Providing Ground Solutions

Flower Island (UK) Ltd

52 Tottenham Street, London

Basement Impact Assessment

Revision 3

June, 2020

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Reference	CG/28961	Revision	0	Issue Date	arch 2019
			1		April 2020
					May 2020
					June 2020

Contents

FIGURES

APPENDICES

1. NON-TECHNICAL SUMMARY

Card Geotechnics Limited (CGL) has been instructed by Flower Island (UK) Ltd ("the Client") to undertake a Basement Impact Assessment (BIA) for a proposed development in the London Borough of Camden.

1.1. The site is located at 52 Tottenham Street, London, the site location is shown in Figure 1.

1.2. The site is rectangular in shape, covering an area of approximately 103m^2 and is currently occupied by a four storey building with a single basement across approximately 70% of the site. There is a single storey extension across the rest of the site to the rear of the main building, and vaults beneath the pavement.

1.3. The ground floor of the main four storey building is used as an office unit, and the top three storeys are residential units. The basement is used for commercial/office storage. There are two vaults beneath the pavement in front of the building, which are accessed via the basement of No. 52.

1.4. The proposed development comprises Redevelopment of the site, following demolition of the existing building, to provide a mixed use development comprising ground floor affordable workspace (Class B1), four residential units (Class C3) on the upper floors (3 x 1 Bed Units and 1 x 3 Bed Unit), alongside lower ground floor plant, cycle parking and refuse storage. There will be eleven storeys above ground, and the single storey lower ground floor basement will extend across the whole of the site footprint. Existing and selected proposed development drawings are included in Appendix A.

1.5. The existing building is approximately 5.7m wide, sandwiched between 30 Cleveland Street, to the west and north and the southern half of Arthur Stanley House at 40 – 50 Tottenham Street, to the east. The building fronts onto the pedestrian pavement of Tottenham Street along the southern boundary. Street level is at 27.2mOD. The current site layout is shown in Figure 2.

1.6. Arthur Stanley House (ASH) adjacent to No. 52 comprises a nine storey above ground reinforced concrete structure with a two storey basement. The building is supported at lower basement foundation level, and does not share a load bearing party wall with No. 52. There is a pre-existing party wall between ASH and No. 52 but it is understood the wall is not load bearing and will likely be removed during the development of No. 52. Trial pitting undertaken by the

structural engineers, TZG Partnership and intrusive investigations at ASH[1] indicate the party wall has been underpinned to the level of ASH lower basement. The lower basement level of ASH is at a level of 20.98mOD and has a floor slab approximately 400mm thick. The northern half of Arthur Stanley House, beyond the north east corner of the site boundary of No. 52, has full planning permission for development which will include installing a piled wall to facilitate lowering the existing basement around the perimeter of the northern half of the building, and construction of a new five storey building.

1.7. No. 30 Cleveland Street comprises an L-shaped building with seven storeys above ground and a single storey basement and abuts the site boundary of No. 52 to the west and north. No. 30 Cleveland Street lies just inside the boundary of City of Westminster. Drawings obtained from the City of Westminster's planning portal, presented in Appendix B, indicate No. 30 Cleveland Street has an existing Lower Ground Floor used for cycle storage/office. The lower ground floor slab is shown to be 3.0m bgl, approximately 24.20mOD. Trial pitting undertaken by the structural engineers indicate the party wall with 30 Cleveland Street is underpinned to a depth of 1.2m below the basement level of No. 52 to 24.03mOD[1].

1.8. Publicly available information[2] indicates there is a Thames Water Sewer running beneath Tottenham Street, parallel to the southern boundary of the site. An indicative line showing the location of the sewer is shown on the site layout in Figure 2.

1.9. The basement floor build-up will be 1.625m thick founded at a level of 22.72mOD and the finished floor level at 24.35mOD. The floor build up will comprise a hardcore, cellcore heave board and concrete blinding at the base with a combined thickness of 485mm, overlain by a 800mm thick concrete slab, overlain by insulation and flooring finishing materials with a combined thickness of 340mm. The existing basement floor level will be lowered by 0.88m from the existing level of 25.23mOD to 24.35mOD beneath the main building. The basement construction will necessitate underpinning No. 30 Cleveland Street and excavating alongside the foundations to Arthur Stanley House.

1.10. It is believed there is an infilled basement excavation, some 3.0m depth bgl, beneath the single storey extension to the rear of the main building where hand augering undertaken by the structural engineers proved Made Ground to around 3.0m below ground level to the top of the Lynch Hill Gravel Formation, and a trial pit proved the foundation to be at least 2.3m below ground level.

[1] TZG Partnership (March 2019) *(No. 52) Tottenham Street Stage 3 Report P1. Contract Ref. 6606*
[2] Hyne Tillet Steel (December 2017). *Arthur Stanley House Drainage Strategy Report. Planning Application Ref. 2018/4294P*

1.11. The existing basement slab is approximately 150mm thick, so the excavated soil to construct the new basement will be 2.36m thick, and 2.51m including the basement slab. The ground floor slab in the rear single storey extension is at 26.72mOD and 230mm thick. The thickness of soil to be excavated beneath the single storey extension will be 3.77m thick, and .00m including the ground floor slab. The level within the vaults is at 25.01mOD. Assuming there is no basement slab within the vaults at present, the thickness of soil to be excavated in the area of the vaults will be 2.29m.

1.12. A ground investigation was undertaken by CGL in 2018 at Arthur Stanley House, and the findings reported in a geotechnical and geoenvironmental interpretative report in February 2018[3]. Owing to the close proximity of the investigations it is reasonable to expect that the ground and groundwater conditions set out within that report will be representative of conditions beneath No. 52. Ground conditions comprise Lynch Hill Gravel over London Clay. The basement of Arthur Stanley House is within the Lynch Hill Gravel which is 6.08m to 2.58m thick beneath the lower basement to the top of the London Clay which is at a level varying between 14.5mOD and 18.4mOD.

