3.3 Existing Buildings and Boundary Conditions

3.3.1 Overview

The site consists of a main building 3-5 storeys high and an adjacent single storey extension (see site location figure). The single storey extension does not have a basement. The surrounding buildings which do include a basement are:

- 25 Old Gloucester Street – Main building (NE)
- 114-118 Southampton Row (SW)
- Partial basement at St George the Martyr's Church (NW)

The following report has been prepared with the assumption that the residential building at the rear of 26 Old Gloucester Street does not have a basement.

There are a range of structural materials used on and adjacent to the site including concrete, timber, and masonry.

3.3.2 26 Old Gloucester Street

There is a 3-storey residential building abutting the existing chapel as per Site Photo 1 overleaf. There are 2 walls along the boundary, where the gable wall of the chapel is adjacent to the gable wall of the residential block. Conservatively, it has been assumed that this building does not have a basement. The chapel gable wall will be removed as part of the works.

3.3.3 114-118 Southampton Row

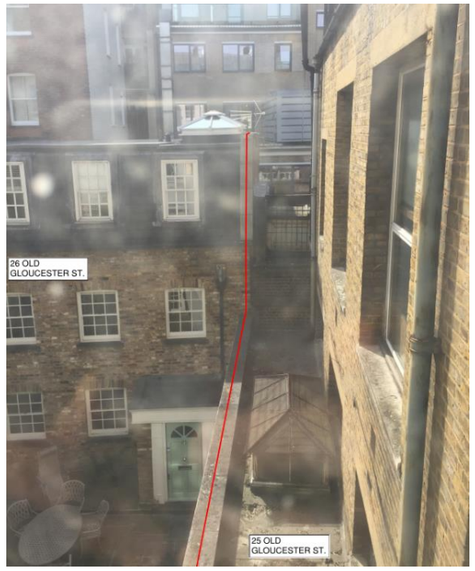
The building to the rear of the site is a 2-storey mixed-use structure with a basement. It is assumed that the existing rear wall is a partywall, which will be retained.

3.3.4 St George the Martyr's Church

The church is detached from the main building, where a path at ground level separates the properties as shown in Site Photo 3. The properties share a partywall along the boundary where the rear extension to 25 Old Gloucester Street abuts St George the Martyr's Church. It is known that part of the site includes a basement, the extent of this basement is to be confirmed.

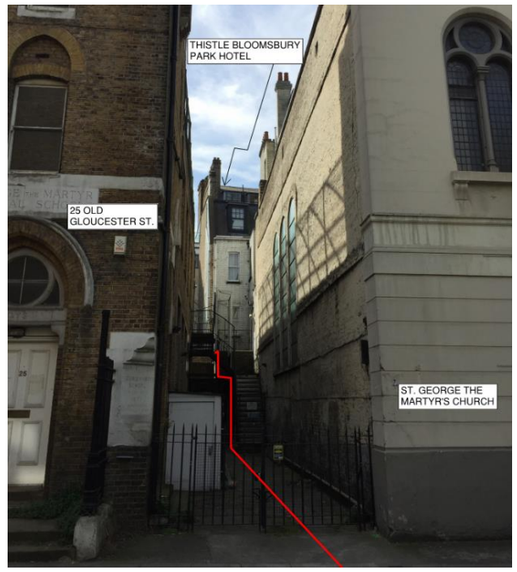
Site location

3.3.5 Boundary Condition Photos

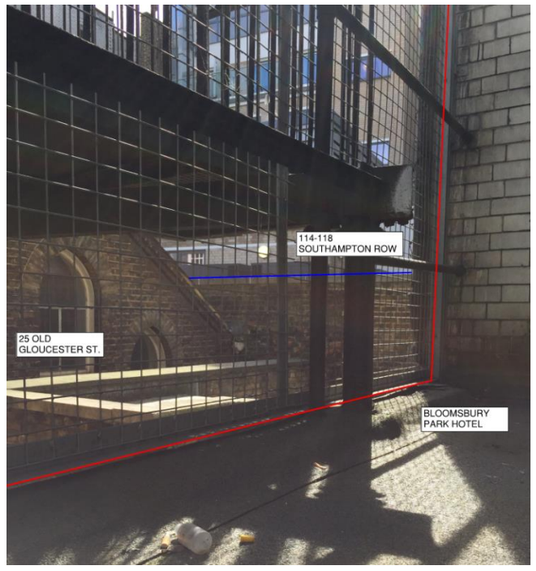


Site Photo 1
Rear terrace to 26 Old Gloucester Street abutting existing chapel

Site Photo 2
Main frontage
26 Old Gloucester St. boundary



Site Photo 3
St George's Church boundary
Main Street & party wall



Site Photo 4
Rear boundary
Bloomsbury Park Hotel abutting existing toilet block
114-118 Southampton Row at rear of chapel

4 Ground Conditions

4.1 Geology

GEA conducted an investigation which included a desk study, 3 trial pits and 2 boreholes. The site investigations confirmed the strati-graphical succession suggested by the published geological records. The GEA report found that the site is underlain by the Lynch Hill Gravel over the London Clay Formation. The Lynch Hill Gravel predominantly comprises sand and gravel, with localised lenses of clay and silt and is characteristically free-draining. The London Clay Formation is homogenous, slightly calcareous silty clay to very silty clay, with some beds of clayey silt grading to silty fine grained sand.

Detailed geographical data as well the logged records of the boreholes and window samples are available in the full site investigation report prepared by GEA Ltd in Appendix D. This document should be reviewed when using geological information for design purposes, the summary included in this document is for general information only.

Description	Constituents	Depth (m)	Thickness (m)
Made Ground	brown silty clayey sand with gravel, brick, ash and concrete fragments.	Ground Level to 3.00	3.00
Lynch Hill Gravel	dense orange-brown slightly silty slightly clayey sandy fine to coarse sub-angular to sub-rounded gravel.	3.00 to 6.50	3.50
London Clay	initially stiff fissured brown silty clay, underlain by stiff fissured bluish grey slightly silty slightly sandy clay.	6.50 to 18.00	11.50+

4.2 Soil Parameters

GEA have defined the following design parameters for the London Clay:

Stratum	Bulk Density (kg/m^3)	Effective Cohesion ($c' – kN/m^2$)	Effective Friction Angle (Φ' – degrees)
Made Ground	1700	Zero	20
Lynch Hill Gravel	1900	Zero	32
London Clay	1950	Zero	23

Refer to Appendix D for further details on testing techniques and the sample selected.

4.3 Ground Water

Groundwater was encountered at a depth of 1.80 m in Borehole No 2. However it was not encountered in Borehole No 3 which refused at a depth of 1.30 m, or Borehole No 1, where the necessary addition of water to aid drilling may have masked any such inflows. Groundwater monitoring standpipes installed in each of the boreholes, and monitored on a single occasion showed a water depth of 4.5m in Borehole No1, while Boreholes No 2 and No 3 remained dry.

While groundwater was found, the report highlights that "On the basis of the groundwater observations to date, groundwater is not expected to be encountered in the basement excavation, having been measured at a depth of 4.50 m below ground level, which equates to about 1.00 m below the level of the proposed basement. It would be prudent to continue to monitor the standpipes to determine equilibrium level and the extent of any seasonal variations." Additionally, although "significant inflows of groundwater are not expected to be encountered in the basement excavation…it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows from within the made ground, particularly in the vicinity of the existing foundations, as a precautionary measure."

4.4 Ground Contamination

Four No. samples of ground were tested for contaminants; the results of these tests can be seen in detail within Appendix D. The contamination report concludes that "The results of the testing have indicated one of the four samples tested to contain an elevated concentration of lead, while all other contaminant concentrations have been found to be below the respective guideline values." The report further notes "The exact source of the contamination is unknown, however the made ground was noted as containing variable inclusions of extraneous material such as ash, which if present in the samples tested may have accounted for the elevated concentrations. In any case, the contamination is not considered likely to be in a soluble form and therefore does not pose a risk to groundwater and thus neighbouring sites."

