacent to the Site boundary.

The terraces, along with Keats House were built at the request of Guy's Hospital. The terraces were originally used as lodgings for students although converted to offices when the New City Court development in the 1980's was built.

The office development was completed by 1984 as a 6 storey office building. Drawings from the architects at the time (The Halpern Partnership) have been used to assess the existing building.

London Bridge Area

Of all the bridges along the Thames in London, London Bridge has the longest history. The earliest bridge dates back to Roman founders of London and until Putney Bridge opened in 1729, London Bridge was the only road crossing on the Thames downstream of Kingston upon Thames. The current bridge crossing, which opened to traffic in 1974, is a box girder bridge built from concrete and steel, designed by Lord Holford which took 5 years to complete. This replaced a 19th century stone arched bridge and previously a 600 year old medieval structure. During the tudor period there were 200 buildings on London bridge, some more than 6 storeys.

By the 19th century ships from around the world came to trade in the area bringing great prosperity. The trading benefitted from the fact that London Bridge Station was also Central London's first railway terminus.

In the 1960s the area started to lose importance as an international port. The warehouse and port buildings not destroyed in the blitz fell into disrepair.

The 1980's property boom later meant St. Martins Property Corporation Ltd developed what is known as London Bridge area today, recognising the need for central London to grow and converting the wharf buildings into housing, offices and retail units.

During the mid 1990's local landowners became increasingly concerned with the poor environment of the area and three local authorities formed to become the Pool of London Partnership (PLP), recognising the potential of the area and the need to capitalise on the decision to extend the Jubilee Line in time for the millennium.

The Site is within the London Bridge, Borough & Bankside Opportunity Area, as designated in the London Plan. The Opportunity Area has an indicative employment capacity in the London Plan for up to 5,500 new jobs.

In 2006 the Business improvement District (BID) was founded to manage and continue to improve the area when PLP ended activities in March 2007.

The BID, which includes Guy's and St. Thomas' Hospital, is an area of commercial and historic interest today. Also known as the pool of London, stretching from London bridge to Tower Bridge, it includes: London Dungeons; Borough Market (the oldest food market in London); the oldest gothic church, Southwark Cathedral; and more recently the Shard, the tallest building in western Europe. Fig. 3.4 shows the new construction sites in and around this BID which borders the New City Court Site:

- The News Building: 600,000 sq ft office and retail (1)
- The Shard: 72 storey tower over 300m tall (2)
- London Bridge Station and Thameslink (5)
- Capital House: planning application to be determined (6)
- Vinegar Yards: planning application to be determined (7)
- Sellar and CIT developments: planning application to be determined

Guy's & St. Thomas' Hospital

Guy's Hospital along with St. Thomas' and Kings College Hospital are all part of Guy's and St. Thomas' NHS Foundation Trust. It is the largest teaching hospital in London and the location of Kings College London School of Medicine.

The Tower Wing (formerly known as Guy's tower) is the World's tallest hospital building, standing 148.65m with 34 floors, which was added in 1974 to the hospital.

The hospital was founded in 1721 by Thomas Guy, a publisher of unlicensed bibles, originally established as a hospital to treat 'incurables'.

Guy's has expanded over the centuries. Despite substantial bomb damage during World War II, the original 18th Century chapel remains intact including the tomb of Thomas Guy.

Now over 13,650 staff work in the hospital and the ite consists of 19 buildings.

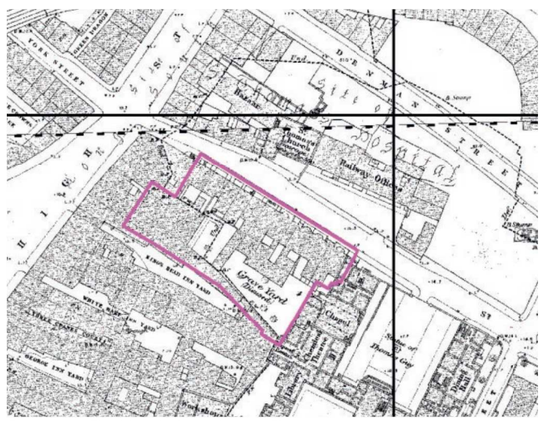

Figure 3.3 Site historical map (1975-76)

Figure 3.4 BID area including new constructtion sites of interest

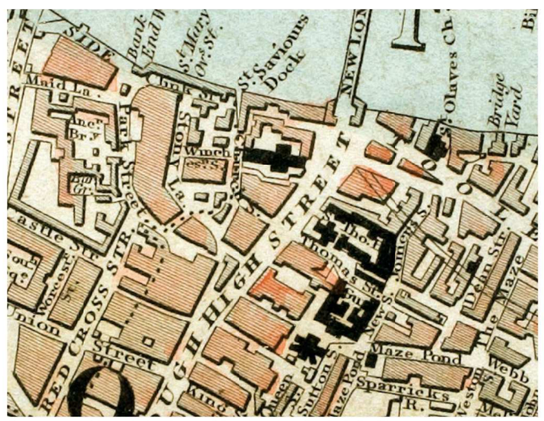

Figure 3.5 Map of site from 1883 showing Guy's & St. Thomas Hospital extent

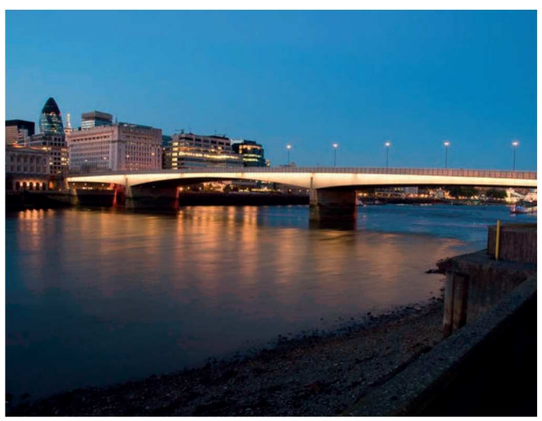

Figure 3.6 lLondon Bridge today

4 Ground Conditions

4.1 Typical Geology

Alluvium

Alluvium consists of a variety of materials ranging from soft compressible variable clays to silts, sands, gravels and also commonly contain organic material in the form of peat and vegetation remains. It may have previously been removed during excavations of the existing Site and replaced by Made Ground (refer to paragraph 4.2), therefore it is only likely to be anticipated of a thickness of 0.5m to 1m.

Terrace Gravels

Terrace Gravels are a mixture of quartz sand, comminuted quartz and mainly brown flint and chert gravel. The proportions of sand and gravel vary considerably in short lateral and vertical distances, depending on the local conditions at deposition. There are also frequent zones of finer-grained material, such as clay and silty sand and even occasional organic deposits. The Terrace Gravel is typically medium dense to dense orange brown, very sandy (medium to coarse) sub-angular to sub-rounded, fine to coarse, flint gravel.

It is anticipated that it is likely to encounter Terrace Gravels at thickness of approximately 1.5-5.5m underlying the Site.

London Clay

London Clay is well documented locally and is generally weathered with silty sandy bands and Limestone nodules, becoming firm grey fissured silty clay with depth. It is generally characterised by a high plasticity, high shrinkage potential, low to very low compressibility and low hydraulic conductivity.

It is anticipated that it is likely to encounter London Clay at thicknesses of approximately 20-25m underlain the Site.

Lambeth Group

Lambeth Group is well documented throughout the London and Hampshire basins, comprising of a variable series of clay, loam, sand and pebble beds which are locally cemented into sandstone or conglomerate. It consists of three formations

The Reading Formation is a series of lenticular mottled clays and masses of fine sands converted into quartzite.

The Woolwich Formation consists of grey clays and pale sands, often full of estuarine shells with pebble beds located at the base.

The Upnor formation consists of light coloured false bedded sands. Where it overlies Thanet Sands, it is formed of an argillaceous greensand with rounded flint pebbles. Where it directly overlies chalk, it is more clayey and the flints are less rounded and are green-coated.

