

## 7.3 Substructure

### 7.3.1 Assumptions

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

- The site investigation data obtained and collated by GEA Ltd in Appendix D is representative of the ground conditions beneath the footprint of the existing building.
- The basement level will be within the London Clay
- The formation level of the main basement will be below the water table
- 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 or Spread Footing

Given the ground conditions, shape and form of the building it is proposed to found the building on a raft slab, which will be tied into the perimeter retaining walls. At this stage it is envisaged this will be in the order of 400mm thick. As there is a risk of heave in the ground it is possible to include heave cavities in appropriate locations within the raft slab, or found the building on spread footings which is unified by a suspended slab as recommended within the GEA report (Appendix D). The exact design of the ground bearing element will be further developed during the detailed stage.

The 4.4 m deep excavation of the basement will result in a unloading of approximately 90 kN/m<sup>2</sup> and the removal of the existing structure will further unload the ground by 9kN/m<sup>2</sup>. The P-Disp analysis indicates that, by the time the basement construction is complete and prior to the building completion, around 10 mm to 15 mm of heave is likely to have taken place at the centre of the proposed excavation, reducing to between 5 mm to 10 mm at the edges. Following completion of the basement and building construction, 10 to 15mm of further movement is predicted due to the new building loads. To confirm this a full ground movement analysis has been undertaken which has assessed the effects of the new development on existing/surrounding buildings paying particular regard to the effects of the demolition of the existing building.

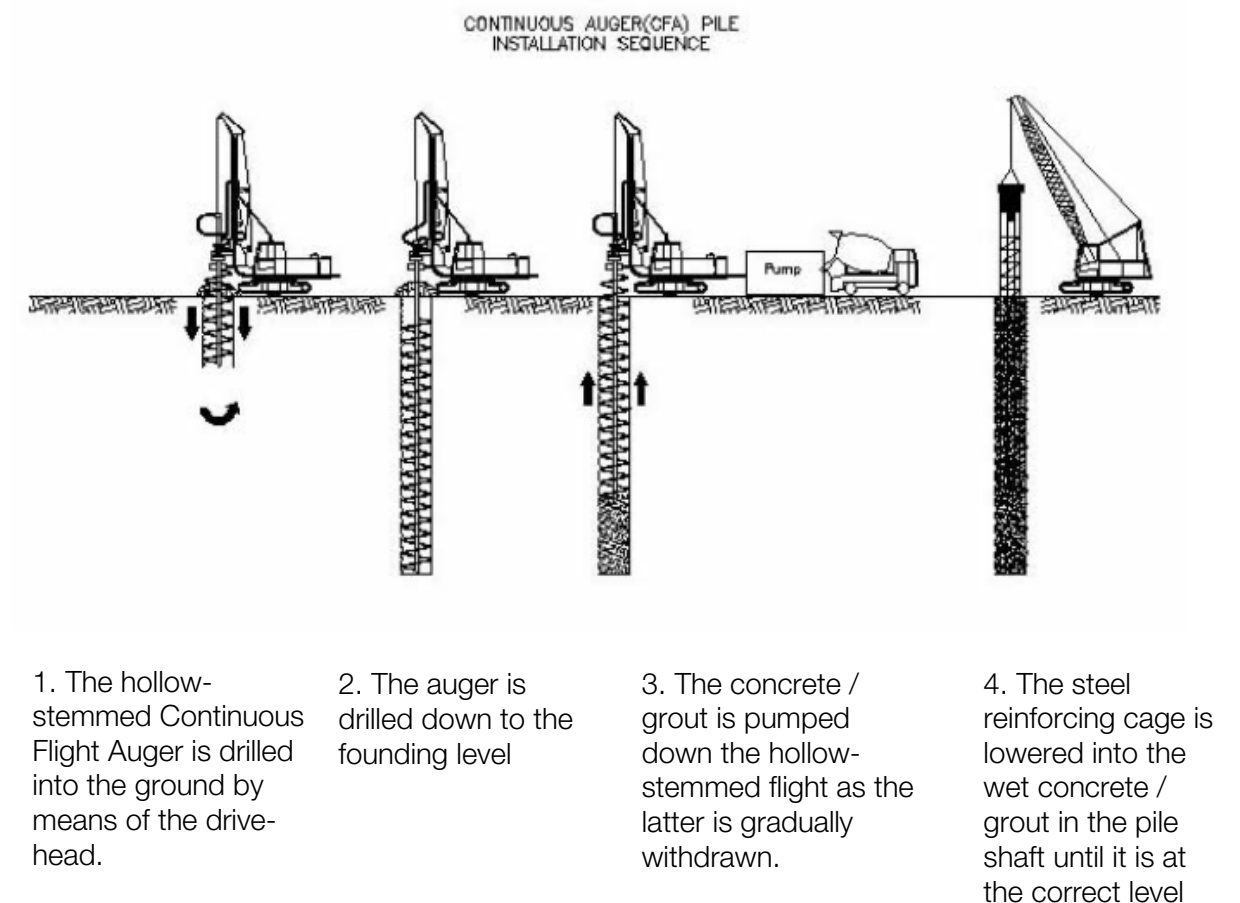
### 7.3.3 Basement Retaining Walls Internally and on Party Wall Lines