1.13. The London Clay Formation is classified as a non-productive stratum and the Lynch Hill Gravel Member is classified a Secondary 'A' Aquifer. As the proposed basement excavation will be above the highest monitored groundwater level of 21.0mOD, no significant groundwater is expected to be encountered, other than possible perched water within Made Ground and claystone/sand lenses within the London Clay (if present).

1.14. A Basement Impact Assessment (BIA) has been undertaken to assess the impacts of the proposed development on neighbouring structures. Predicted building damage is Category 0 (negligible) on the Burland Scale.

1.15. A structural monitoring strategy will be implemented to control the works and impacts to neighbouring structures and will comprise installing survey targets along the faces of adjacent buildings. Prior to construction commencing, baseline survey readings should be established and a condition survey should be undertaken of adjacent buildings with any cracks and defects recorded and monitored during construction stages. A mitigation strategy should be prepared in advance of construction and implemented should unacceptable movements occur.

[3] CGL. (February 2018). *Arthur Stanley House, Tottenham Street. Geotechnical and Geoenvironmental Interpretative Report. Ref. CGL/09198A. Planning Application Ref. 2018/4297/P*

1.16. The BIA has identified no potential hydrogeological impacts and no impacts to the wider hydrogeological environment.

1.17. The BIA has identified a very low flood risk for the proposed development and no impacts to the wider hydrological environment.

2. INTRODUCTION

Card Geotechnics Limited (CGL) has been instructed by Flower Island (UK) Ltd ("the Client") to undertake a Basement Impact Assessment (BIA) for the proposed development at 52 Tottenham Street, Camden, London, W1T 4RN. The purpose of this assessment is to consider the effects of the proposed development, which includes lowering and extending to the rear the existing single storey basement, on the local hydrology, hydrogeology, geology and potential impacts to neighbours and the wider environment.

The BIA approach follows the current planning procedure for basements and lightwells adopted by the London Borough of Camden[4] and accompanying Supplementary Planning Document (SPD)[5] and comprises the following elements (CPG Basement):

- Desk Study;
- Screening;
- Scoping;
- Site Investigation, interpretation and ground movement assessment;
- Impact Assessment.

2.1 Sources of Information

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- CGL's Basement Impact Assessment (November 2017)[6] and Geotechnical and Geoenvironmental Interpretative Report (Feb18)[7] for Arthur Stanley House adjacent to No. 52;
- Existing and proposed development drawings (see Appendix A);
- Adjacent buildings historical drawings (see Appendix B)
- Drainage Strategy Report for Arthur Stanley House[2]

[4] Camden Council. (2018). *Camden Planning Guidance – Basements and Lightwells.* (March 2018)
[5] Camden Council. (2017). *Camden Planning Guidance.* (November 2017)
[6] CGL. (November 2017). *Arthur Stanley House, Tottenham Street. Basement Impact Assessment. Ref. CGL/09198A_Arthur Stanley House Planning Application Ref. 2017/4306/P*
[7] CGL. (February 2018). *Arthur Stanley House, Tottenham Street. Geotechnical and Geoenvironmental Report. Ref. CGL/09198A Planning Application Ref. 2018/44297/P*

- British Geological Survey Mapping and historical borehole records (see Plate 1, Plate 2 and Appendix C);
- TZG Partnership (the project structural engineer) (No. 52) Tottenham Street Stage 3 Report[1] (see Appendix D)
- Hydrogeological data (Natural England. 2019. Magic Map Application. [ONLINE] Available at https://magic.defra.gov.uk/MagicMap.aspx. [Accessed 1 March 2019]);
- Current/historical hydrological data (Barton, N., 1992. The Lost Rivers of London: A Study of Their Effects Upon London and Londoners, and the Effects of London and Londoners on Them. 3rd ed. Whitstable, Kent: Historical Publications Ltd.);
- Flood risk mapping (Environment Agency. 2019. Flood map for planning. [ONLINE] Available at: https://flood-map-for-planning.service.gov.uk/. [Accessed 1 March 2019].);
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) – Basements (March 2018);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);

2.2 Site layout

The site is located at 52 Tottenham Street, Camden, London, W1T 4RN, within the London Borough of Camden. The site location is shown in Figure 1.

The site is approximately 5.7m wide, sandwiched between 30 Cleveland Street to the west, and Arthur Stanley House at 40 – 50 Tottenham Street to the east. The current site layout is shown in Figure 2.

The site is rectangular in shape, covering an area of approximately 103m^2 and is currently occupied by a four storey building with a single basement across approximately 70% of the site. There is a single storey extension across the rest of the site to the rear of the main building, and vaults beneath the pavement. The site is not within a wider hillside setting.

The existing ground floor level of No. 52 is at 27.79mOD and the existing basement is currently at a level of 25.23mOD. The ground floor of the existing building is used as an office unit, and the top three storeys are in residential units. The basement is used for commercial/office storage. To the rear of the main building, there is a single storey extension. It is believed there is an infilled basement excavation, some 3.0m depth bgl, beneath this extension. There are two vaults beneath the pavement in front of the building, which are accessed via the basement of No. 52 which have a floor level of around 25.01mOD.

Arthur Stanley House is a nine storey rectangular reinforced concrete structure with a two storey basement. The lower basement level is at a level of 20.98mOD and has a floor slab is approximately 400mm thick. The northern half of Arthur Stanley House, at the north east corner of the site boundary of No. 52, has full planning permission for redevelopment which will include installing a piled wall around the perimeter of the northern half of the building to facilitate lowering the existing basement to between 20.1mOD and 18.8mOD, and construction of a new five storey residential building.