It is anticipated that it is likely to encounter the Lambeth Group at thicknesses of approximately 15-17m underlying the clay.

Thanet Beds

The Thanet Sand formation is the oldest deposit from the Palaeogene. At the base, the "Bullhead bed" comprising a conglomerate of rounded flint pebbles and almost unworn nodular flints "Bullhead". The flints are typically coated with dark green glauconite and lie within a matrix of glauconitic sandy clay. The bulk of the Thanet Sand comprises of silty, fine-grained sand. The colour varies between greenish and brownish grey. At the surface, the sands weather to a pale yellowish grey.

It is anticipated that it is likely to encounter Thanet Sands at thicknesses of approximately 10-11m.

Upper Chalk

The Upper Chalk band is softer than the Middle Chalk. Flints are abundant as a general rule. The base of the division is a hard band called the Chalk Rock, which in the area north of the Thames, is the most prominent horizon in the Chalk. It consists of one or more beds of hard, creamy limestone each approximately 1 foot thick, usually with scattered green grains of glauconite. Between the creamy limestone bands are layers of hard nodular chalk formed in a softer matrix.

Observations

Although the boreholes purchased from BGS provide a good indication of the likely conditions on the Site, it is recommended that a full site investigation is carried out in order to investigate the ground conditions specific to the Site.

Preliminary geotechnical design parameters are advised in this report. This data is based on referenced material and AKT II's experience of the geology local to the Site and will be confirmed by a comprehensive, site specific investigation.

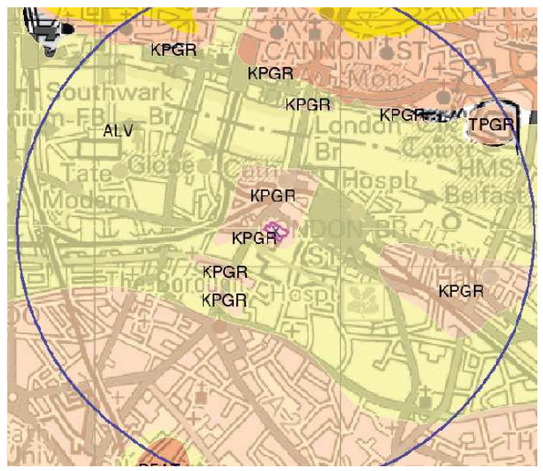

Figure 4.1 Superficial geology

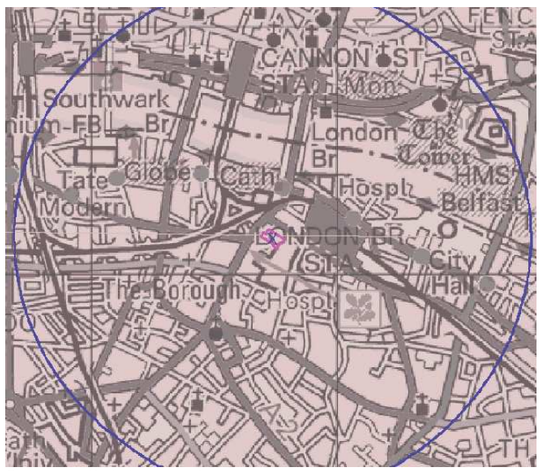

Figure 4.2 Underlaying geology

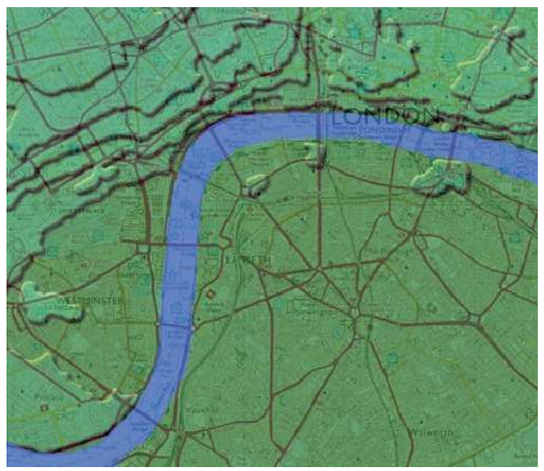

Figure 4.3 Topography 3D Map

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay and Silt	Flandrian - Pleistocene
	KPGR	Kempton Park Gravel Formation	Sand and Gravel	Devensian - Ipswichian
	LASI	Langley Silt Member	Silt	Devensian - Ipswichian
	TPGR	Taplow Gravel Formation	Sand and Gravel	Wolstonian - Choklerian
	HAGR	Hackney Gravel Member	Sand and Gravel	Wolstonian - Choklerian
	PEAT	Peat	Peat [Urlithified Deposits Coding Scheme]	Quaternary - Ryazanian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay	Eocene - Eocene
	LMBE	Lambeth Group	Clay, Silt, Sand and Gravel	Paleocene - Paleocene

Figure 4.4 Geology strata

4.2 Anticipated Ground Conditions

The results from the Envirocheck report form the outline description of the ground conditions and borehole information taken within close vicinity to the Site.

This allows an initial picture to be developed of the underlying geology and depth of the key layers outlined in section 4.1 although none of the boreholes have been taken directly on the Site of the proposed development.

Whilst no boreholes are available for the actual Site the borehole records that are available from the wider area (Figure 4.5) indicate the Site to be highly consistent in terms of the depth of each layer of strata below the surface.

The deep borehole logs show that the London Clay extends only to a depth of approximately 27m and sits on the Lambeth group layer.

The superficial geology and borehole logs showed the Site to be underlaid by 4 main layers:

Made Ground

Made ground is a layer of fill material considered to have little or no bearing capacity, usually consisting of a variety of materials, often sands and gravels but in some cases concrete and brick among other substances. The thickness of the made ground, and its composition, vary accross the borehole logs. On the Eastern side within the site of Guy's & St. Thomas' a larger thickness of made ground is found ranging from 9m to 12.5m (Boreholes 4 & 5). The investigations have found the made ground to consist of topsoil, coarse gravel sized brick, concrete, flint and some coal fragments.

Alluvium

The alluvium layer is found in three out of the 5 chosen borehole logs (1,2 &3) which range from 40-110mm in thickness, therefore it is possible that alluvium will be found on Site. The alluvium consists of a 'soft bluish-grey mottled grey and black sandy clay'. The stiffness range in laboratory tests range from very soft to stiff in nature.

Kempton Park Gravels

Kempton Park Gravels are a form of terrace gravels, a layer of material deposited by the river and are a mixture of quartz sand, comminuted quartz and mainly brown flint and chert gravel. From the borehole logs it is assumed that the Site may experience terrace gravels from om to -6m Above Ordnance Datum (AOD).

London Clay

London Clay is well documented locally and the clay located can be expected to be approximately 20m in depth. Formation is described to consist of stiff to very stiff grey-brown clay with occasional pockets of light grey silt.

During the construction of the Shard, located close to the proposed New City Court site, a fault was discovered below the Site running north-to-south direction, with a downthrow of about 6m to the SE. This is documented in the pile test reported by Byrne Looby partners in 2012. To the West another fault of similar displacement and orientation was encountered during the JLE construction. Along these two geological faults, the ground forms a minor horst feature, with marginally elevated London clay.

Lambeth Group

Lambeth group is expected to be in between 30m and 35m below ground level and consists of a very stiff clay matrix, either grey or multicoloured fissured clay, with gravel, green gravelly sand or green shelly gravelly clay pebbles.