Given the nature and location of the site, it is proposed to construct the basement using a underpinned retaining wall with liner box. 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 4.4m deep sections, with suitable temporary works installed at the end of each stage to ensure no ground movements occur during excavation to the basement formation level.

### 7.3.4 Continuous flight auger (CFA) piles in Areas of the East and West (see Appendix A - Proposed Structural Drawings)

CFA piles (see figure below) are a common and efficient method of installing a piled wall. In addition, the CFA piling technique is almost vibration free and one of the quietest forms of piling, making it ideal for environmentally sensitive and built up areas. Adopting this approach will keep construction phase vibration to the practical minimum. The pile diameter is likely to be 600 diameter.



### 7.3.5 Basement Retaining Walls Adjacent to Party Wall Lines

Basement walls adjacent to Party Walls will be constructed in a manner that adequately supports and minimises settlements. This provides a robust boundary during construction and excavation of the basement, while also keeping noise and vibration to a practical minimum on sensitive party wall boundaries. The walls will be propped during construction, to keep ground movements within agreed limits.

7.3.5.1 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.

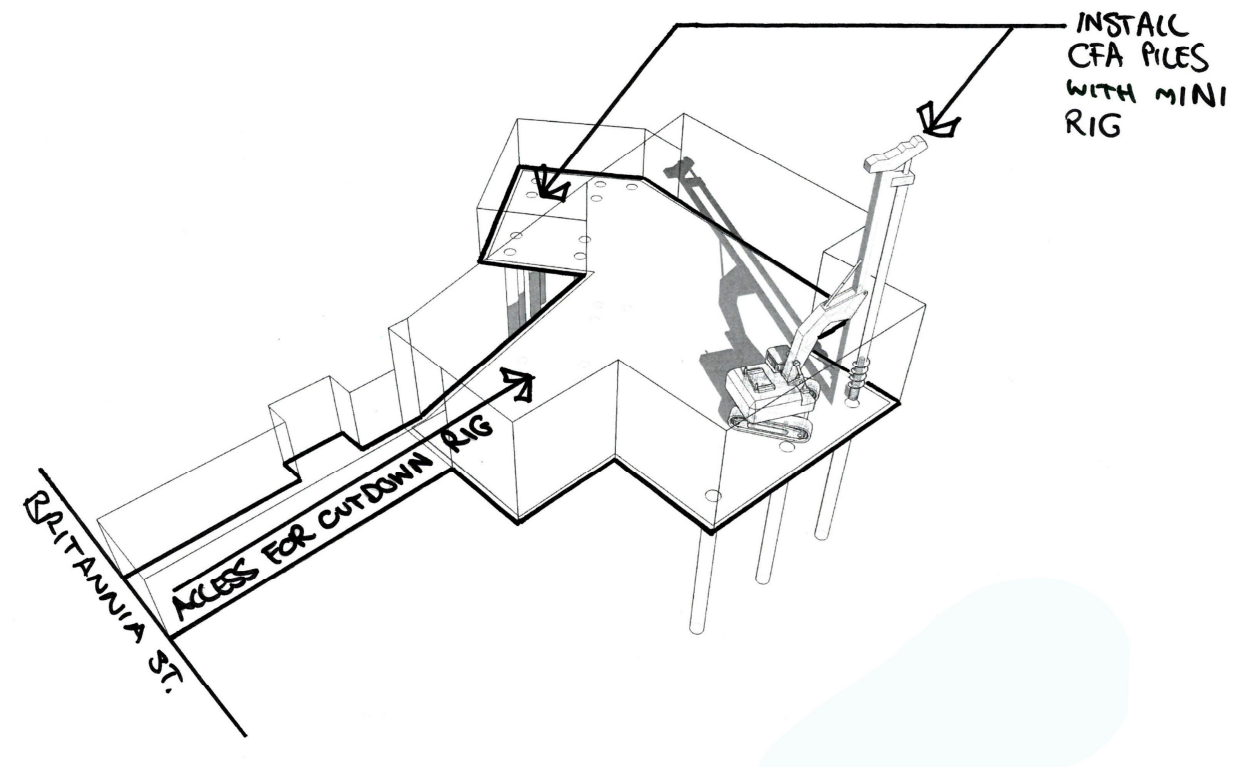
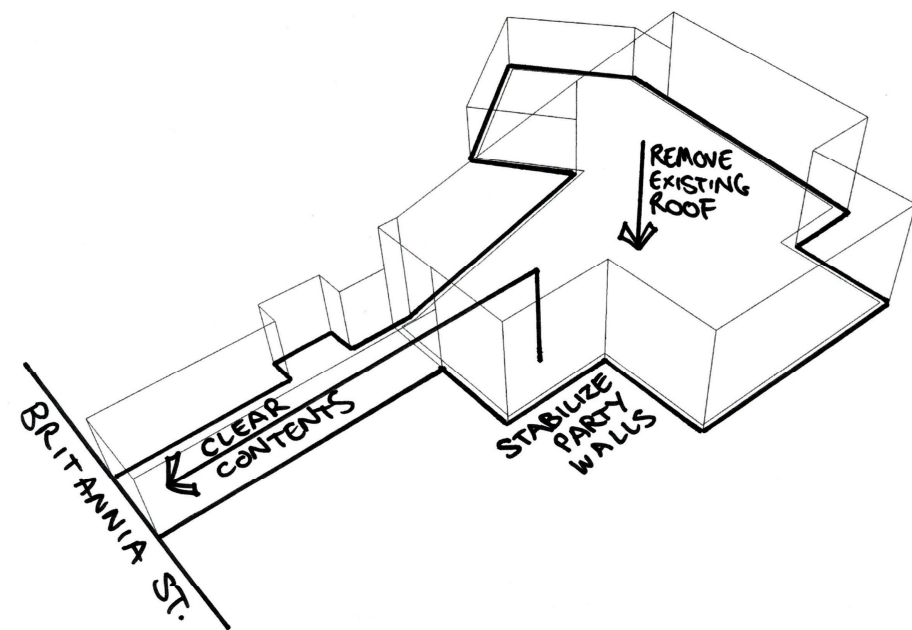
Grade	Example of use of structure	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use B) Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a drier environment (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 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. 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.