No. 30 Cleveland Street comprises a seven storey L-shaped building such that it abuts No. 52 to the west and north of the site boundary with No. 52. No. 30 Cleveland Street lies just outside the London Borough of Camden, within the City of Westminster. Drawings obtained from the City of Westminster's planning portal, presented in Appendix B, indicate No. 30 Cleveland Street has an existing Lower Ground Floor used for cycle storage/office. The lower ground floor slab is shown to be 3.0m bgl or approximately 24.20mOD.

The neighbouring structures are not listed.

Publicly available information[2] indicates there is a Thames Water Sewer running beneath Tottenham Street. The report states the sewer is 1219mm x 813mm but does not give the exact location or invert level of the sewer near No. 52. An indicative line showing the location of the sewer is shown on the site layout plan in Figure 2.

2.3 Proposed development

The proposed development comprises redevelopment of the site, following demolition of the existing building, to provide a mixed use development comprising ground floor affordable workspace (Class B1), four residential units (Class C3) on the upper floors (3 x 1 Bed Units and 1 x 3 Bed Unit), alongside lower ground floor plant, cycle parking and refuse storage.

The development will create eleven storeys above ground, and a new basement across the full footprint of the new building and site. Construction of the new basement will entail excavation to formation level of 22.72mOD. The new basement floor will be 1.625m thick comprising a hardcore,

cellcore heave board and concrete blinding at the base with a combined thickness of 485mm, overlain by a 800mm thick concrete slab, overlain by insulation and flooring finishing materials with a combined thickness of 340mm.

The existing basement level will be lowered by 0.88m from the existing level of 25.23mOD to 24.35mOD beneath the main building. The basement construction will necessitate underpinning No. 30 Cleveland Street and excavating alongside the foundations to Arthur Stanley House.

The existing basement slab is approximately 150mm thick, so the excavated soil to construct the new basement will be 2.36m thick, and 2.51m including the basement slab. The ground floor slab in the rear single storey extension is at 26.72mOD and 230mm thick. The thickness of soil to be excavated beneath the single storey extension will be 3.77m thick, and 4.00m including the ground floor slab. The level within the vaults is at 25.01mOD. Assuming there is no basement slab within the vaults at present, the thickness of soil to be excavated in the area of the vaults will be 2.29m.

Existing and selected proposed development drawings are included in Appendix A.

The two storey basement slab level at Arthur Stanley House is at 20.98mOD and the lower ground floor level at 30 Cleveland Street is estimated to be at 24.20mOD. Therefore, the excavation to formation for the new basement at No. 52 will be 1.74m above the basement level of Arthur Stanley House, and 1.48m below the basement level of 30 Cleveland Street. It is therefore probable that only foundations for 30 Cleveland Street will require underpinning, if the foundations of the building do not extend the depth of the new proposed basement, or are not piled.

It is anticipated the new building at No. 52 will be founded on a piled foundations. Piles cast in-situ, Continuous Flight Auger (CFA) or bored would be suitable to support the applied loads.

The proposed construction methodology is presented in the TZG Partnership Stage 3 report[1]. The basement excavation will be supported by installing a sequence of portal framework within the existing building prior to excavation. Following the excavation the existing building will be demolished leaving the supporting framework in place to install the piles and basement slab, and construct the new building.

3. DESK STUDY

3.1 Site History

The historical development of the site and the surrounding area has been traced from extracts of Ordnance Survey maps dating from 1872 to 1995 and are presented in the CGL Interpretative Report[3]. A summary of the historical Ordnance Survey maps is presented below.

A building was present at the site from 1872, with a similar footprint as currently present today. A courtyard is present to the rear of the site and the site is bounded by buildings to the rear, east and west. The pavement and Tottenham Street are present to at the front of the property. There is a small outbuilding shown to the rear of the courtyard between 1896 and 1995. The area to the west and east of No.52 were occupied by a number of buildings.

From available bomb damage maps[8],[9] the structure at the southeast corner of the site was damaged beyond repair, while the surrounding structures sustained minor blast damage. The Bombsight.org (free online resource)[9] identified that 17 high explosive bombs were dropped within approximately 250m of the site. The bomb damaged building is shown as a 'Ruin' on maps between 1951 and 1962. By 1968 the buildings to the west have been demolished and Arthur Stanley House constructed. A single storey extension was constructed after the Second World War, to the rear of the site.

3.2 Published and Unpublished Geology

The British Geological Survey (BGS) geological sheet[10] indicates that the site is underlain by the bedrock geology of the London Clay Formation (London Clay). Superficial deposits comprising the Lynch Hill Gravel Member (Lynch Hill Gravel) are mapped across the site and surrounding area. Extracts from the superficial and bedrock geology sheets are presented Plate 1 and Plate 2, respectively. The Lynch Hill Gravel Formation typically comprises sand and gravel with occasional lenses of silt, clay or peat. The London Clay comprises overconsolidated, fissured, stiff to very stiff, silty clays. A weathered profile characterised by orange brown colour and reduced shear strength is typically present at the top of the London Clay.