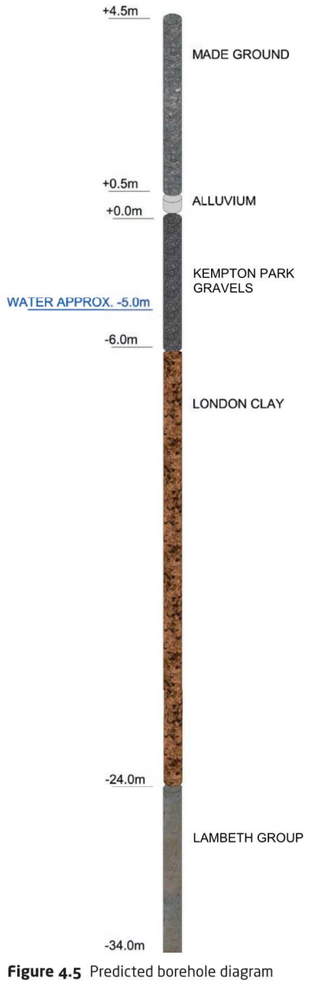

Figure 4.5 Predicted borehole diagram

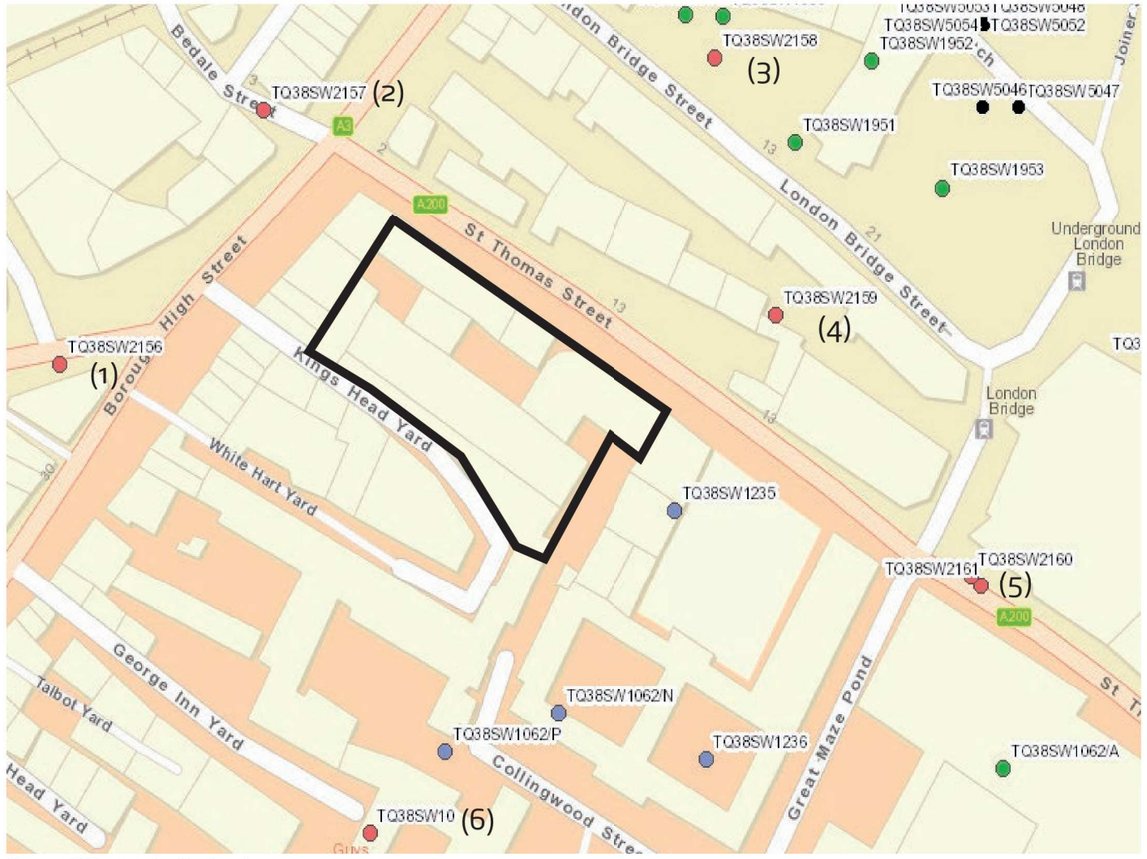

Figure 4.6 Borehole location key plan map

4.3 Hydrogeology and Hydrology

4.3.1 Environmental Agency Classification

A Principal Aquifer is defined by the Environment Agency as layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

A Secondary A Aquifer is defined by the environment Agency as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

A Secondary B Aquifer is defined by the Environment Agency as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

A Secondary Undifferentiated (U) Aquifer is defined by the Environment Agency as has been assigned in cases where it has not been possible to attribute either category A or B to a rock type.

According to the Envirocheck Superficial Aquifer Map in Fig 4.7, the Site is underlain by a Secondary A Aquifer with surrounding areas of A secondary Undifferentiated Aquifer.

According to the Bedrock Aquifer Map in Fig 4.8, the bedrock underlying the Site is defined as unproductive Strata. Unproductive Strata have negligible permeability and are generally regarded as not containing groundwater in exploitable quantities. In this stratum, the groundwater flows imperceptibly and requires consideration for the risk of slow degrading pollutants.

London Clay and Lambeth Group are classified as non-aquifers and should provide a natural barrier to prevent contaminants migrating to the deep Thanet Sands and Chalk Aquifers. A summary of the hydrogeological properties of the main geological units that are anticipated to underlie the Site is shown in Fig 4.9.

The superficial geology is designated as a Secondary A Aquifer with a potential for groundwater flooding owing to its close proximity with the River Thames.

4.3.2 Groundwater Level

Indications from the available boreholes suggests that the water table is generally 5m below ground level (0.00m AOD). A few boreholes show higher water which could be a result of some rain water retained in a less permeable made ground layer.

This information will be confirmed in subsequent stages further to ground investigations.

4.3.3 Source Protection Zone

The EA have defined Source Protection Zones (SPZ's) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones are defined by the EA as outline below:

- The Inner Protection Zone is the distance travelled by groundwater from any point below the water table to the abstraction in 50 days for a particular area. It has a minimum radius of 50m.
- The Outer Protection Zone is the distance travelled by groundwater from any point below the water table to the abstraction in 400 days for a particular area. It has a minimum radius of 250m.
- The Total Catchment Zone is the area around the abstraction within which all groundwater recharge is presumed to be discharged to the source.

The SPZ Map from Envirocheck indicates that the Site is not located within a Protection Zone. It is likely that the ground water abstractions are from the Chalk Aquifer. This means that there is no risk of pollutants or contaminants from the Site making their way into a source of drinking water.

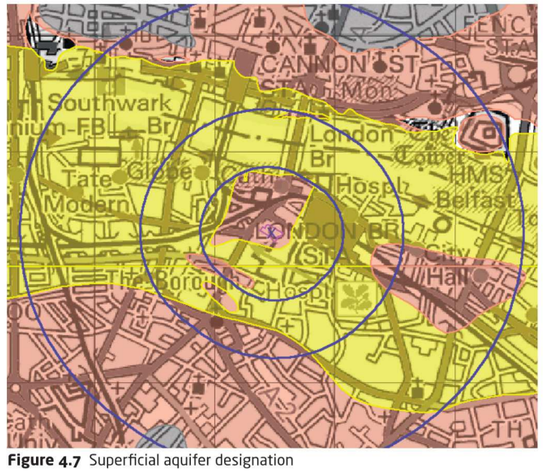

Figure 4.7 Superficial aquifer designation

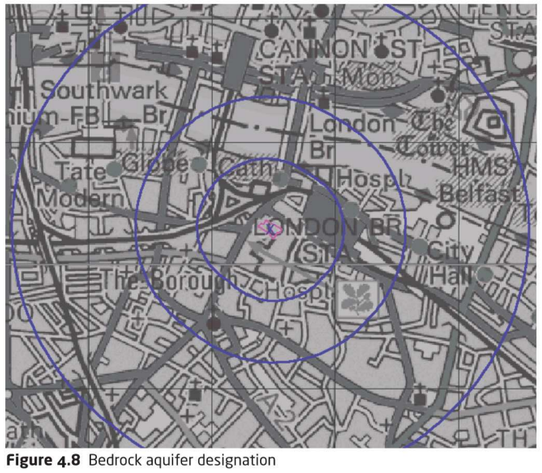

Figure 4.8 Bedrock aquifer designation

4.4 Construction within Archaeological Remains

Due to the location and previous history of the Site and surrounding area, it is believed that there is a low potential for archaeological remains to be present at the Site. However, if archaeological remains were to be found, the presence of the existing building on the Site means that they are likely to have been partially truncated by basement, foundation or service trench excavations. If archaeological remains are to be found, there are engineering principles to reduce the impact of construction on the archaeological heritage:

- Minimise the extent of excavation required for the construction
- Minimise the number of vertical penetrations
- Minimise the extent of excavation required for the foundations

Activities such as level reduction, new basement and foundation construction, new service trenches or demolition works for example will raise archaeological issues.