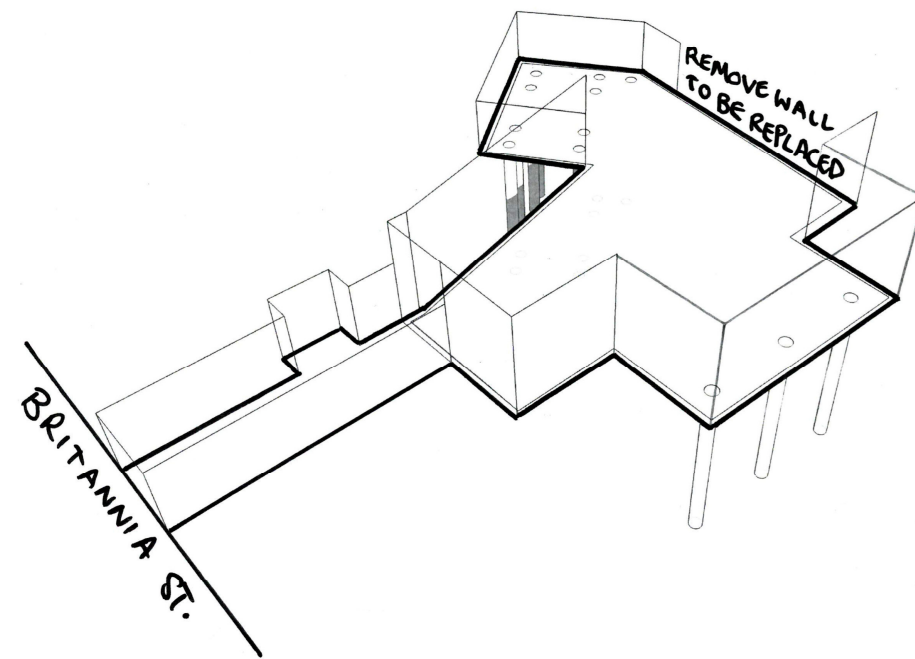


### 8.1 Site Clearance

- After the clearance of internal freestanding structure has been completed, roof removed, and the party wall stabilised, the site will be cleared and monitoring equipment will be installed
- Excavation plant will be brought on site and preliminary site set up will commence.

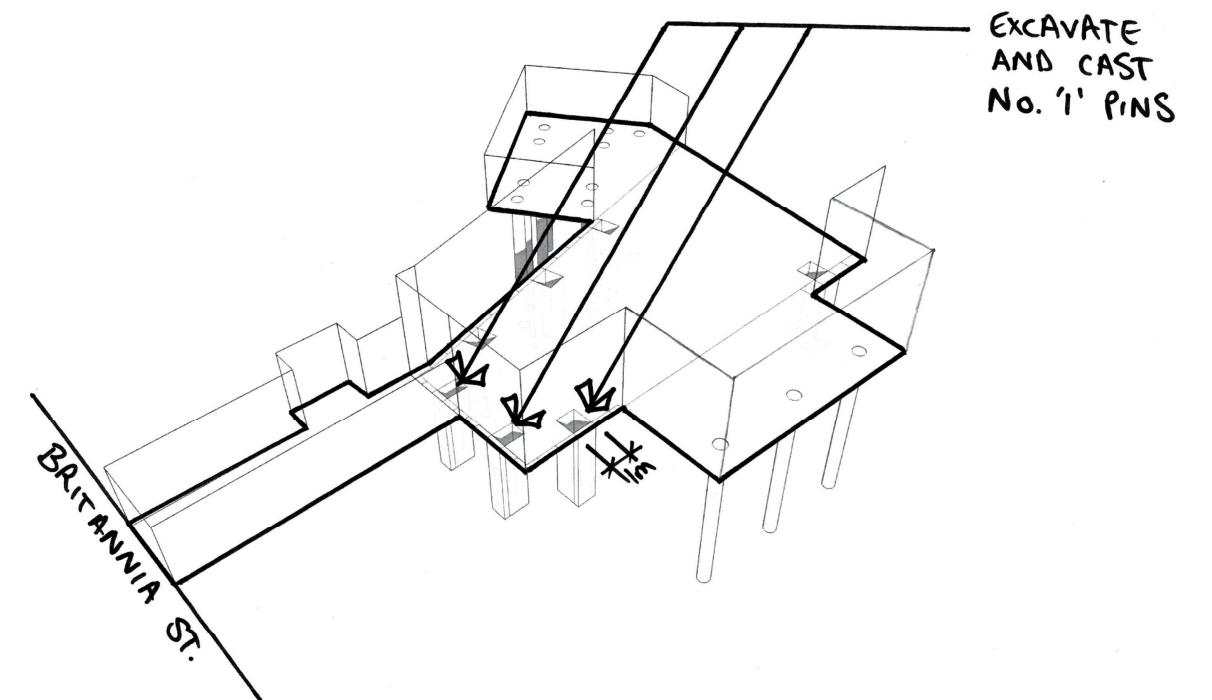
### 8.2 CFA Pile Installation

- A cut-down CFA rig will drive into site from Britannia Street
- Piles will be installed on the east and west ends of the site with suitable clearance from the partywalls.