4.5 Hydrology and Hydrogeology

The site hydrogeology is outlined in detail within the GEA report and can be summarised as follows:

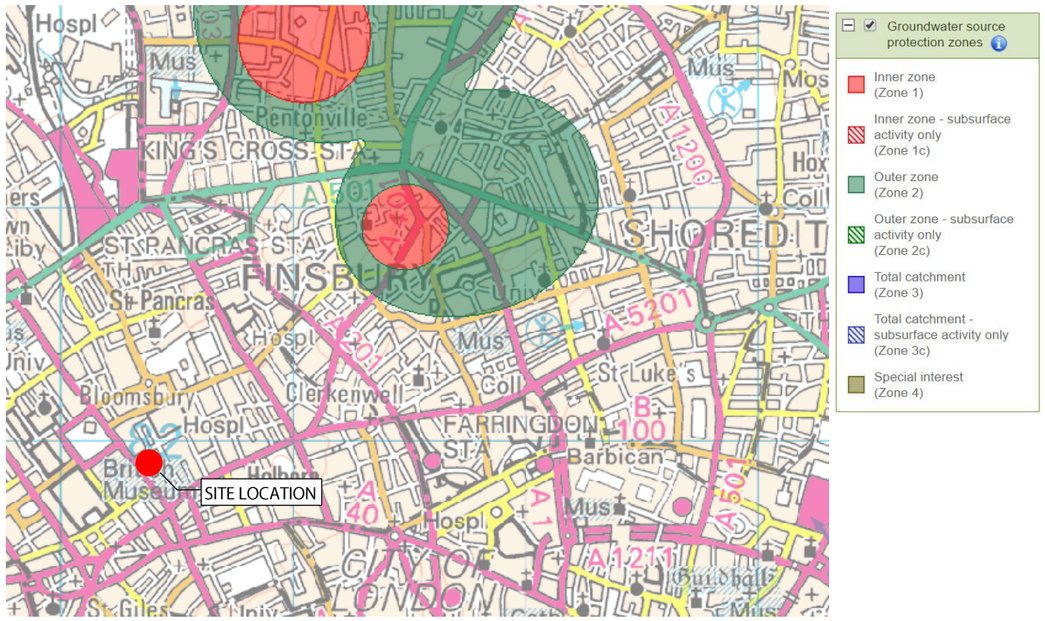
1. The Environment Agency Maps shows the site is outside of the Environment Agencies Source Protection Zone (SPZ).

2. The permeability of the Lynch Hill Gravel is expected to range between about 1 x 10-6 m/s and 1 x 10-4 m/s, whereas in contrast, any groundwater flow within the London Clay will be at a very slow rate, due to its negligible permeability. Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10-10 m/s and 1 x 10-8 m/s, with an even lower vertical permeability. The London Clay cannot therefore support groundwater flow and as such does not support a "water table" or continuous piezometric surface.

3. Surface water features such as canals and ponds are not present in the locality.

4. The route of river fleet has which has been shown to have historically run along Euston Road in a easterly direction, approximately 200 m to the north of the site has been assessed, the report notes "The direction of groundwater flow beneath the site is likely to be in a south-easterly direction, downslope towards the River Thames. Any surface water runoff that infiltrates the shallow made ground and Lynch Hill Gravel above the London Clay is likely to flow southwards along the surface of the London Clay towards the River Thames which is located roughly 1.2 km to the south."

5. The site is not located in an area at risk of flooding from rivers or sea or surface water, as defined by the EA, although a section of Old Gloucester Street is shown to be at low risk of surface water flooding.



SPZ zones within Camden

River Fleet

5 Underground Rail Assets

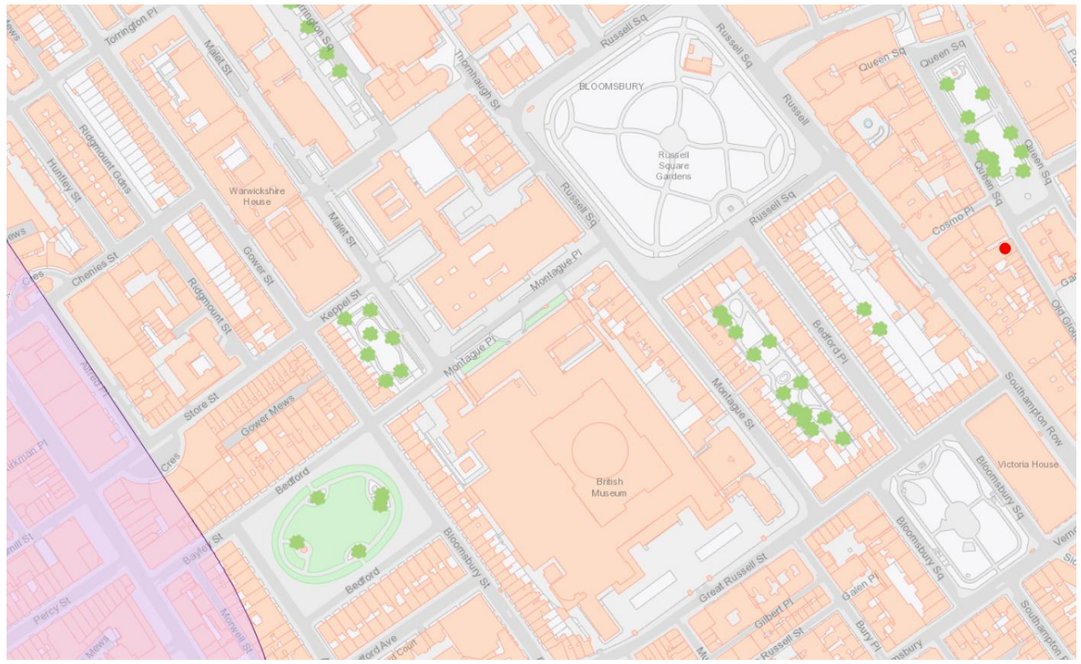
5.1 Current LUL Assets

The Piccadilly line runs in line Southampton Row which is parallel to Old Gloucester Street. As per the map shown below, the site and proposed works are entirely clear of the LUL exclusion zone and as such will not impact on the LUL assets.

LUL Exclusion Zone Map

5.2 Crossrail 2 Safeguarding Zone

As with the existing railways, the site is outside of the safeguarding zone the future development of Crossrail 2, and as such does not impact the development in question.



Crossrail 2 Safeguarding Zone Map

6 Existing Structure

6.1 Material and Geometry

The existing extension building is a single-storey loadbearing masonry structure with masonry corbels with a concrete strip footing observed in TP2. The roof is supported on the rear partywall and the main building which covers the majority of the site. The observations given are based on a limited visual inspection only. The report on the completed trail pitting is to be completed to confirm assumptions.

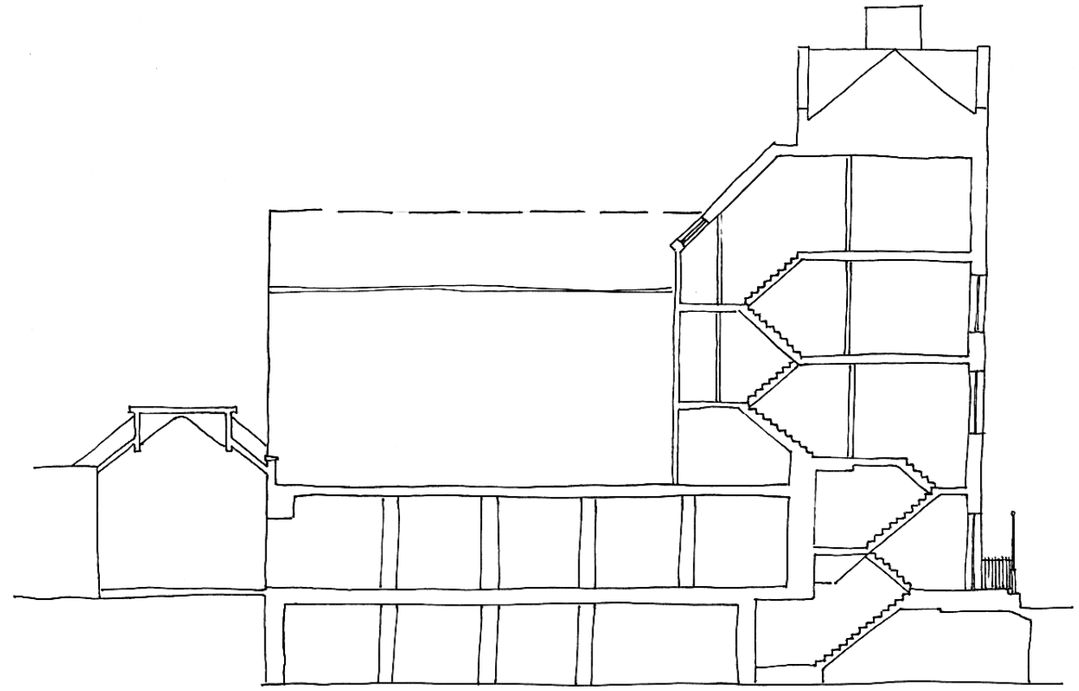
6.2 Soil Load Profile

Based on visual inspection of the site, an existing all-up loading of 3kN/m2 has been estimated to establish an existing surcharge load on the ground.