4.5 Risks Associated with Geology

Unknown geology is often one of the biggest risks facing a project due to the difficulty in knowing the exact profile of the soil across the entire Site.

The existing piled structure and the extensive works carried out in the area as part of the Jubilee line extension would suggest that the risk is low. However, issues to be aware of include:

Inclusions of weak or strong layers which can affect capacity of piles and ability to bore

- Perched water tables
- Local fissures
- Variable properties
- Existing Thames Water Sewer

Whilst this list is not exhaustive it gives a background to elements that might be encountered.

Strata	Hydrogeological significance	Classification (Environment Agency)
Alluvium	Has potential to transmit relatively small quantities of water. The site is located in close vicinity of the River Thames, so it is likely to contain significant quantities of groundwater.	Secondary (U)
Terrace Gravel	Has potential to transmit significant quantities of water. The site is located in close vicinity of the River Thames and the Terrace Gravel is underlain by relatively impermeable Clay, so it is likely to contain significant quantities of groundwater.	Secondary (A)
London Clay	The London Clay is an aquitard and therefore will not contain significantly large quantities of groundwater.	Unproductive Stratum
Lambeth Group	The Lambeth Group is unlikely to contain significantly large quantities of groundwater, however the lower part of the stratum where the material has less clay content may be in hydraulic continuity with the lower layers.	Unproductive Stratum
Thanet sands	This strata is highly permeable and is often in hydraulic continuity with the underlying Chalk.	Principal Aquifer

Figure 4.9 Summary of Environmental Agency aquifer classification of the anticipated geology

5 Environmental Assessment

The information presented in this chapter has been extracted from the desk study report and is based on the information received from the Envirocheck report and maps for the Site.

Reference should be made to the independent Site specific Environmental Statement reports included in the relevant submittal for further information on which all of the items listed in this chapter are addressed and mitigated.

5.1 Introduction

The aim of this part of the report is to provide an initial assessment of the environmental conditions of the Site as well as the potential contamination of the Site.

Additionally, the objective is to characterise the contaminants, their pathways and potential receptors for the purpose of a risk assessment. This aims to provide relevant information to protect the health and safety of future Site users and construction workers and protection to the environment.

Information on the potential contaminants that could be present within the ground can come from many sources (historical maps, Environment Agency, Envirocheck Report, previous contamination tests, etc.).

Contamination may arise from a wide range of activities on the Site or off-Site. This may include:

- Heavy industry
- Electric substations, power stations, gas works, etc.
- Chemical plants
- Landfill sites, recycling or disposal sites
- Railway sidings
- Works including finishing processes (plating, painting, etc.)
- Fuel storage facilities, garages, etc.
- Former mining sites
- Ministry of Defence sites
- Timber treatment works
- Sewer farms or sewage treatment plants

We note an Envirocheck site sensitivity search showed a registered radioactive site present, however on investigating this it was found that Guy's & St. Thomas' NHS Foundation Trust contract procurement department was previously located on the 2nd floor of the New City Court Office building. Therefore, this meant it was a registered address for the contract of radio pharmaceuticals and radioactive materials and no radioactive substances would be found in the ground.

During a site walkover, suspect soils usually are identified by sight and olfactory observations. Some obvious signs of contamination include, but are not limited to:

- Soil discolouration
- Unusual or different soil texture
- Unusual odour
- Standing water or trench with hydrocarbon sheen
- Abandoned industrial waste such as drums or asbestos sheeting

5.2 Statutory Information

AKT II instructed Envirocheck to carry out a search of their records and report on the following aspects:

Water:

- Abstractions and discharge consents
- Red list discharge consents
- Pollution incidents and prosecutions relating to controlled water
- Groundwater vulnerability and river quality

Waste:

- Landfill sites (historical and current)
- Waste water treatment or disposal and transfer sites
- IPC registered waste sites

Statutory controls:

- Integrated pollution and air pollution controls
- Prosecutions relating to authorised processes
- Enforcement and probation notices
- Planning hazardous substance consents and enforcements
- COMAH, NIHHS and explosive sites

The following is a factual summary of the information obtained from the Envirocheck search.

Contaminant	Level
Chromium	Moderate
Lead	Moderate
Nickel	Moderate
Arsenic	Low
Cadmium	Low

5.3 Preliminary Contamination Assessment

Potential Site specific contamination risks are assessed and presented below. A conceptual model includes possible sources, pathways and receptors, which are defined below.

A source is a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters.

A pathway is a route or means by which a receptor can be exposed to or affected by a contaminant.

A receptor is something that could be adversely affected by a contaminant. It can be a living organism, group of organisms, an ecological system or human controlled waters. It can also be a property which is in a listed category or could be harmed by a contaminant.

5.3.1 Potential Contamination Sources

Potential contamination may arise from the different sources on Site. Presence of boilers and associated fuel leakages may be responsible for hydrocarbon presence within the ground. Electricity plant rooms may be responsible for PCB (Polychlorinated biphenyl) pollution.

Historical uses of the Site or surrounding area may provide contamination sources. Typical historical use of the Site and surrounding area which may cause contamination issues include railway lines, gasworks, industrial use, breweries and chemical works.

Many bombs that were dropped during the Second World War blitz did not explode on impact. Bomb detonators don't deteriorate, and the explosives do not become inert with time. The Ministry of Defence has published maps indicating the extent of damage to buildings during the raids and the possible locations of Unexploded Ordnance (UXO) in Central London. A detailed UXO risk assessment was undertaken by 1st Line Defence (DA3587-00) and there is no evidence to suggest that UXO's are present at the site but if present they would consequently present a health and safety risk and a contamination risk, as described as follows:

- Heavy metal (Copper, Zinc etc.) Contamination from the bomb's casing.
- Organic aromatics (Toluene, Nitrosamine, daughter products etc.) Contamination from the degradation of the explosive charge.
- Heavy metal (Lead, Mercury) contamination from the degradation of the detonator charge.

Bombs during the wars were also responsible for heavy contamination as they broke several pipes and conduits when exploding. A Second World War bomb damage map indicates that the row of terraces along St Thomas Street suffered minor damage but that the row of buildings in King's Head Yard suffered slightly more damage, although not structural. The buildings along King's Head Yard were demolished and replaced by New City Court. The CCTV survey carried out in 2017 didn't evidence damages of the pipes and conduits in the Site.

The Site is not located within a radon affected area, as less than 1% of homes are above the action level. No radon protective measures are necessary for the proposed development.

Asbestos surveys have been completed by:

- John F. Hunt Associates for Contrakt Ltd on 2017/07/11 report no 140137. The survey included first to fourth floor of New City Court office building. The surveyed areas were assessed to be between Risk Rating E (No asbestos detected) and Risk Rating C (Low Risk Material). However there were areas which were not possible to be inspected and they should be considered to contain asbestos unless proven otherwise.
- Bureau Veritas UK Limited. The survey was carried out on 2010/01/27 for the lift shafts of New City Court. From the summary of the findings the report states 'All available areas of the lift shaft and pit were surveyed but there were material or voids encountered that could not be inspected. No Items were sampled or presumed.
- Bureau Veritas UK Limited on 2008/06/25 report no ZGAX712. In the marked up plans the survey shows the areas which were inspected and reveals where the asbestos was identified in the basement and on the 5th floor in the pipe flange gaskets.
- Quantum Compliance on the 2018/03/26. The survey, carried out in specific areas only, didn't identify any asbestos containing material.