Plate 1. Bedrock and Superficial Geology – extract from Geology of Britain Viewer[11] [accessed February 2019]

[8] London Topographical Society, 2005. The London County Council bomb damage maps 1939 – 1945.
[9] www.bombsight.org (Accessed 03 March 2019).
[10] BGS. (2006). *North London*. England & Wales Sheet 256. Bedrock and Superficial edition. 1:50,000.
[11] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

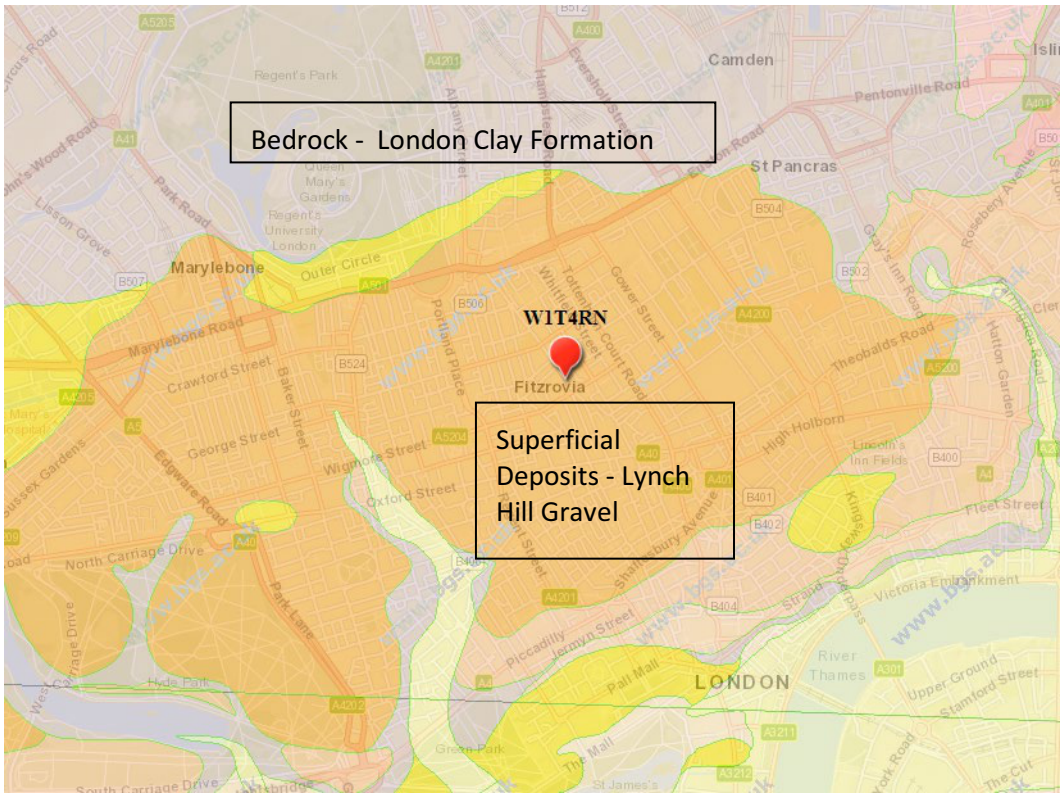
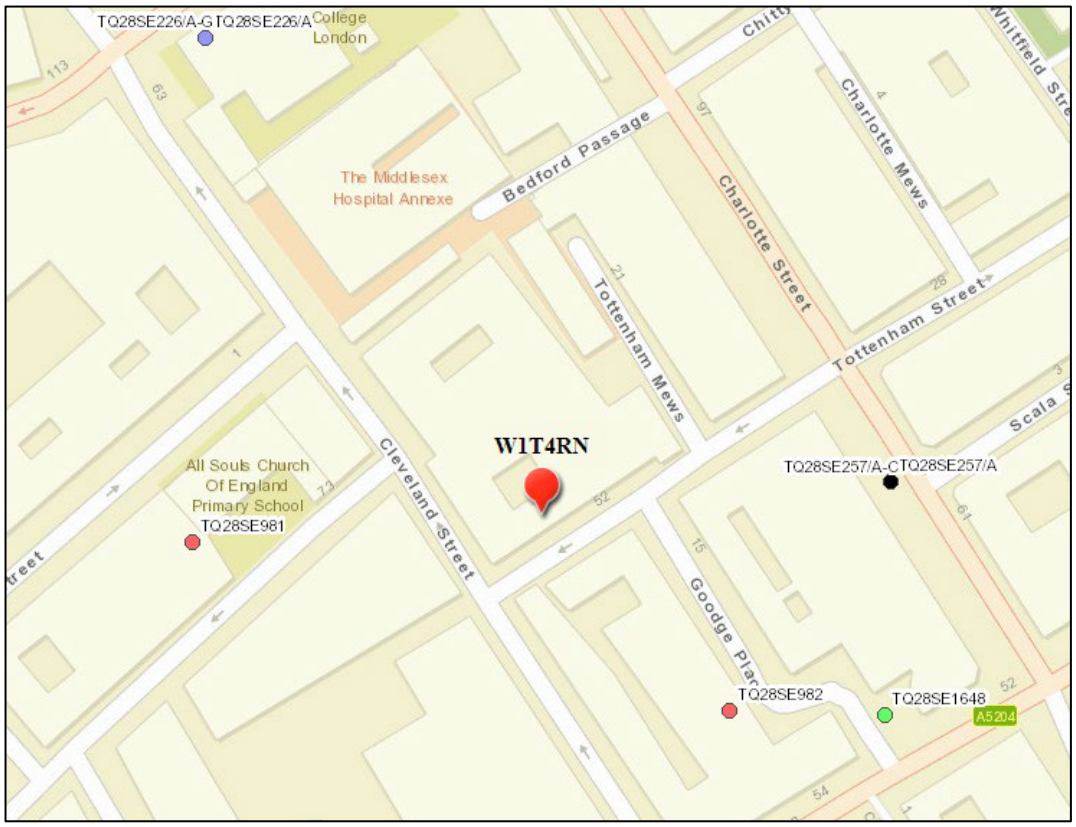


Plate 2. BGS Location Plan – extract from Geology of Britain Viewer[11] [accessed February 2019]



3.3 Hydrogeology

Information provided by Natural England[12] indicates that the London Clay is a non-productive stratum. The Lynch Hill Gravel overlying the London Clay is designated a Secondary (A) Aquifer. The site is not within a groundwater source protection zone[12].