6.3 Foundations

Initial borehole reports show the extension ground floor comprises of floorboards with a void below, and up to 3m of made ground thereafter. A summary of the findings of the trial pits is tabulated below and the trial pit records are included in the Appendix.

Trail Pit No	Structure	Foundation Detail	Bearing Stratum
1	Northern boundary (at rear)	Brick wall extending to the full depth of the trail pit of 1.60 m.	Unconfirmed
1	Western boundary (at rear)	Brick wall extending to the full depth of the trail pit of 1.60 m.	Unconfirmed
2	Southern boundary (at rear)	Brick Corbels over concrete strip footing bearing at a depth of 1.28 m.	Made Ground (brown silty clayey sand with gravel, brick, ash and concrete fragments).
3	Internal columns	Brick corbels over concrete pad foundation extending to a depth of 0.87 m.	Made Ground (brown silty clayey sand with gravel, brick, ash and concrete fragments).



SECTION X-X

7 Proposed Structure

7.1 Overview

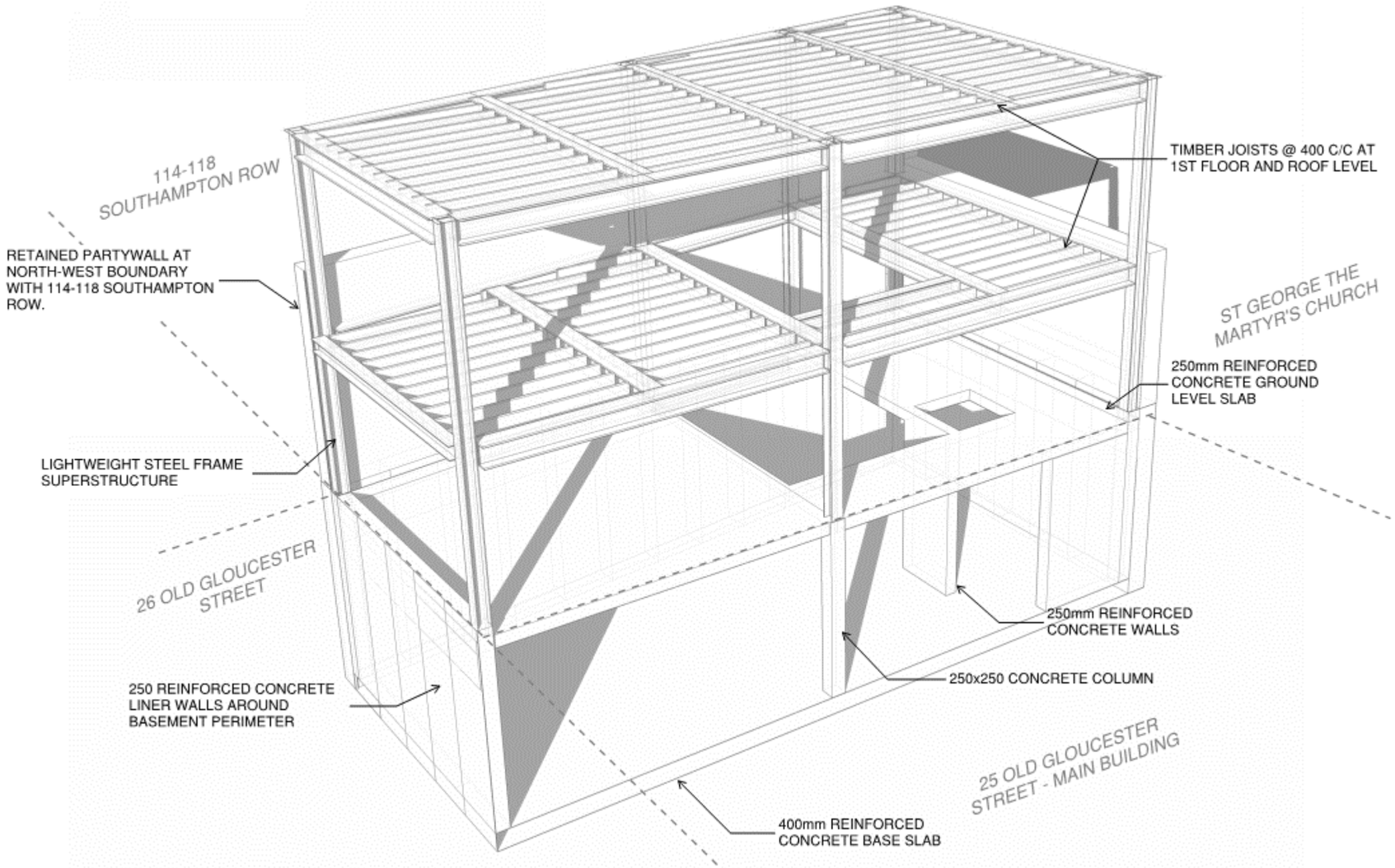
The proposed scheme involves the demolition of the existing chapel extension with the exception of the partywalls which will be retained. Once this is complete the underpinning works and retaining walls will be constructed, followed by the basement excavation. Refer to Section 8 for details of the sequencing, and Appendix A for further details of the proposed structure.

7.2 Superstructure

The proposed superstructure will be an integrated steel beam and timber floor with depths of approximatly 250mm, built in the conventional sequence of works.

All steel sections to be used will be steel UC section. The UC columns are continuous to the ground floor level; the resulting forces will be supported on the new lining walls, concrete column and basement slab. Perimeter and primary beams will span between columns, with additional secondary and trimmer beams provided where necessary.

The ground and basement floor slab will act as rigid diaphragms to restrain the top and base of the retaining walls and transfer lateral earth pressures from each retaining wall to the opposing side.



7.3 Substructure

7.3.1 Assumptions

The following assumptions have been made during the design of the substructure of the building:

- The basement level will be within the London Clay
- The water table is below basement formation level
- The basement will be Class 3 in accordance with BS8102
- Final temporary works design will be finalised by the contractor

7.3.2 Basement Raft Slab

Given the ground conditions, shape and form of the building it is proposed to found the building on ground bearing basement slab, which will be tied into the perimeter liner/retaining walls. At this stage, it is envisaged this will be in the order of 400mm thick. Following the detailed ground investigation report, requirements for heave cavities will be identified. The exact design of the ground bearing element will be further developed during the detailed stage.

The 3.4 m deep excavation of the basement will result in a unloading of approximately 60 kN/m^2 and the removal of the existing structure will further unload the ground by 3kN/m2. P-disp and a full ground movement analysis has been undertaken, and will be discussed following the issue of the final GEA report.

7.3.3 Basement Retaining Walls on Party Wall Lines

Where required, at the partywall lines with the 3 adjacent sites, it is proposed to construct the basement using traditional mass concrete underpinning and a reinforced concrete liner wall box to resist lateral earth and hydrostatic pressure. Refer to Section 8 for details of the sequencing, and Appendix A for further details of the proposed structure.