5.3.2 Contamination Migration

If potentially polluting activities have taken place historically at a Site, the hazard to human and/or environmental receptors will be increased if significant pathways are or were historically present on or beneath the Site along which contaminants can preferentially migrate. Pathways can be anthropogenic (artificial) or natural.

Other sources of contamination are outlined by the results Envirocheck Search, contained in Section 5.2.

5.3.3 Receptors

The potential receptors identified could be one of the following categories:

Humans: Construction site workers, future Site users, visitors and maintenance staff.

Property : Foundations, basement structure and services

Controlled Waters:

- Principle Aquifer: Upper Chalk and Thanet Sands
- River Thames and Docks (located close to the Site)

5.3.4 Potential Natural Pathways

The Envirocheck Superficial Aquifer map in Figure 5.1 indicates that the Site is underlain by Secondary A Aquifer, which is likely to be associated with near surface river terrace deposits.

The potential for significant contamination migration through the terrace deposits is considered to be moderate. This may provide a possible pathway for contaminants to reach the River Thames.

The underlying London Clay and Lambeth Group should act as an impermeable barrier below the Site to prevent the deeper penetration of contaminants into the Chalk and Thanet Sands Aquifers.

Any waterproofed basements and the surrounding hard standing areas surrounding the development can be used to demonstrate a breakage in the pollutant linkages. This can limit contact with non-organic pollutants that do not readily volatise such as arsenic, lead, copper, nickel and some polycyclic aromatic hydrocarbons (PAH).

5.3.5 Potential Anthropogenic Pathways

Anthropogenic pathways for contaminant migration can be present in the form of soakaways, land drains, etc. Leaking surface water or foul drainage pipes and permeable backfill to the trenches containing services could also act as preferential pathways for potential contaminant migration.

Given the age of the existing building on Site and the drainage systems used at the time, it is unlikely that soakaways and other ground infiltration systems will be present at the Site. Also, the nature of the Site (comprising solely of buildings) and surrounding area (comprising of buildings or either tarmac or paved areas), also suggests ground infiltration systems are not present.

Surface water and foul water are carried from the Site in the public sewage and highway drainage systems. A CCTV was carried to survey in 2017 and includes all the sewers within the Site up to the public sewers.

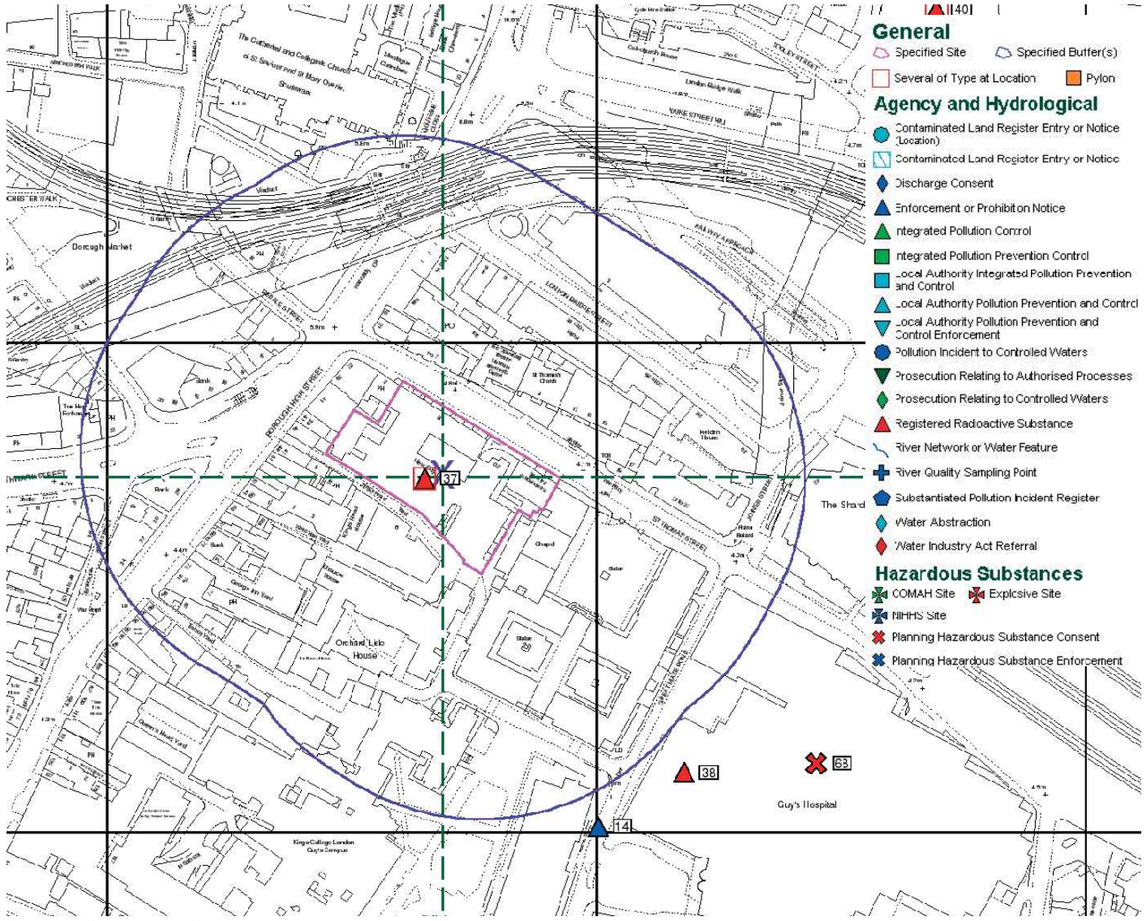

Figure 5.1 Site sensitivity Map

6 Site Constraints

6.1 Statutory Services Searches

Numerous services are known to be present on the Site and in the surrounding roads and pavements. The statutory services search was carried out as part of the desk study to locate potential underground obstructions and surrounding utility assets. Based on this information, a Site constraints drawing was produced and can be found in the relevant Appendix attached to the Basement Impact Assessment report. It is noted that the information provided by the relevant statutory bodies is approximate and more detailed investigations involving GPR targeted trial trenches may be undertaken prior to commencing ground works, to verify locations where critical.

6.2 Thames Water Assets

The Thames Water Asset Map in Fig. 6.1 shows the existing public sewers in the vicinity of the site. Running along King's Head Yard, on the southern boundary of the site, there is a sewer connecting to a combined Borough High Street sewer, which may lie in close proximity to the proposed development. On the northern boundary along St. Thomas Street there is a main public sewer believed to be in concrete. Finally, on the east side, running from south to north, under the existing basement of Keats House there is a 300mm cast iron sewer. The existing 250mm RC basement slab is suspended between pile caps, notched to allow for the sewer to run underneath. The sewer runs from a manhole located on the south side (manhole 39) underneath the building, goes through the manhole situated in the lightwell in front of the building on the north side and discharges into the sewer along St Thomas Street.

A CCTV survey has been carried out for all pipes running across the Site. The survey shows that the pipe underneath the basement is currently in use.

The east sewer is proposed to be diverted under a section 185 agreement from manhole 39 (upstream manhole) closer to Conybeare House, running along the party wall, and then will be reconnected to the existing manhole located in the lightwell. Please refer to the relevant Appendix attached to the Basement Impact Assessment report for the proposal of sewer diversion.

6.3 TfL Structures (LUL Tunnels and Station)

There are several TfL constraints below ground and around the Site, as noted below:

- Westbound Jubilee Line Tunnel and London Bridge Station
- Northbound Line Tunnel
- Compensation Grouting
- Ventilation shaft located at the entrance of the London Underground.