The groundwater is anticipated to be within the Lynch Hill Gravel and therefore relatively shallow. Further details on anticipated groundwater levels are given in Section 7.6.

3.4 Hydrology, Drainage and Flood Risk

3.4.1 *Hydrology*

A summary of the hydrological setting for the site is presented below, and is based on information drawn from published data and documents listed in Section 2.1.

- There are no significant surface water bodies present in the vicinity of the site.
- The course of the former River Fleet site is located approximately 435m northeast of the site.
- The site is not located within catchment of the Hampstead Heath Pond Chain, which is some 4.8km to the north-west of the site.

3.4.2 *Flood Risk*

A summary of the flood risk for the site is presented below, and is based on information drawn from published data and documents listed in Section 2.1:-

- The site is located in a Flood Zone 1 and is not at risk of flooding from watercourse or tidal flooding, with no restrictions to development (Environment Agency's Flood Map for Planning);
- The site is in an area with no recorded historic groundwater events and is not susceptible to elevated groundwater levels (Figure 4e of Camden's SFRA-Appendix B), the groundwater flood risk is therefore considered negligible;
- The site is at very low risk of surface flooding, the flood risk from surface water and overland flows is considered very low (Environment Agency's indicative Surface Water Flooding Map);
- The site is not at risk of reservoir flooding (Environment Agency's Risk of Reservoir Flooding Map);

[12] Natural England. 2019. *Magic Map Application.* [ONLINE] Available at https://magic.defra.gov.uk/MagicMap.aspx. [Accessed 10 January 2019]

3.4.3 *Drainage*

- The site is not located in a Critical Drainage Area or in a local flood risk zone. (Figure 6 of Camden's SFRA-Appendix B);

- The existing site surface is covered with the existing main building and single storey extension to the rear. There are no areas of permeable surfaces on the site.

- The proposed development involves no material change to the proportion of impermeable/permeably surfaces.

4. SCREENING

4.1 Introduction

A screening assessment has been undertaken to assess the potential risk posed to local hydrology, hydrogeology and land stability. The assessment is undertaken in the form of a series of tables, setting out the questions with regard to the primary concerns associated with the proposed construction. Where 'yes' or 'unknown' can be simply answered with no analysis, there answers have been provided.

4.2 Subterranean (groundwater) flow

This section answers questions relating to subterranean (groundwater) flow in Table 1 below.

Table 1. Subterranean (groundwater) flow

Question	*Response*	*Details*	*Action Required*
1a. Is the site location directly above an aquifer?	Yes.	The site is located above the Lynch Hill Gravel Member - a Secondary (A) Aquifer which lies above the London Clay Formation– a non-aquifer. Groundwater monitoring indicates the groundwater level to be around 21.0mOD so the basement will be above the groundwater level and will not affect or be affected by groundwater flow or water quality/recharge. Therefore no further investigation or impact assessment is required.	None
1b. Will the proposed basement extend beneath the water table surface?	No.	Groundwater is anticipated to be present within the Lynch Hill Gravel Member but below the depth of the basement excavation. The basement formation level will be at 22.72mOD, groundwater monitoring indicates the groundwater level to be around 21.0mOD, 1.72m below the basement formation level. Some limited perched water may be present within the Made Ground (if present).	None
2. Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	The nearest watercourse is the River Fleet, a Lost River of London, which is located approximately 435m northeast of the site.	None
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No.	The Hampstead Heath ponds are located 4.8km to the north-west of the site.	None
4. Will the proposed basement development results in a change in the proportion of hard surface/paved areas?	No.	There is a four storey building with a single storey basement occupying approximately 70% of the site, and a rear single storey extension with a flat roof occupying the remainder of the site. The proposed development will see no change in the existing extent of hard surfaces.	None
5. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No.	Currently the site is covered by the existing building and a flat roofed single storey extension. No soakaways will be constructed. Surface water management systems are to be incorporated into the new development to ensure that post development surface water run-off rates do not exceed the pre-development run-off rates.	None
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any pond (not just the pond chains at Hampstead Heath) or spring line?	No.	There are no known ponds or spring lines in the vicinity of the proposed development.	None

In summary, groundwater is present in the Lynch Hill Gravel Member, but below the level of the basement and therefore will not affect/be affected by the proposed basement extension. There will be no change in hardstanding therefore no change in infiltration characteristics of the site.

4.3 Slope Stability

This section answers questions relating to slope or land stability in Table 2 below.