The basement formation level will be reached using mass concrete underpins, with anticrack mesh reinforcement on the inside face of the underpin. These will be constructed in a sequence to be agreed with the approved inspector and neighbouring partywall Surveyors. Given the nature of the ground conditions it is envisaged these will be excavated in 3.4m deep sections, with suitable temporary works installed to prevent ground movements occur during excavation to the basement formation level.

7.3.3.1 Basement Grade

The basement will be grade 3 to BS8102 (see table 1 below), consequently the underpin wall will be lined with a reinforced concrete wall to provide a flat surface for fixing of the drained cavity layer. The drained cavity protection would be provided by means of non load-bearing block walls around the full basement perimeter and a traditional raised screed across the lowest floor. A pump will then be connected to the drained cavity layer to remove any small amounts of water that leak through the primary concrete waterproofing shell.

Grade	Example of use of structure	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use B) Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a drier environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc.; leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

Table 1 – Basement Grading from BS8102

To achieve this level of waterproofing it is recommended that the lining wall is to be fully tanked, and a drainage cavity be installed, however other appropriate methods can also be considered.

8 Drainage

8.1 Strategy

The proposed development will incorporate a new surface water and foul water drainage network to serve the development. This will outfall to the existing Public Sewers running in the adjacent Highway, utilising the existing connection where possible.

A CCTV survey will be carried out to ascertain the line and condition of the existing connection with any proposed mitigation measures carried out as part of the works.

Surface water from the proposed development will be routed to this existing connection also. Due to space limitations and the existing soil properties, infiltration of surface water to the ground is not proposed. This will ensure that there is no impact on groundwater sources in the area.

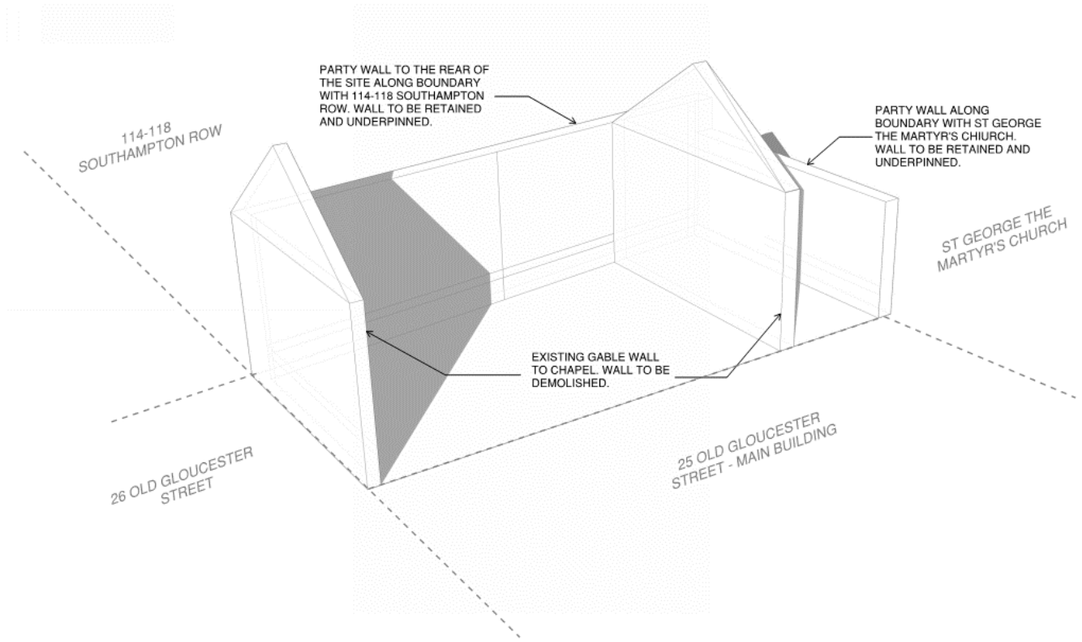
The impermeable area of the site will not be increased as a result of the proposed development. In this regard, the peak run-off rates from the site will not increase. This is in line with London Plan and Thames Water policy and ensure that there is no adverse effect on the receiving infrastructure.

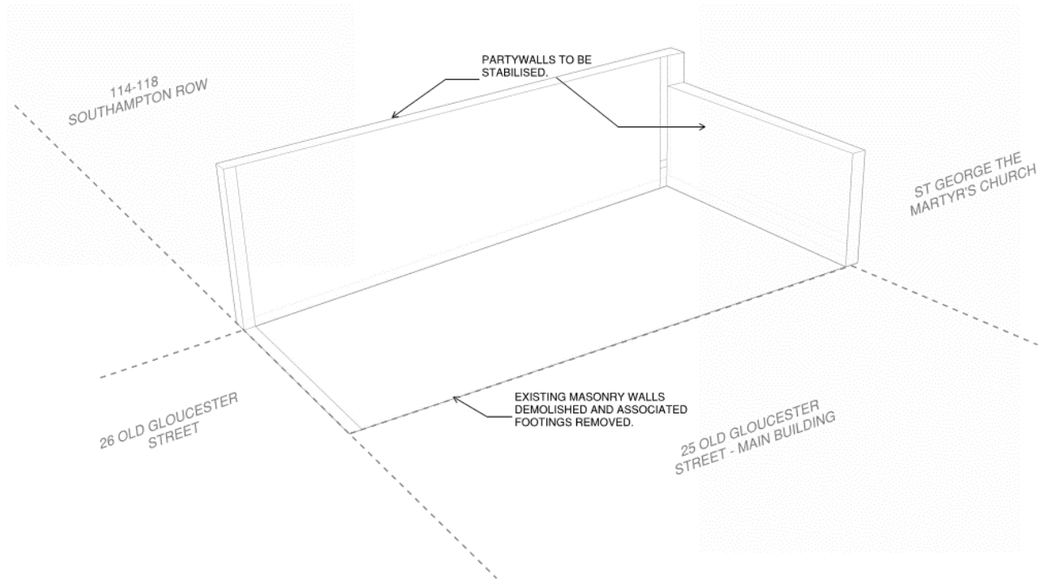
A Section 106 application will be made to Thames Water for consent to connect to their Public Sewers via the existing connection (if possible).

The drainage for this site is not connected to any adjacent property and as stated above has its own induvial connection to the public sewers.

9 Outline Underpinning Basement Construction Sequence

Prior to works commencing, schedules of condition will be carried out to the adjoining properties as part of the Party Wall process. The monitoring regime will be agreed including precise monitoring of targets affixed to adjoining structures. Initial readings will be taken prior to works commencing, and then at agreed intervals going forward. The monitoring readings will be compared with 'trigger levels' at which further investigations or mitigation measures will be implemented if required. Once this is complete the works will commence with the clearing of the site with the exception of the partywalls which are to be retained.