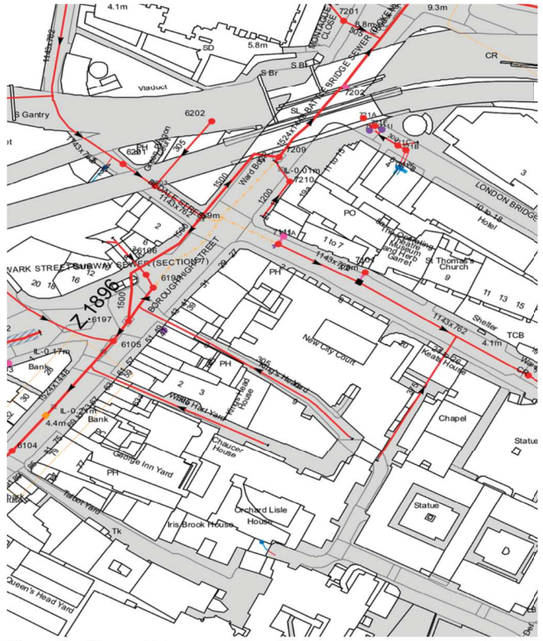

Figure 6.1 Thames Water sewer network

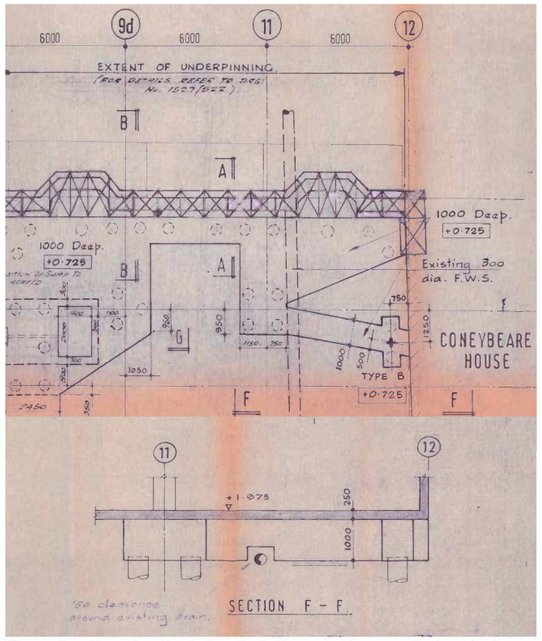

Figure 6.2 Sewer location below Keats House as shown on Engineer's plan section F-F

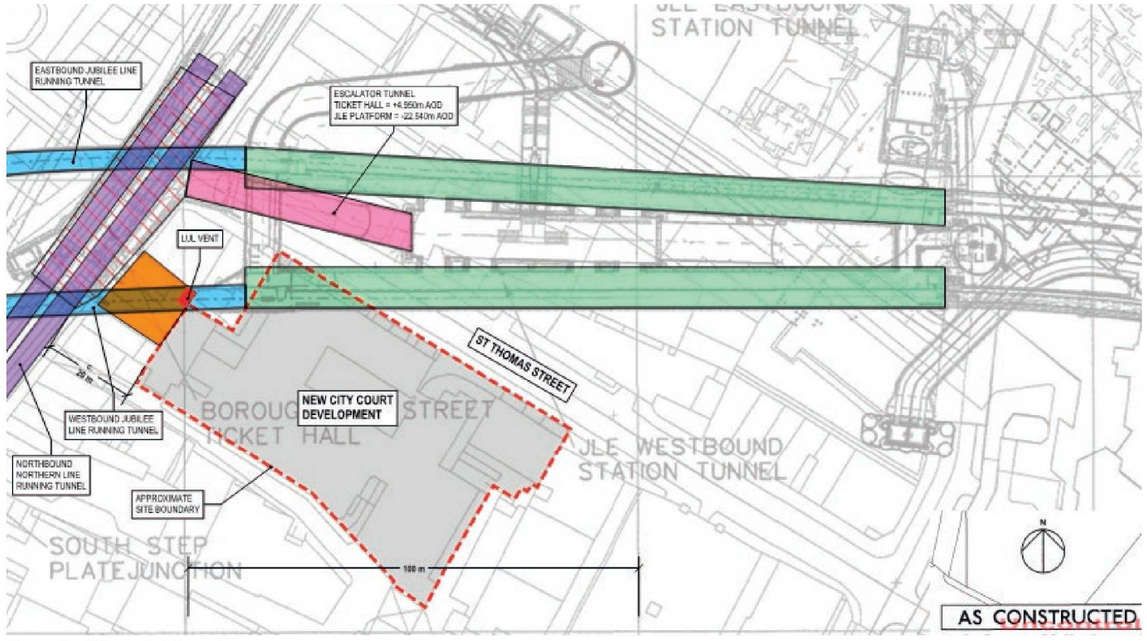

Figure 6.3 TfL assets information

Westbound Jubilee Line Tunnel and London Bridge Station

Passing underneath the Northwest corner of the Site is the westbound tunnel of the Jubilee Line. The diameter of the tunnel is approximately 8.7 m (outer diameter) and it sits 27 m below the surface of St Thomas Street (to centre of tunnel). The tunnel sits within the London clay layer.

The Jubilee Line Extension (JLE) was one of London's biggest engineering projects to date and cost over 3.5 billion, constructed in 1994. At London Bridge, the JLE underground station forms part of a complex transport interchange, which includes the existing Northern Line of the underground, the national/suburban rail network and local bus terminals. The station consists of the enlarged tunnel and includes numerous shafts and connecting adits. The tunnel extension created 6 new stations and 5 existing stations were enlarged or rebuilt. There are currently 63 7-car trains servicing the Jubilee line, with a capacity able to seat 100+ seated and standing. The maximum speed is 62mph (100Km/hr), with 630 vault electrification. The new tunnels were built with a diameter of 4.35m, whereas the existing tunnels were previously 3.85m.

The JLE joins central and east London and crosses the Thames river four times. It consists of a 16km extension including 12km of 4.5m diameter twin tunnels. The tunnel was bored using the New Austrian Tunnelling Method (NATM) as well as precast segmental linings in cast iron and concrete. The tunnel was constructed using a sprayed concrete lining (SCL) technique. As with excavation geometry, the thickness of the shotcrete temporary lining was dictated by the tunnel diameter. It varied between 150mm and 400mm. All shotcrete sections were reinforced with mesh reinforcement and lattice girder arches, comprising 12mm to 16mm reinforcing bars. A volume of approximately 100000m³ of ground was removed during tunnelling and innovative settlement prevention methods, such as compensation grouting, were specified for use in the conjunction with the tunnel excavation. The tunnel was bored around 1994 and completed in December 1999 in time for the millennium and associated celebrations.

A correlation survey was done by Plowman Craven to verify the location of the Westbound Jubilee line tunnel. The survey was included in the relevant drawings and analysis.

Northbound Northern Line Tunnel

Passing 20m away from the west boundary of the development is the Northbound Northern Line tunnel.

As per archive information the tunnel is believed to be in a segmental cast iron with an assumed external diameter of 4.0m, running at roughly 22m below ground.

Compensation Grouting

As part of the strategy to control ground movements below the surrounding buildings whilst the Jubilee Line tunnel was bored compensation grouting was installed and performance limits were specified for this when it was installed in the gravel and London clay layers during the extension.

A plan layout showing the extent of installation of Tube a Manchette (TAMs) is shown in Fig 6.5. The system basically consists of a length of pipe with small holes drilled around the circumference and at equal intervals along the length of the pipe.

The TAMs are located primarily below the terraces on St Thomas Street, therefore, they are unlikely to have any bearing on the foundations for the main development, however the effect of the TAMs on the local distribution of the Tower and settlements should be taken into consideration. The TAMs below New City Court were installed at a level of approximately 6m below the interface between terrace gravels and London clay.