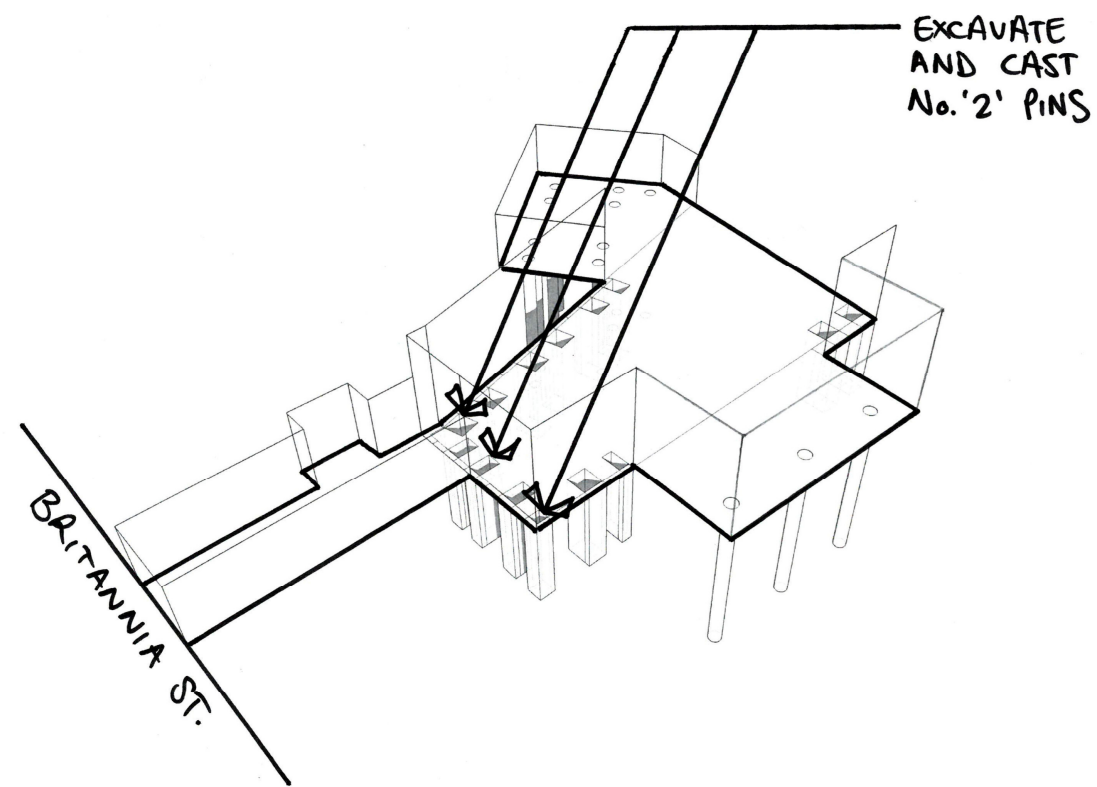
### 8.3 Removal of Existing Wall to be Replaced

- The existing wall to the south of the site which is replaced in the proposed scheme is 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.