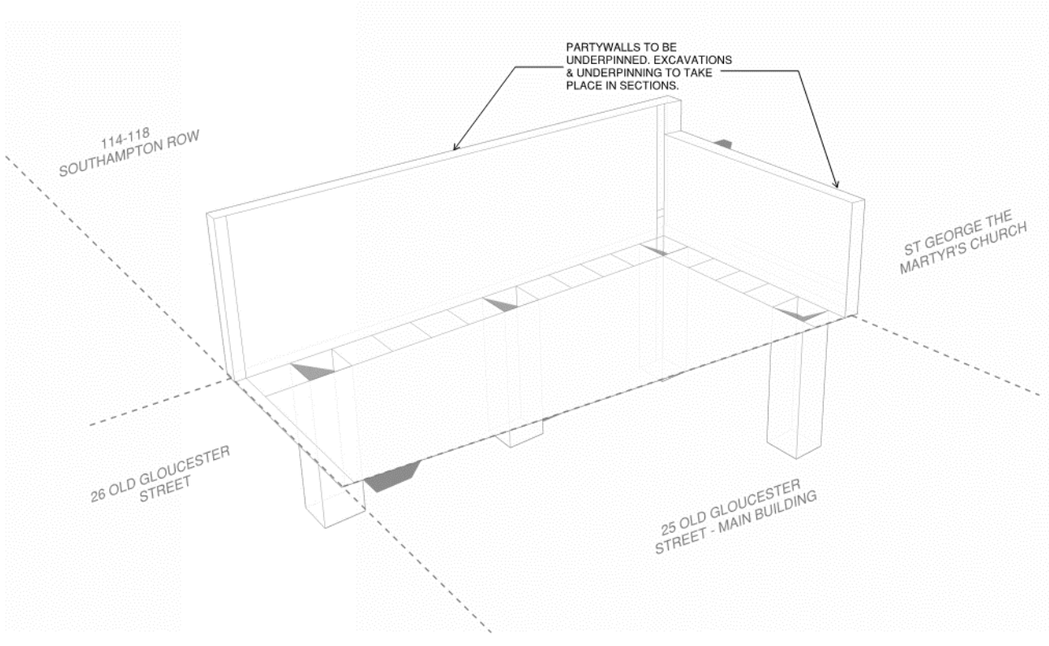


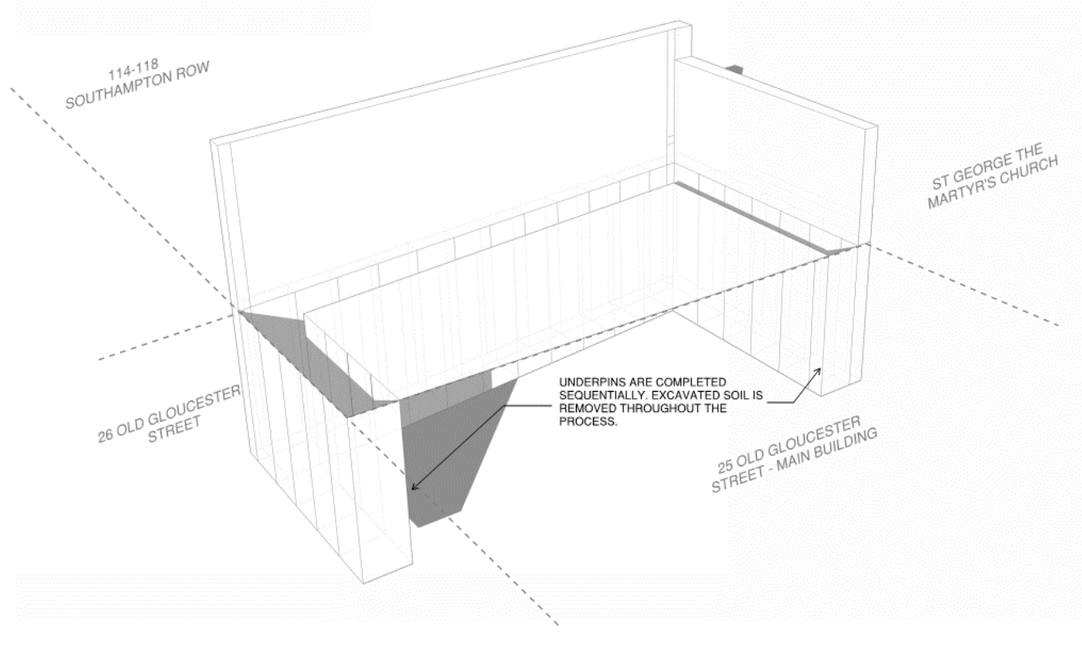
9.1 Site Clearance

- Site is cleared of internal freestanding structure, followed by stabilisation of the party wall. The site is then cleared and monitoring equipment is installed. The can be removed or temporarily retained subject to contractor's preference.
- Excavation plant will be brought on site and preliminary site set up will commence.

9.2 Removal of Existing Masonry Walls

- The existing chapel gable walls to which are to be demolished in the proposed scheme are to be removed sequentially course by course from the top to ground level.
- Temporary propping of the associated walls will be required to ensure stability.



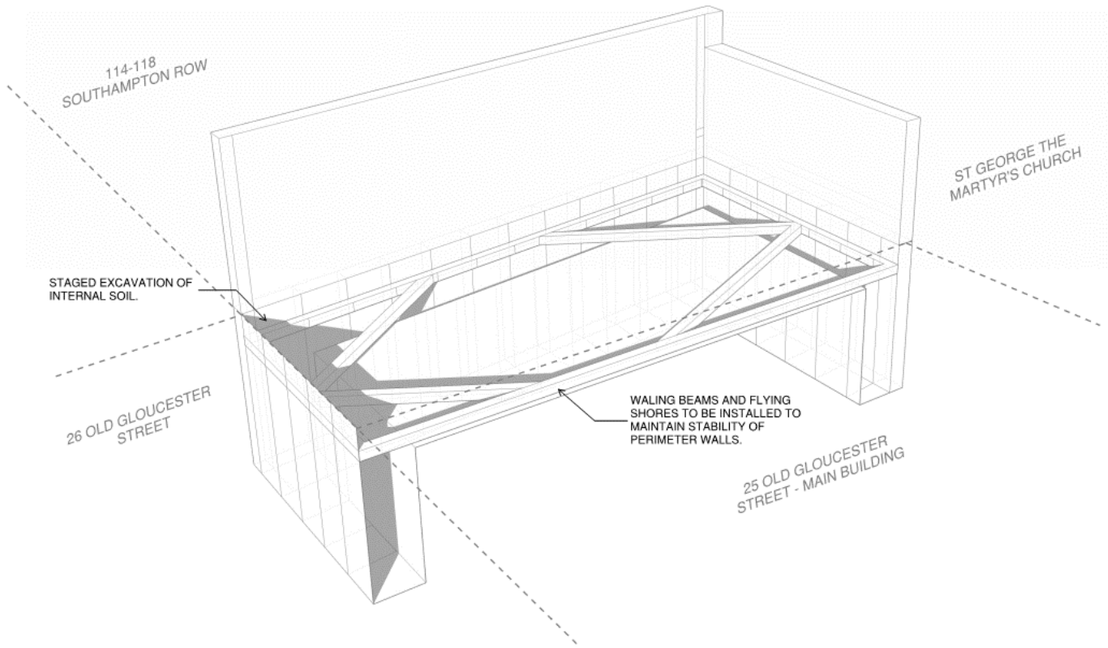


9.3 No. '1' Underpins

- The partywalls will be notionally divided into sections and the 1st series of underpins will be excavated with the necessary temporary works.
- Casting of the No.1 pins will commence in accordance with the specification.

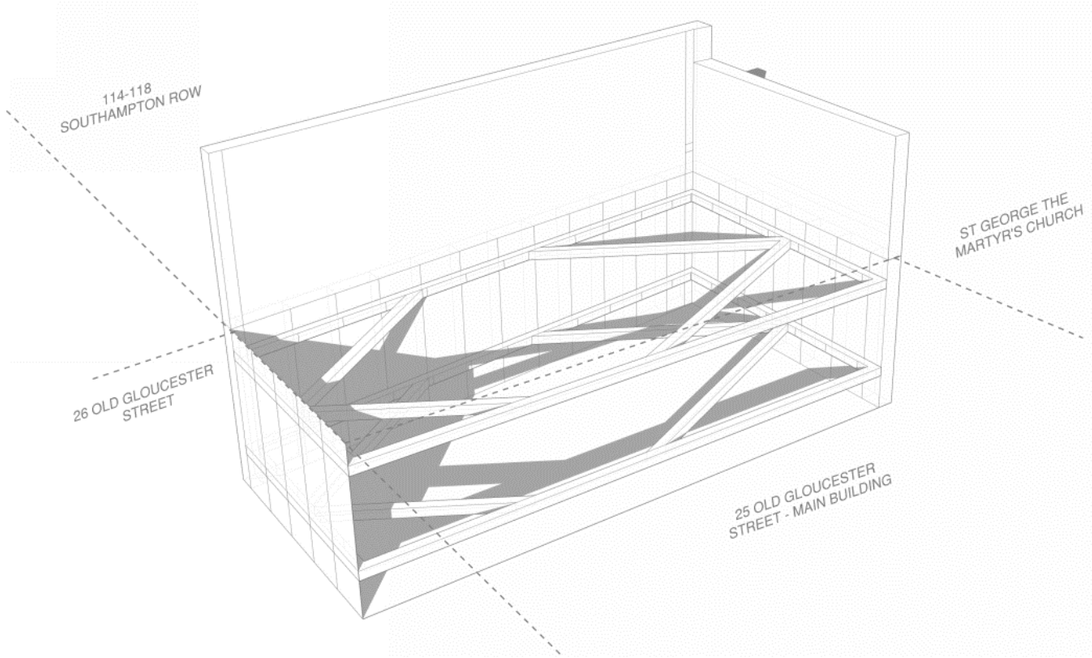
9.4 Completion of Underpinning Sequence

- The No. 2, 3, 4, and 5 underpins will be completed sequentially and in accordance with the Underpinning specification to ensure the existing partywall is supported at all times with underpins which have achieved adequate strength.
- Excavated soil is removed throughout the process