When installing the TAMs at London Bridge station, disused tunnels were used to gain access to the desired elevation between the tunnels and the foundations of the overlying structures. The elevations of these existing tunnels determined the level of the grouting horizon and the TAMs were installed as deep as 7m below the top of the London clay, although the preferred elevation was 3-5m higher. The installation of TAMs from tunnels allowed parallel arrays and a constant spacing of 2m was adopted under major landmarks such as Big Ben. Along St. Thomas street a service tunnel below the road, lined with precast concrete bolted segments, was used to distribute a parallel array beneath the existing terrace houses approximately 50m long. The grouting to be implemented was decided on a day- to-day basis and uniform injection quantities and spacings were adopted. The JLE contract required real time monitoring of both the ground and structure movements in all areas where there was compensation grouting and electrolevels were used, however traditional survey methods were preferred which meant a high frequency of readings were recorded, every two hours at critical stages of the construction.

Over London Bridge station covering an area approximately 12100m², 163 TAMs were installed at a length of 4700m. One of the main areas of concern for settlements was the Chapter House chapel on the north side of St. Thomas street. Settlements in excess of 110mm were recorded in the middle of the chapel. the monitoring below the St. Thomas street terraces included precision levelling and crack monitoring. The compensation grouting protective measures controlled ground settlements such that the maximum building movements recorded were less than 35mm in this area.

The southern extent of the TAMs will need to be determined as they may affect the potential for piling in this area. The proposed Site does therefore highlight a potential risk that must be considered.

The proposed pile foundation suggests piling through the layers of grouting which are thought to be 200mm thick.

LUL Vent

On the West Site boundary there is a large vent which has been confirmed by LUL to be the back of the London Bridge Area managers office over the Borough High Street Entrance.

The louvres on the vent are the escalator extract outlets and inlet grilles to and from the Borough High Street ticket hall that had to be fire separated from the rest of the structure.

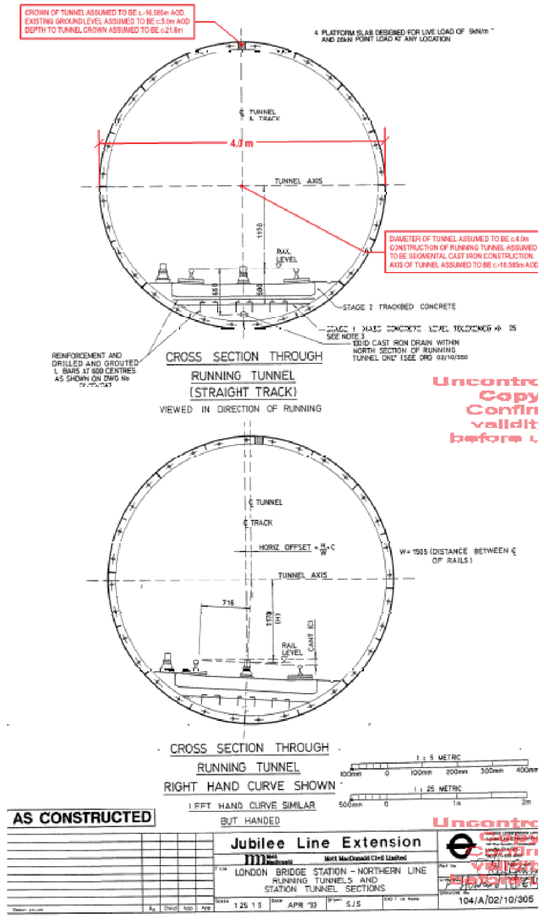

Figure 6.4 Northern Line Tunnel

Figure 6.6 LUL Vent

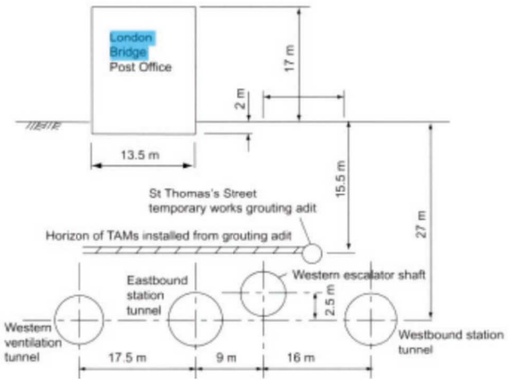

Figure 6.7 Compensation grouting - section through St. Thomas street

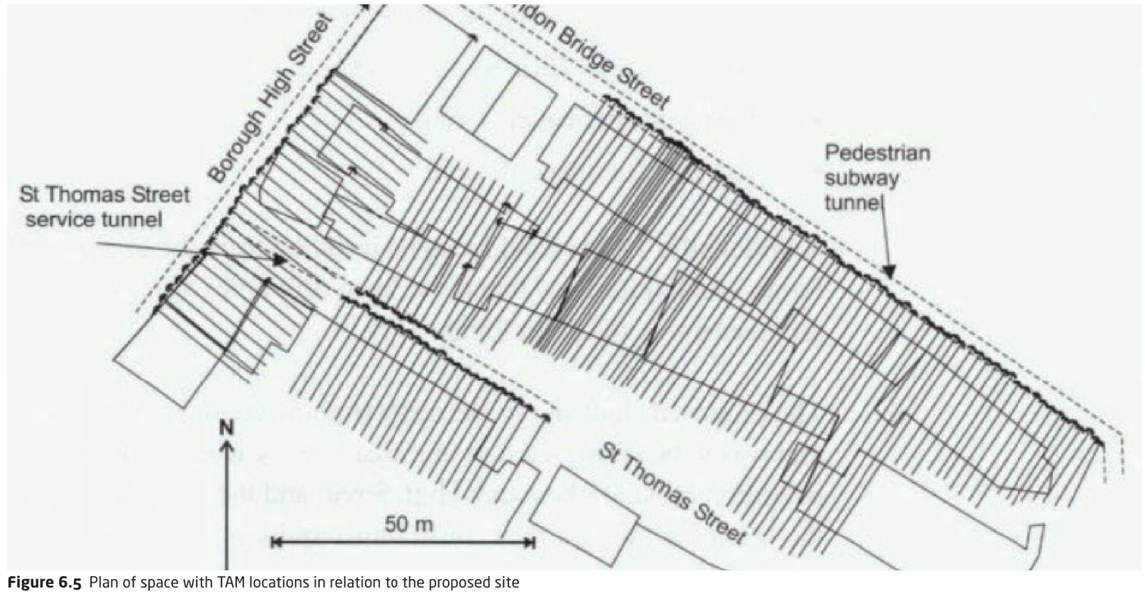

Figure 6.5 Plan of space with TAM locations in relation to the proposed site

6.4 Highways

The proximity of the proposed basement to the adjacent highways on the south side in the interface with King's Head Yard, will require an Approval in Principle (AIP) document for the permanent support of the highways in the following design stages. Please refer to the Basement Impact Assessment report for more information on this item.

6.5 Utilities

A utility report obtained from Landmark Envirocheck provides useful information concerning statutory utilities in and adjacent to the Site.

Given the previous and current Site uses, it is unlikely that there will be any major utilities crossing the Site, unless reported within this report.

An electrical substation is located in the south-west corner of the Site. This is positioned over two floors from basement to ground.

6.6 Underground Structures

Existing foundations and services are likely to be have been installed relating to the site's historical use, but it is likely that they have been removed during previous excavations of the existing basement.

It is necessary that previous and existing building plans are studied in detail to assess the extent of the existing buried foundations. From archival information it can be seen that the New City Court is founded on a series of pile caps with 450mm diameter piles each with a capacity of load of approximately 70 tonnes. From a preliminary design assessment the piles are approximately 15-20m deep and founded on the London clay.

The record drawings show that mass concrete was used in the temporary works strategy for the building built in the 1980's. Mass concrete pads was also used for the facade retention scheme and on visiting the vaults. Some of those pads could be found left inside the masonry vaults in front of Keats House. This would suggest that the mass concrete blocks, which are large in size, are likely to have been left in the ground and would need to be removed when excavating the proposed basement.