Table 2. Slope stability

Question	*Response*	*Details*	*Action Required*
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No.	The topography is generally level.	None
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No.	No proposed or other slopes are proposed at the site.	None
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater and 7 degrees (approximately 1 in 8)?	No.	There are no railway cuttings/embankments near the site.	None
4. Is the site within a wider hillside setting that is greater than 7 degrees (approximately 1 in 8)?	No.	The surrounding area is generally flat.	None
5. Is the London Clay the shallowest strata at the site?	No.	The site is underlain by the Lynch Hill Gravel Member, over the London Clay Formation is at 17.9mOD, 9.3m below ground level (bgl).	None.
6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained?	No.	There are no trees present on the site.	None
7. Is there a history of shrink-swell subsidence in the local area and/or evidence of such effects at the site?	Unknown.	There is negligible risk of shrink/swell as the proposed development/excavation will not extend into the London Clay Formation and the London Clay Formation is not at a shallow depth.	None
8. Is the site within 100m of a watercourse or a potential spring line?	No.	The nearest watercourse is the lost River Fleet which is located approximately 215m to the north-west of the site.	None
9. Is the site within an area of previously worked ground?	No.	Localised Made Ground is anticipated based on the site's situation and historical use, however it is not in a wider area of worked ground.	None
10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No.	Excavation will be within the Lynch Hill Gravel Member – a Secondary (A) Aquifer. The excavation will not extend beneath the water table. Some localised dewatering may be required if perched Water is encountered within Made Ground (if present).	None
11. Is the site within 50m of the Hampstead Heath Ponds?	No.	The Hampstead Heath ponds are 4.8km north-west of the site.	None
12. Is the site within 5m of a highway or pedestrian right of way?	Yes.	No. 52 Tottenham Street fronts directly onto a pedestrian footpath and Tottenham Street. .	Impact Assessment
13. Will the proposed basement significantly increase the differential depth of foundations relative to the neighbouring properties?	Yes.	The proposed development will involve lowering the existing single storey basement by 0.88m and extending the basement area across the footprint of the site. The proposed formation level of the basement will be 2.72mOD. The neighbouring property of Arthur Stanley House has two storey basement deeper than the proposed basement level at No. 52, at 20.98mOD. There is a lower ground floor at the other neighbouring property, 30 Cleveland Street, which has an estimated slab level of 24.20mOD, 1.48m higher than formation level of the proposed basement formation level at No. 52.	Impact Assessment

Question	*Response*	*Details*	*Action Required*
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines	No	The closest underground tunnels are LUL Edgware-Morden and Royal Mail Underground Railway 1 217m northeast of the site. There is a Thames Water Sewer beneath Tottenham Street offset approximately 5.3m from the southern site boundary. The sewer is outside the zone of influence of the proposed basement excavation and therefore the basement construction is not expected to impact the asset.	None

In summary, a site investigation is required to confirm ground and groundwater conditions. A ground movement assessment should be undertaken to determine the impact on surrounding buildings and infrastructure.

4.4 Surface water and Flooding

This section answers questions relating to surface water and flooding in Table 3 below.

Table 3. Surface water and flooding

Question	*Response*	*Details*	*Action Required*
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	No.	The Hampstead Heath ponds are located 4.8km north-west of the site.	None
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No.	The proposed development will not result in a change the existing route for surface water run-off.	None
3. Will be proposed basement development results in a change in the proportion of hard surfaced /paved external areas?	No.	The proposed development will not result in a change of the amount of hard surfaces across the site.	None
4. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No.	The existing site is covered by hard surfaces and the proposed development involves no change in surface water received by adjacent properties or watercourses.	None
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No..	The existing basement is currently used for storage for the commercial office at ground floor level. The new basement will not result in a detrimental change to the quality of surface water.	None
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	No.	The site is located in an area of 'Low' flood risk in accordance with Environment Agency mapping.	None

In summary, the proposed development will not result in a change in surface water infiltration as it is not anticipated the run-off/surface attenuation characteristics will change. The site is not located within a flood risk area. It is therefore considered that no further assessment is required in relation to surface water flow and flooding.

4.5 Non-Technical Summary of Screening Process

Based on the screening exercise a Basement Impact Assessment is required for this site which will address the following:

- Slope/Land Stability – An investigation to confirm the ground conditions including the geotechnical parameters of the ground and groundwater conditions;
- Slope/Land Stability – Assessment of the potential ground movements across the neighbouring properties of 30 Cleveland Street and Arthur Stanley House and building damage category;
- Slope/Land Stability – Assessment of the potential ground movements from the proposed development across the pedestrian footpath and highway;
- Slope/Land Stability – An assessment to determine the impact on the Thames Water Sewer;

The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

5. SCOPING

5.1 Introduction

The following issues have been brought forward from the Screening process for further assessment. It is considered that the development proposals can be suitably designed to maintain stability. In order to demonstrate this, the findings of a ground investigation undertaken for the redevelopment of Arthur Stanley House (ASH), adjacent to No. 52, have been utilised in lieu of undertaking site specific ground investigation. A summary of the ASH ground investigation is presented in Section 6 of this report, and structural information is presented in Section 8. A ground movement and damage impact assessment presented in Section 9 of this report. Conclusions of the impact assessment are provided in Section 12 of this report.

5.2 Slope/Land Stability – No. 30 Cleveland Street

The basement level of No. 30 Cleveland Street will be approximately 1.48m higher than formation level of the proposed basement formation level at No. 52. Construction and excavation activities will cause ground movements that have the potential to damage existing, neighbouring structures.

5.3 Slope/Land Stability –Tottenham Street and pavement

The proposed development will result in lateral and vertical ground movements associated with heave due to basement excavation and retaining wall installation movements and deflections that may impact on the pavement and road of Tottenham Street.

6. SITE INVESTIGATION & ADDITIONAL ASSESSMENTS

A site investigation was undertaken by CGL between 2nd and 24th January 2018 to provide further information to undertake a ground movement assessment for the Arthur Stanley redevelopment. The CGL investigation comprised the excavation of four exploratory boreholes also undertaken from the lower basement level of Arthur Stanley House. Ground conditions encountered below the lower basement level were broadly consistent with published geology. Detailed information regarding the CGL investigation have been obtained from the London Borough of Camden Planning Portal Planning Application Reference 2018/44297/P [7]. The site investigation was undertaken broadly in accordance with the principles set out by BS 5930:2015.[13]

[13] BS5930:2015. *Code of Practice for Ground Investigations.*

7. GROUND AND GROUNDWATER CONDITIONS

7.1 Summary

The ground conditions encountered during the CGL investigation are summarised in Table 4 below. Depths are given as metres below ground level (mbgl). Exploratory hole location plans for the CGL investigation are shown on the site layout plan in Figure 2.

Table 4. Ground Conditions Summary from adjacent site.