9.5 Level Reduction and Temporary Works Installation

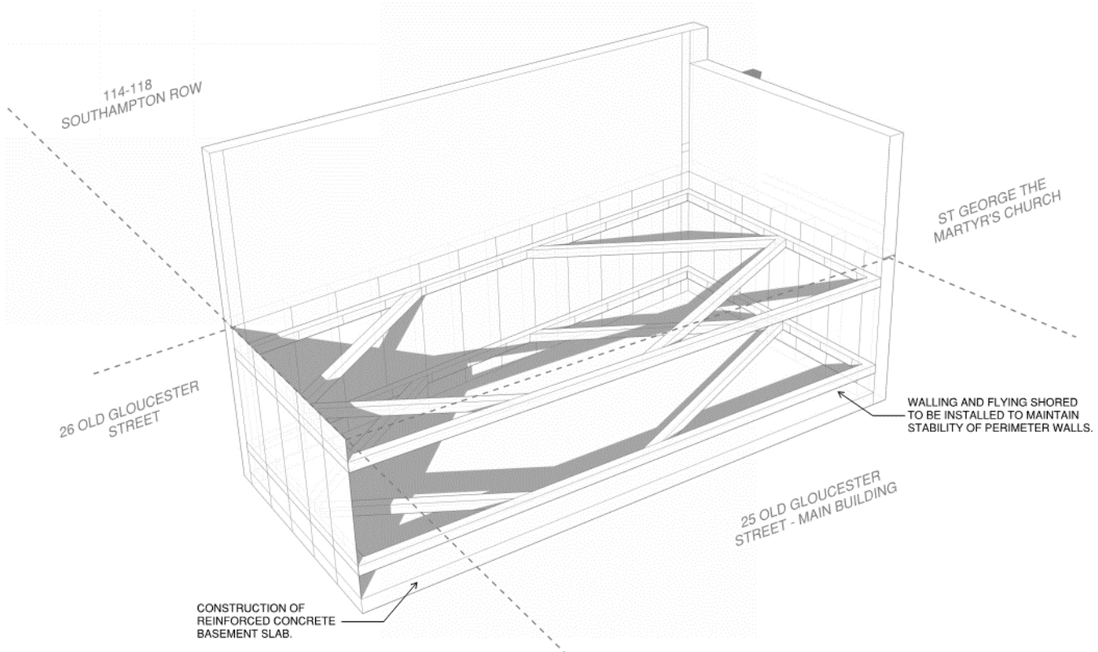
- As the soil and propping which was installed within the underpin excavation is removed, waling beams and flying shores will be installed to maintain stability of the perimeter walls (inclined strutting may also be utilised should the Contractor find this preferable/practical).



9.6 Bulk Excavation and Temporary Propping

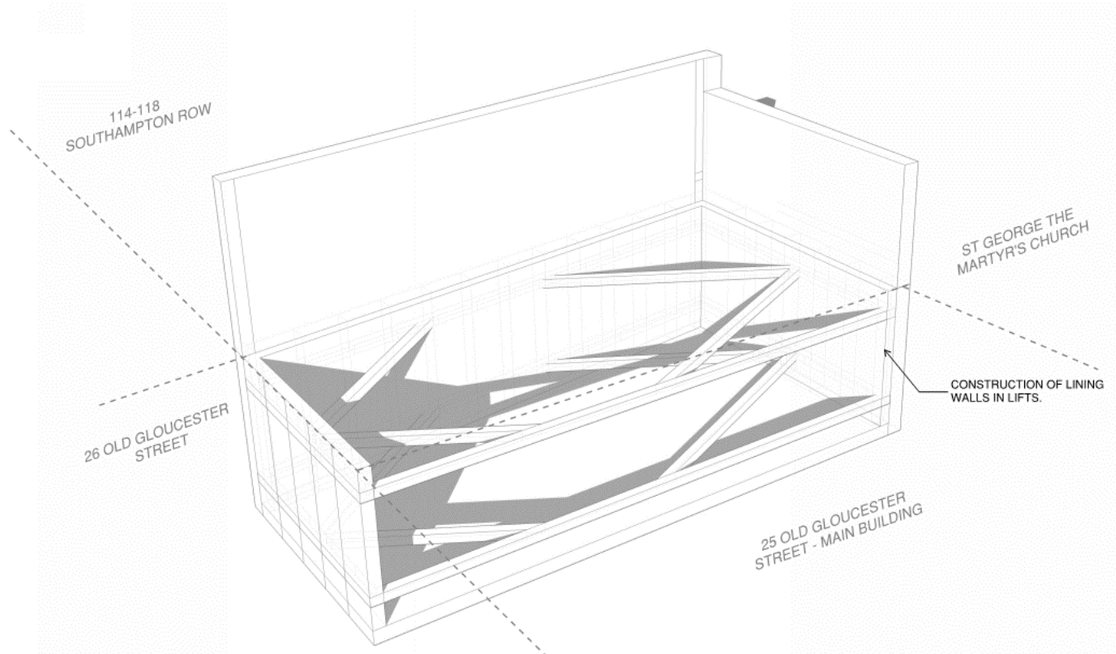
- As the staged excavation is continued, further propping of the wall is carried out as required to maintain stability of the walls.

- Once this is complete the formation level is to be prepared for construction of the ground bearing slab, all below slab elements to be installed.



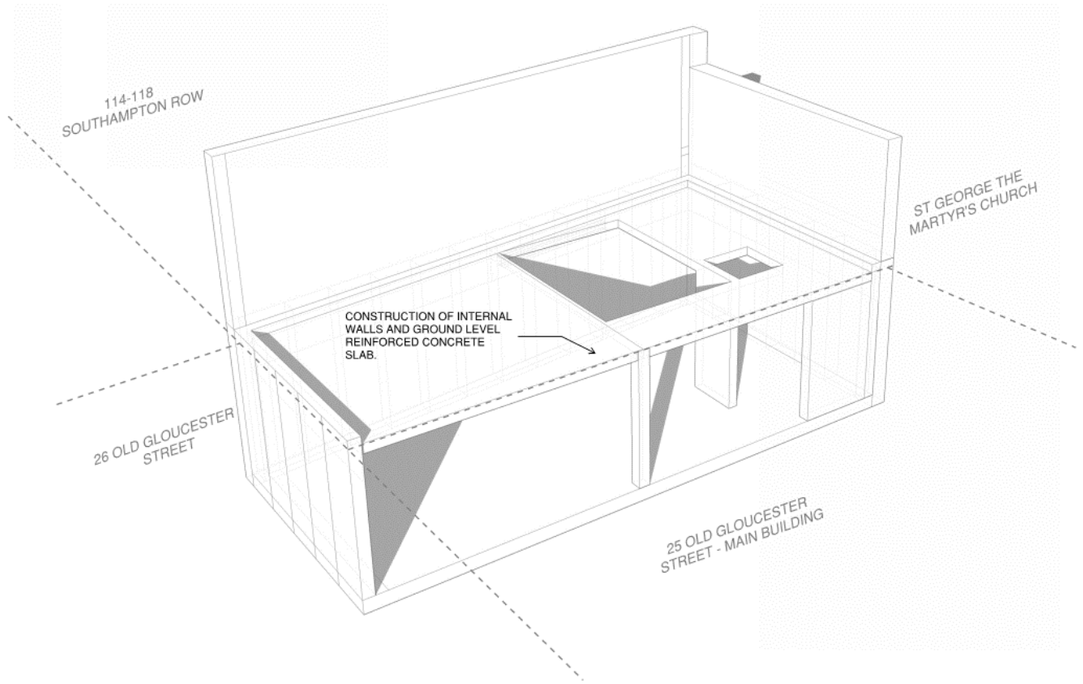
9.7 Casting of the Basement Floor

- Once blinding layer and heave protection (if required) is installed the basement slab is ready for construction.
- The reinforcement is placed in accordance with the Structural drawings.
- The basement slab is cast and left to cure.
- Starter-bars and kickers are prepared for the following stages ensuring that they are properly protected in the temporary case