There is also a cellar along King's Head Yard belonging to 'The King's Head' public house which can be seen in the Site constraints drawing, in the relevant Appendix of the Basement Impact Assessment report.

6.7 Unexploded Bombs

London was heavily bombed during World War II and therefore the risk of finding unexploded bombs is relatively high. Extensive maps of London are available which highlight areas where bomb hits occurred. From the map indicated in Fig 6.9 the proposed Site for this development has not suffered any direct bomb strikes. This would appear to be corroborated by the historic maps which show no extensive new buildings post World War II and that there is currently an existing new building occupying the Site.

A detailed UXO Risk assessment Report; DA3587-00 highlights the Site to be at low risk, with a small area of medium risk in the western section of the Site area, which is adjacent to the St. Thomas Street buildings and the NCC courtyard.

6.8 Archaeology

London, as a Roman city, has a rich and illustrious archaeological history. The area falls within Southwark Council's designation of an archaeological priority zone suggesting that there are possibilities of archaeological finds in the area. During the Roman times the course of the Thames was markedly different from its current constrained channel. As the map shown in Figure 6.10 indicates, during Roman times the Site was actually on an islet, with the river running a course around this islet. The map indicates that during this time, the west end of the Site was approximately 1 m above ordnance datum and the east end of the Site was just 0.5 m above ordnance datum.

In 1982-3, an archaeological 'rescue' excavation took place on the Site prior to construction of the existing New City Court building after which the area was machined down to formation level for the construction of the existing basement. Significant multi-period remains were recorded including pits with Iron Age pottery, and evidence of at least seven Roman buildings. A possible medieval chapel likely to have been associated with St Thomas' Hospital was recorded, along with post-medieval buildings, and human remains associated with the burial ground of the Hospital which extended across 30-40% of the south-east of the Site. The burials were removed – without archaeological recording – by a graveyard clearance contractor, although it is possible that occasional disarticulated bone is still present, especially around the south-eastern edges of the Site. However, given the depth of the basement, except for beneath the terrace of listed buildings and the facade of Keats House, is it unlikely that there is any surviving archaeology in the Site other than very deeply cut features such as timber piles or wells.

It is recommended that any geotechnical pits that are excavated for engineering purposes should be closely monitored by a competent archaeological organisation. This will likely involve exploratory works during the geotechnical investigations. Based on the findings, further investigation may be required during the initial phases of construction.

Reference should be made to the independent site specific archaeological documentation included in the relevant submittal for further information.

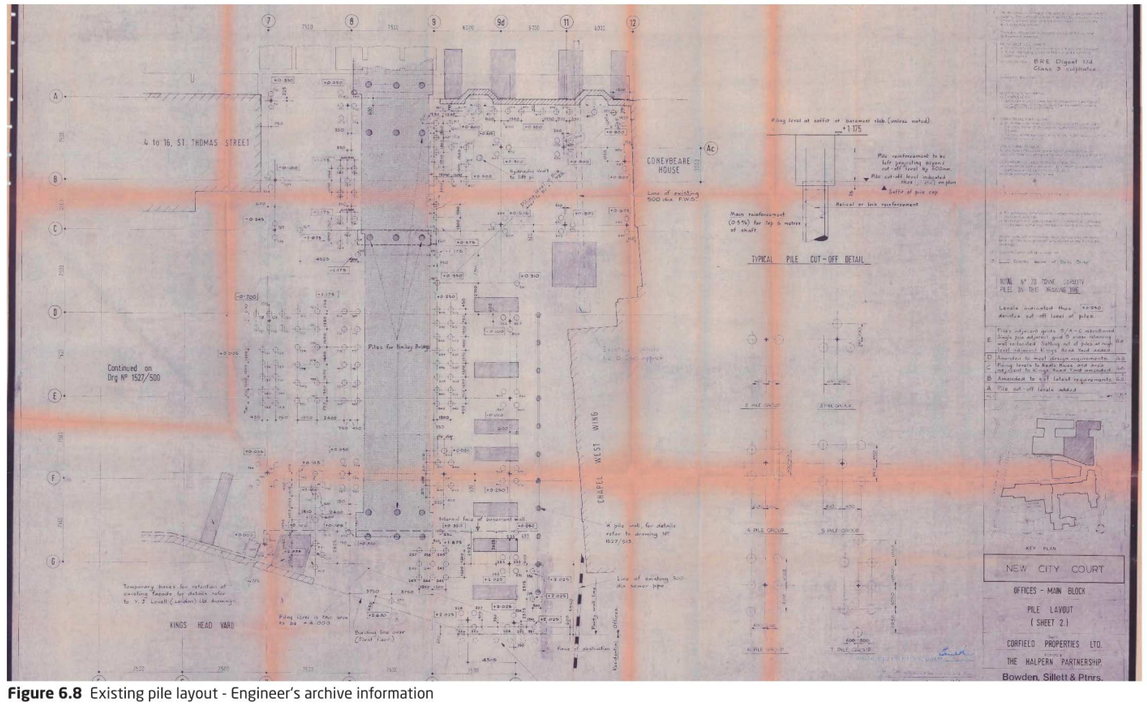

Figure 6.8 Existing pile layout - Engineer's archive information

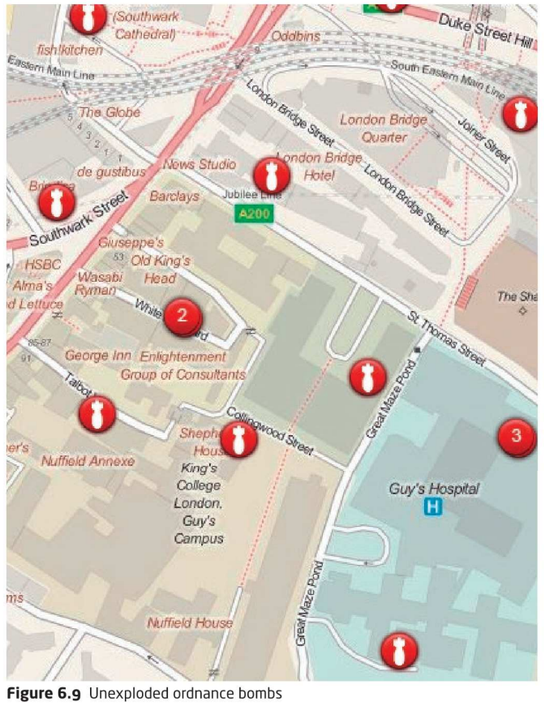

Figure 6.9 Unexploded ordnance bombs

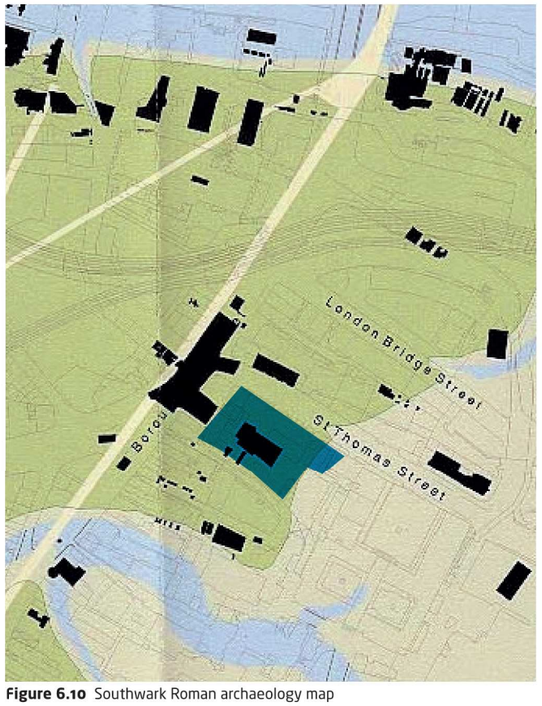

Figure 6.10 Southwark Roman archaeology map