Stratum	*Depth to Top of Stratum (mbgl) [mOD]*	*Typical Thickness (m)*
Reinforced concrete (Ground level). (All exploratory holes)	(0) [27.47 to 27.53]	(0.3 to 0.35)
Reinforced concrete (Lower Basement Slab). (All exploratory holes)	(6.5) [20.97 – 21.03]	(0.4 to 1.2)
Firm dark brownish gravelly clay becoming medium dense clayey gravel. Gravel is fine to coarse angular to sub-angular of brick, concrete and flint. (CGL BH5 only) **[MADE GROUND]**	(6.9) [20.63]	(1.2)
Medium dense to very dense dark orange and yellowish brown sandy GRAVEL. Gravel is fine to coarse sub-angular to rounded flint. Common sub-rounded cobbles of flint between 8.7-9mbgl (CGL BH5 only) Stiff dark orange brown slightly gravelly CLAY encountered in bottom 0.1m to 0.4m thick. (All exploratory holes) **[LYNCH HILL GRAVEL MEMBER]**	(6.9 to 8.1) [19.43 to 20.63]	(1.8 to 4.9)
Stiff becoming very stiff dark orange brown becoming dark grey closely fissured silty CLAY with occasional partings of fine silty sand. Occasional coarse selenite crystals throughout. (All exploratory holes) Horizons of claystone encountered between 13.1mOD to 14.9mOD, 0.1m to 0.2m thick (CGL BH1, BH3, BH4 only). **[LONDON CLAY FORMATION]**	(9.1 to 13.0) [14.53 to 18.42]	(16.6 to 17.5) Proven in BH1 and BH3 only
Hard dark blue grey mottled brownish red slightly sandy silty CLAY with occasional partings of fine sand. Rare shell fragments above -0.5m OD to 0.1mOD. (CGL BH1 and BH3 only) **Reading Formation (Undifferentiated) –** **[LAMBETH GROUP]**	(25.9 to 26.8) [0.73 to 1.73]	(3.7 to 5.3)
Hard dark grey mottled yellowish brown slightly sandy CLAY with rare calcareous horizons. (CGL BH1 and BH3 only) **Reading Formation (Undifferentiated) –** **[LAMBETH GROUP]**	(30.3 to 30.5) [-2.83 to -2.97]	Thickness not Proven (5.7m recorded to -8.53mOD)

7.2 Made Ground

Made Ground was only encountered in borehole CGL BH5, between 20.6mOD and 19.4mOD, 1.2m thick, immediately underlying the lower basement slab. It is considered, based on the soil description alongside chemical and geotechnical laboratory testing, that this is reworked Lynch Hill Gravel Member (Lynch Hill Gravel) and London Clay Formation (London Clay) that was disturbed during construction of the existing basement on site. The Made Ground encountered comprised a firm dark brownish gravelly clay becoming medium dense clayey gravel.

Hand augering undertaken by structural engineers TZG Partnership to the rear of No. 52 proved Made Ground to a depth at approximately the same level as the existing basement level 25.0mOD, before encountering sand and gravel, possibly the top of the Lynch Hill Gravel.

Made Ground encountered in the BGS borehole logs varied in thickness between 2.2m and 7.3m, see borehole logs in Appendix C.Made Ground encountered in TZG Partnership's trial holes and hand augers was found to be a 'firm slightly gravelly clay', and was described as 'soft' beneath the single storey extension.

7.3 Lynch Hill Gravel Member

The Lynch Hill Gravel was encountered in all boreholes, beneath the slab in the CGL boreholes BH1 to BH4 and beneath the Made Ground in BH5, to a maximum depth of approximately 3m below lower basement level.

The stratum was found to generally comprise fine to coarse sand and fine to coarse gravel of flint (sand percentage varying from 27% to 97% in particle size distribution testing).

SPT 'N' values ranged between 7 and 27, corresponding to a loose to medium dense soil. This range is lower than typically expected for the Lynch Hill Gravel, considered likely to be due to the presence of water under pressure during the borehole drilling.

The depth to the surface of the London Clay was deeper in BH5 (CGL, 2018) than the other boreholes, encountered at a level of 14.53mOD, compared to 17.97mOD to 18.42mOD in the other boreholes. Typically, the thickness of Lynch Hill Gravel recorded beneath the basement was between 1.8 to 2.4m, however, in CGL BH5 4.9m was recorded. In this area, BGS boreholes and ground investigation information held on CGL's database the top of the London Clay is typically between 17.7mOD and 19.2mOD. However, BH5 and historic BGS borehole TQ28SE981, located approximately 100m west of the site (included in Appendix C), recorded the surface of the London Clay at 14.53mOD and 14.32mOD

respectively. It is considered that this increased thickness of Lynch Hill Gravel could be representative of a potential buried river channel.

7.4 London Clay Formation

The London Clay Formation (London Clay) was encountered beneath the Lynch Hill Gravel. The London Clay was found to be a stiff to very stiff[15], extremely closely to very closely fissured greyish brown clay with occasional bioturbation and rare off-white fine to coarse sand sized shell fragments. The fissures were generally sub-horizontal, planar, smooth, unpolished.

A plot of SPT 'N_{60}' values against level from the CGL investigation at Arthur Stanley House is presented as Figure 3 and an undrained shear strength against level plot is presented as Figure 4.

Undrained shear strength triaxial test results on 100mm samples ranged between 73kPa and 504kPa. The SPT 'N' values and triaxial results both generally increased with depth and suggest a relationship of c_u = 4.5xN[14], based on Plasticity Index results from Atterberg Limit testing on the London Clay.