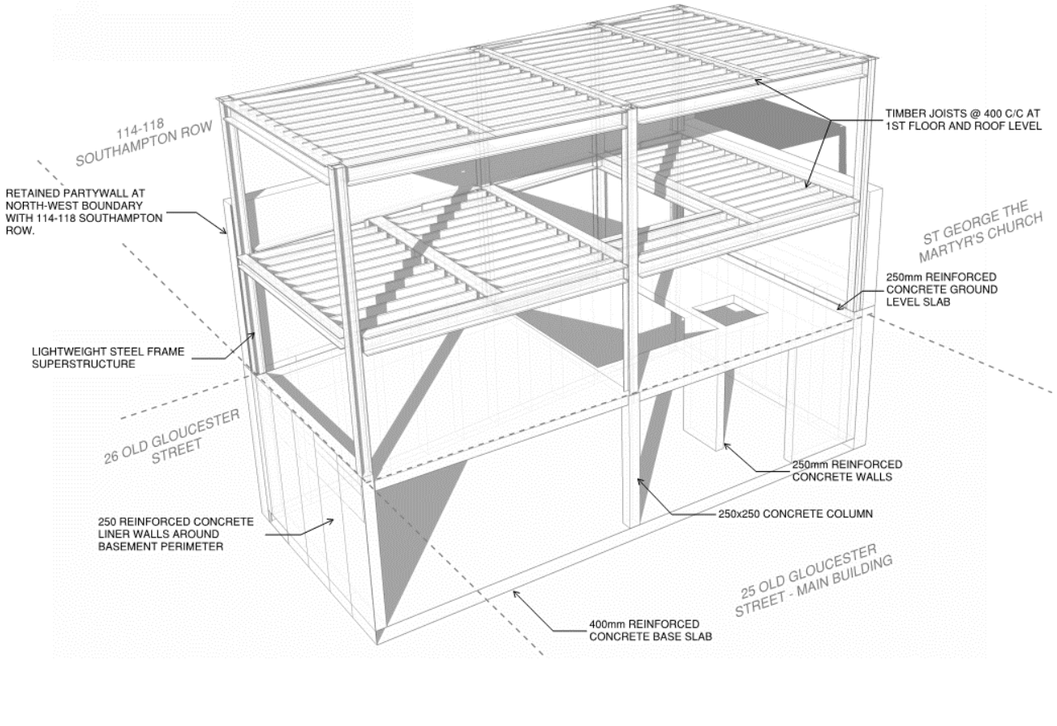
9.8 Casting of the Lining Wall

- Once the basement slab has cured, the lining wall is cast in lifts, removing and repositioning the temporary props to ensure stability is maintained.
- The lining walls are completed with the propping to the head of the wall left in place.



9.9 Installation of Ground Level Diaphragm and Basement Columns/Walls

- The internal columns and walls are constructed to provide support to the Ground level slab
- To restrain the top of the perimeter walls once the temporary props are removed the Ground level slab must be installed to act as a rigid diaphragm.
- Once this floor is complete the temporary props are removed and the construction of the superstructure is commenced.



9.10 Superstructure Construction

- Once the substructure is completed, the construction of the superstructure can commence with the erection of the steel frame.
- Timber floor diaphragms, partitions and stair/lift elements are installed.

10 Likely Ground Movements

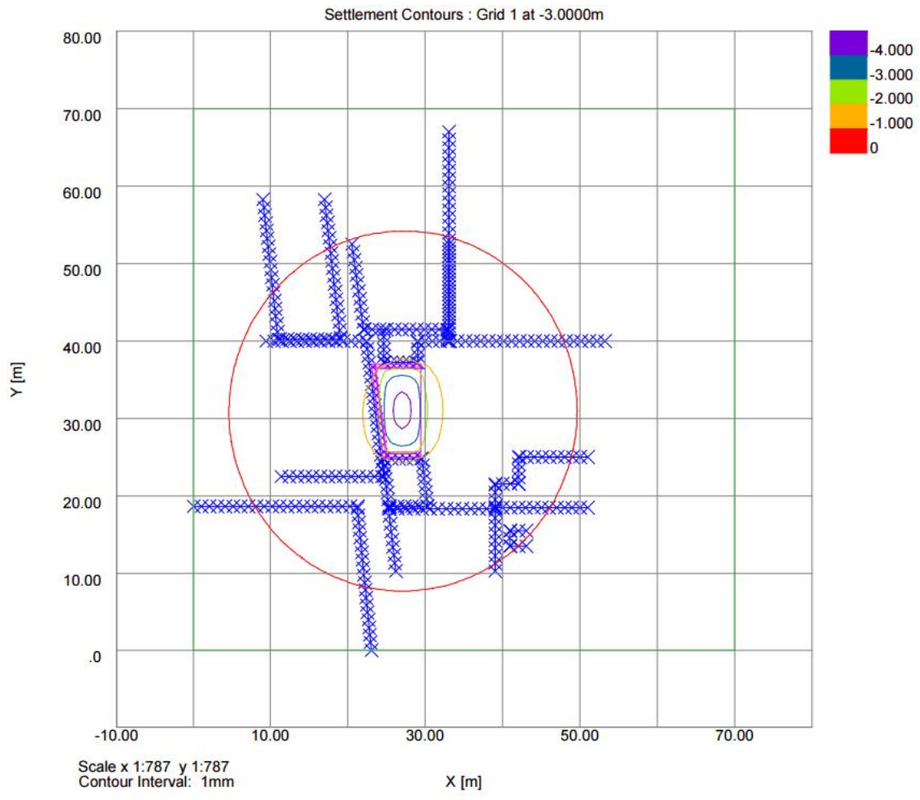
The key construction activities that will result in ground movement during the works are:

1. Demolition
2. Installation of Underpins
3. Excavation
4. Construction of new building

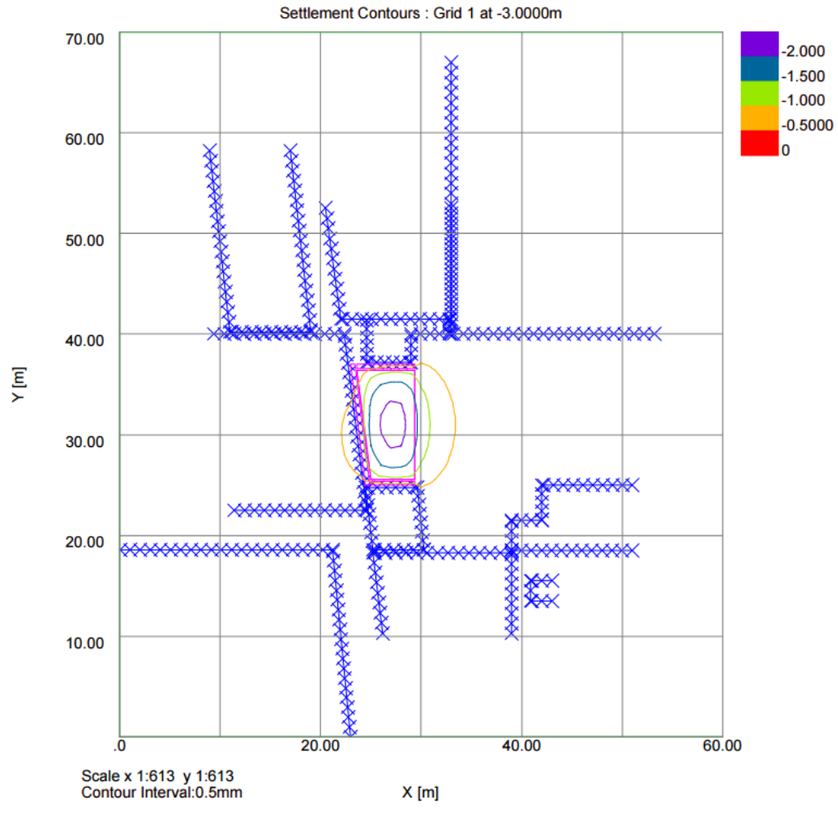
The amount of ground movement caused by these activities relates to the ground conditions, together with the care and sequence with which the works are carried out. This analysis is based on the sequence of construction described previously, should the Contractor propose to carry out the works in a different sequence to that assumed in our design then a further assessment of the predicted movement will be required, and the proposal only accepted if there is no significant change to the scale of predicted movement.