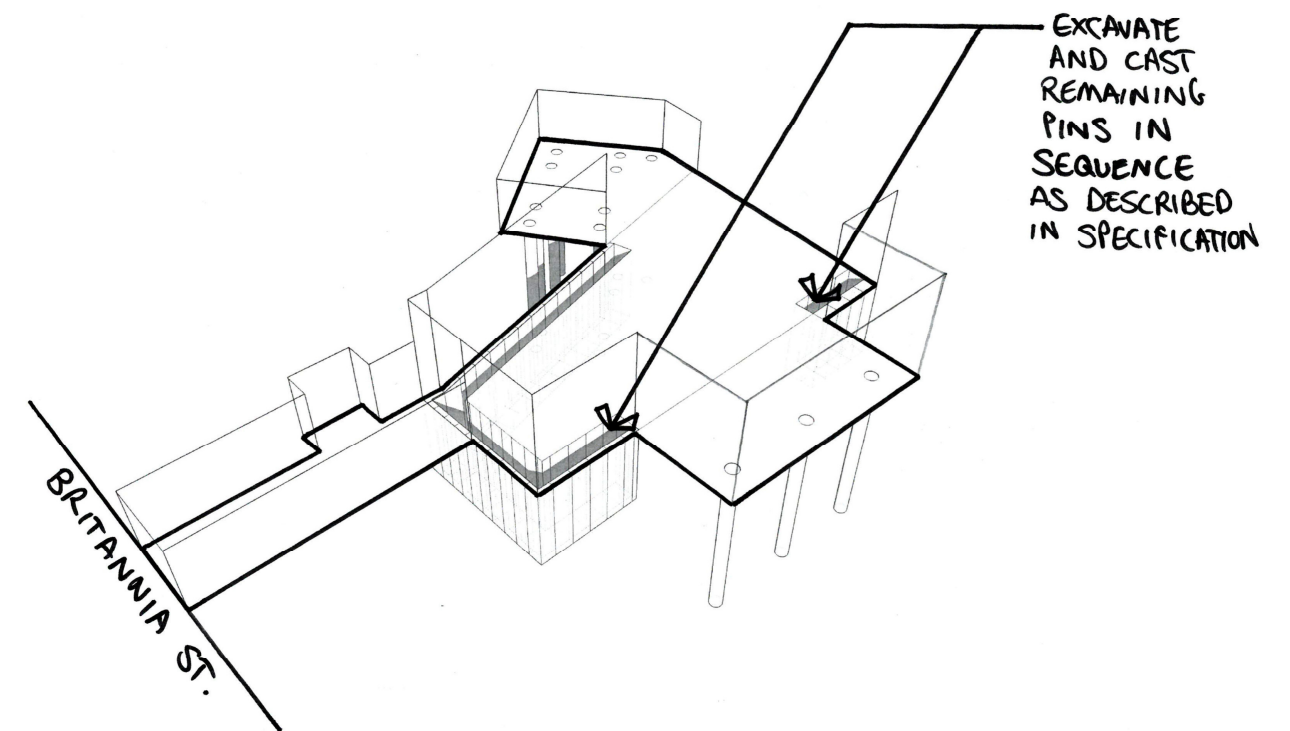
### 8.4 No. '1' Underpins

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



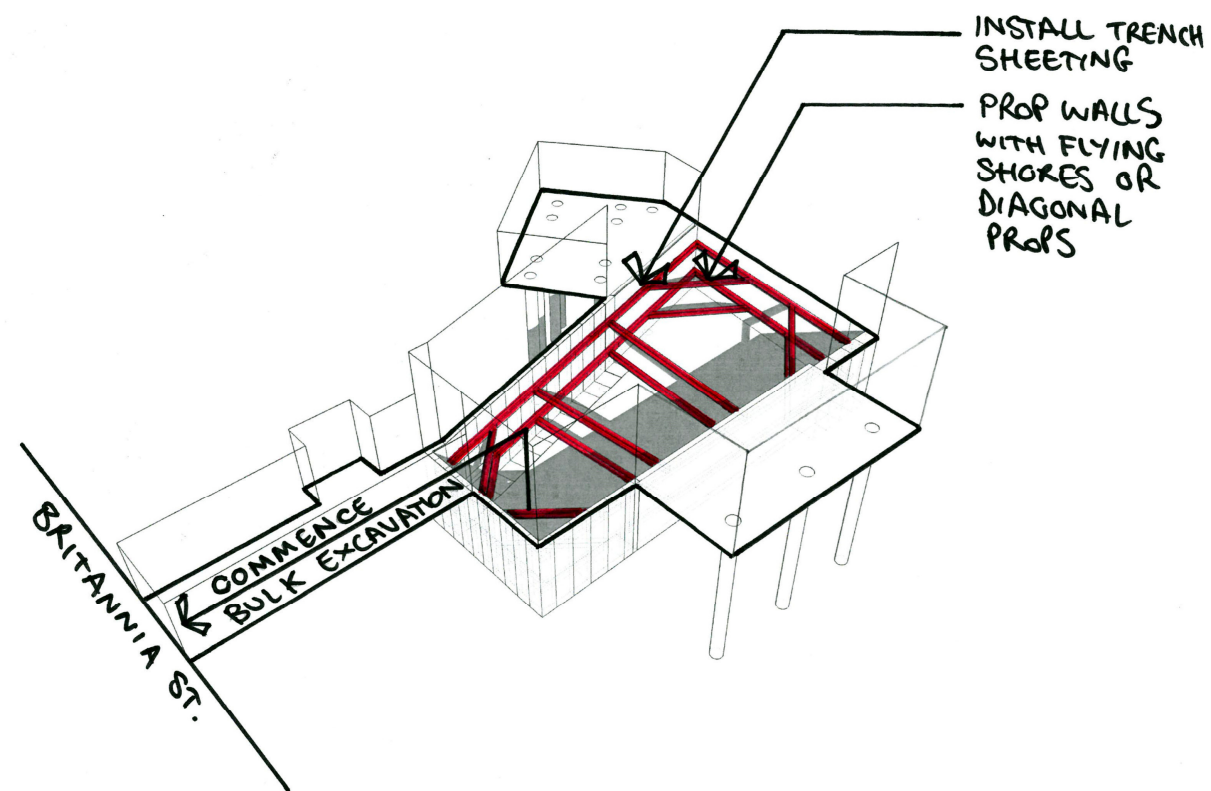
#### 8.5 No. '2' Underpins

- Once the No. '1' are complete the second series of pins will commence with the excavation of the 2<sup>nd</sup> series of pins.
- In the same fashion as the previous underpins, the concrete underpins will be cast and cured.