All projects which involve an appreciable level of excavation will cause a degree of movement and the GEA analysis has helped to quantify this for the project. Generally, the ground behind the retaining wall will tend to move vertically down and horizontally toward the excavation on all sides. The maximum predicted movements are illustrated below.

The results predicted have resulted from a carefully considered iterative process, with the design and assumed sequence of construction has been developed to help to reduce the amount of overall movement.



Contours showing short term movements



Contours showing overall term movements

11 Discussion of Predicted Ground Movements and Potential Damage

11.1 Discussion

The Contractor will be made aware of the care he needs to take in carrying out the works and how the likely movements depend on the sequence of works. Should the Contractor propose to carry out the works in a different sequence to that assumed in our design then a further assessment of the predicted movement will be required, and the proposal only accepted if there is no significant change to the scale of predicted movement.

The cracks which are predicted within the GEA report (Appendix D) show that all walls will fall within the 0 - Negligible category as measured against the Burland Scale (table can be seen on the left). It is recommended that movement monitoring is carried out on all structures prior to and during the proposed basement construction. Whilst these movements are small, the differential movement across the width of the adjoining properties could lead to hairline cracks appearing in the walls and in the finishes. As explained in this report the scale of movement predicted could lead to hairline cracks in the walls. Finishes to floors, walls, and ceilings however can be more susceptible to cracking as a result of this movement, especially brittle finishes. The Contractor will be required to carry out detailed monitoring of the adjoining properties to record ground movements, and take action should the movement not be as expected. Trigger levels will be set to identify limits on monitored results and to define actions if these limits are reached. The traffic light approach will be adopted with green, amber, and red trigger levels set. The new structure is designed to be self-stabilising and independent of party walls while providing support and lateral restraint.

11.2 Mitigation Measures

Measures to mitigate potential damage as a result of ground movements include:

1. Propping of the retaining wall during construction to limit deflection.
2. Temporary works to ensure stability of existing structures.
3. Movement monitoring and trigger levels.

Category of damage	Description of typical damage	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0-0.05
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	0.05-0.075
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	0.075-0.15
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.	5-15 or a number of cracks > 3	0.15-0.3
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. Service pipes disrupted.	15-25 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 number of cracks	

Damage Category Chart (CIRIA C580)

12 Proposed Monitoring of Movements

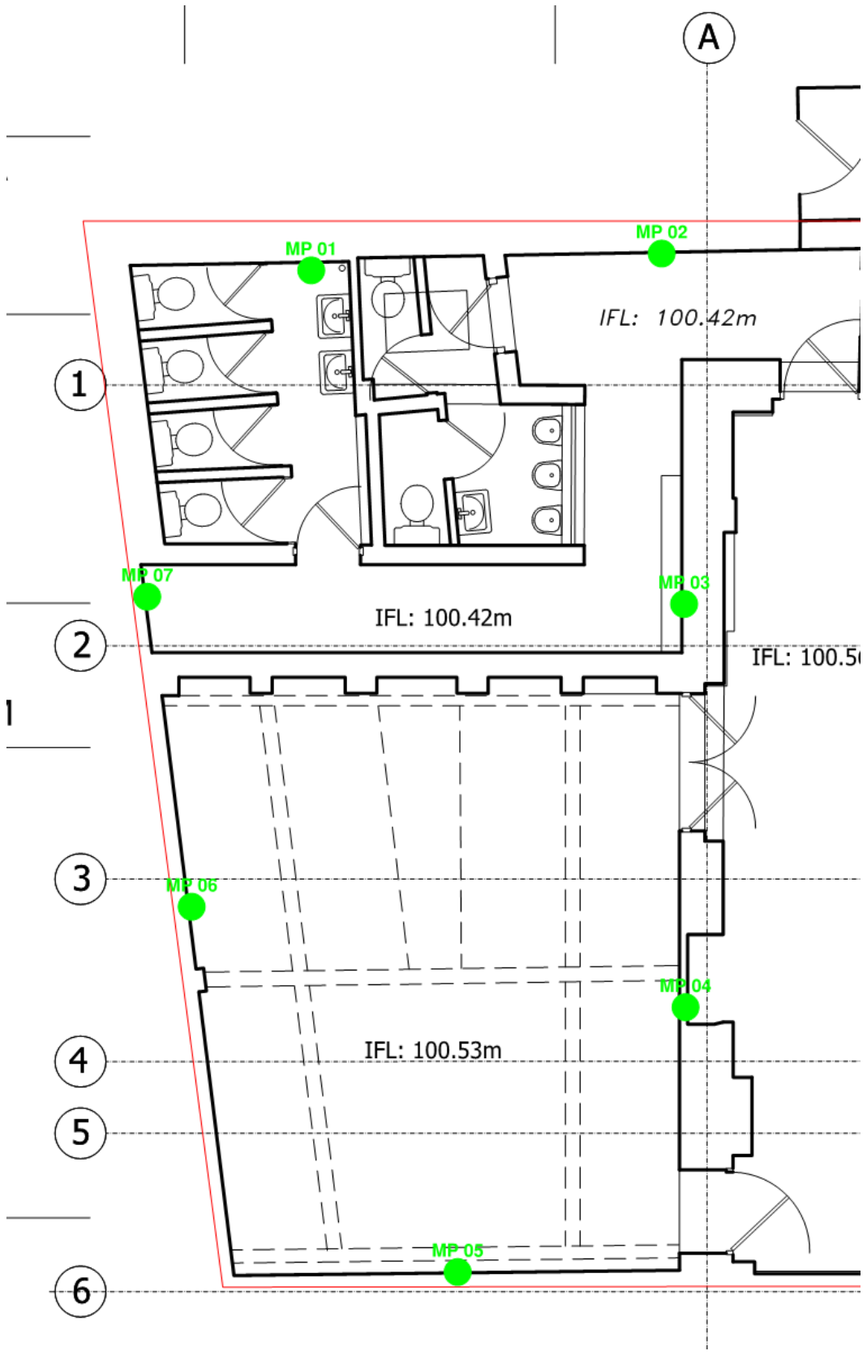
As part of the proposed works the Contractor will be required to carry out monitoring of the adjoining buildings as a check on the actual ground movements during construction. This monitoring is to include the proposals illustrated here which aim to monitor the movement of the adjoining buildings.

The monitoring is proposed to start before the main demolition works commence to help establish the baseline and record pre-construction activities.

During the works the monitoring will be aimed at recording the building movements on a regular twice weekly basis (reduced frequency as appropriate) to gauge whether the movements taking place are within the predicted and expected limits. Monitoring results are to be forwarded to the deign team for comment as soon as they are available.

If the monitoring shows that the movement exceeds, or looks likely to exceed, the expected figure, action will need to be taken by the Contractor to bring them under control as per the Trigger Levels to be agreed with partywall surveyors.

The proposal could involve stopping the works onsite though this is unlikely if the Contractor is proceeding carefully and diligently with the construction. All of this including an action plan for what to do if appears excessive will need to be agreed with the Contractor and reflected in their method statement.



Proposed monitoring locations