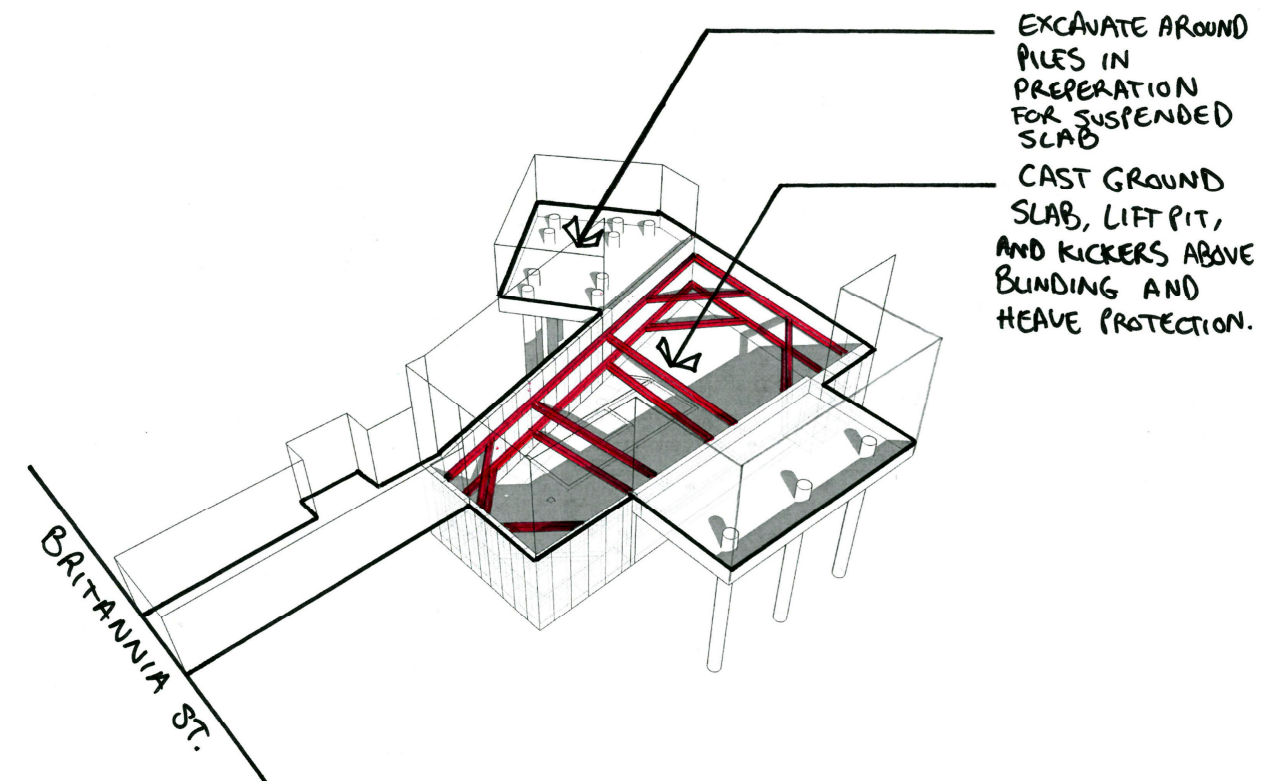
#### 8.6 Completion of Underpinning Sequence

- The No. 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



### 8.7 Bulk Excavation and Temporary Propping

- Following completion of the underpins, the excavation of the internal soil will begin.
- 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).
- Trench sheeting is installed against the earth where underpins are not required.
- Once this is complete the formation level is to be prepared for construction of the ground bearing Slab/Strips, all below slab elements to be installed.



### 8.8 Casting of the Basement Floor

- Once blinding layer and heave protection 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
- Earth is excavated from around the pile heads in preparation for the suspended ground level slab.