7.5 Lambeth Group

The Reading Formation, part of the Lambeth Group was encountered beneath the London Clay as a hard-mottled clay, the top 9.9m of which was proven on site. The Reading Formation was generally described as hard, dark blue grey mottled brownish red or yellow brown slightly sandy silty clay with occasional partings of fine sand. SPT 'N_{60}' values ranged between 64 and 83, and an extrapolated 'N_{60}' value of 141 for one SPT which did full penetration depth.

Based on the Plasticity Index values measured from the Atterberg Limit tests undertaken on samples of the Lambeth Group, a relationship of undrained shear strength, cu = 5*SPT 'N' is considered to be appropriate for the Lambeth Group.

7.6 Groundwater

Groundwater was encountered in all exploratory boreholes within the Lynch Hill Gravel. It is noted that pumping of groundwater was being undertaken at the time of the ground investigation to maintain water below the lower basement slab level. Prior to the CGL investigation and pumping, the water was recorded at 0.3m above lower basement slab in ASH at a level of 21.3mOD.

Water seepages were encountered within the London Clay in the CGL boreholes BH1 at 22.5m bgl, BH3 at 22.8m bgl, BH4 at 22.0m bgl and BH5 at 18.0m bgl and 22.0m bgl. A 'medium' water strike was also

[14] Stroud, M A and Butler, F G (1975) The standard penetration test and the engineering properties of glacial materials. In: Proceedings of the Symposium of glacial materials, University of Birmingham, April (1975)

encountered within the London Clay in borehole BH4 at 10.7mbgl. Groundwater monitoring results within the CGL boreholes indicated that the groundwater is approximately at 21.0mOD.

It should be noted that groundwater levels can vary seasonally and with time. However, due to the considerable thickness of the Lynch Hill Gravel and its potentially high permeability, which allows groundwater to dissipate relatively quickly, groundwater levels are not expected to vary significantly.

7.7 Geotechnical Design Parameters

Geotechnical design parameters for the soils encountered on site are summarised in Table 5 below. These are based on the borehole records from the adjacent property of Arthur Stanley House, the results of the in-situ testing and on published data for the well-studied London geology. Design levels are given in metres below Tottenham Street ground level (mbgl) at 27.2mOD.

The parameters in Table 5 are unfactored (Serviceability Limit State) and are considered to be 'moderately conservative' design values.

Table 5. Geotechnical Design Parameters

Stratum	*Design Level (mbgl)[a] [mOD]*	*Bulk Unit Weight γ_b (kN/m³)*	*Undrained Cohesion c_u (kPa) [c']*	*Friction Angle ϕ' (°)*	*Young's Modulus E_u (MPa) [E']*
Made Ground (cohesive)	0 [+27.2]	19	50 (assumed) [0]	30 (assumed)	30[b] [22.5][c]
Lynch Hill Gravel Member (Granular)	(3.8) [+23.4]	19	-	36[d]	[70][d]
London Clay Formation (Cohesive)	(8.7) [+18.5]	20	100 + 7z[e] [5][c]	21[f]	60+4.2z[b,e] [45+3.2z][c,e]
Lambeth Group (Cohesive)	(26.2) [+1]	20	250[g] [5][g]	23[c]	200[h] [160][i]

Notes:

a. *mbgl = metres below ground level. Existing basement level is 2.4m below ground level (27.2mOD)*
b. *Based on 600 c_u - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
c. *Based on 0.75Eu - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
d. *Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2nd Edn. John Wiley, New York, 1967.*
e. *z = level below surface of stratum.*
f. *BS 8002:2015 Code of practice for Earth retaining structures, British Standards institution.*
g. *Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
h. *Based on 800 cu - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
i. *Based on 0.8Eu - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*

8. CONSTRUCTION METHODOLOGY

8.1 Outline Temporary and Permanent Works Proposals

The proposed construction sequence is as follows, based on the construction methodology given in the TZG Partnership structural engineer's Stage 3 report[1]:-

- Stage 1 – Install waling beam and bracing to 30 Cleveland Street rear party wall. Demolish boundary wall and bulk excavate to 30 Cleveland Street lightwell level;
- Stage 2 – Install waling beam and prop to party walls at ground, first, second, third, and roof level;
- Stage 3 – Demolish top levels to ground level. Install waling beam and prop and bulk excavate to 30 Cleveland Street party wall;;
- Stage 4 – Underpin 30 Cleveland Street party wall as necessary;
- Stage 5 – Excavate to formation level of basement, to 23.55mOD;
- Stage 6 – Construct piling mat and install bearing piles at basement of excavation;
- Stage 7 – Remove pile mat and construct 800mm thick basement slab to slab level 24.35mOD;
- Stage 8 – Erect scaffold tower around chimney breast and demolish chimney breast;
- Stage 9 – Construct reinforced concrete lift core and ground floor slab within footprint of proposed building;
- Stage 10 – Continue portal frames and reinforced concrete lift to top of proposed building, removing portal frames as construction is progressed ;
- Stages 11 and Stage 12; Install cradle mounts and cladding to roof of building.

It is envisaged piles will be cast in-situ, Continuous Flight Auger (CFA) or bored. The excavation is expected to be above groundwater table and therefore substantial dewatering of the basement excavation is unlikely to be required.

The party wall with 30 Cleveland Street will be underpinned in no more than 1.0m bay widths. The foundations of Arthur Stanley House are at the lower basement level, which are below the level of the

proposed excavation at No. 52. It is understood that the original party wall with ASH is not load bearing and will likely be removed as part of the development. Conceptual site models of the proposed construction and party walls/basements are shown in Figure 5 and Figure 6, based on the information provided in the TZG Partnership structural engineer's Stage 3 report and the proposed development drawings in Appendix A[1].

9. GROUND MOVEMENT ASSESSMENT

9.1 Sources of ground movement

A Ground Movement Assessment (GMA) considers ground conditions, construction methodology and existing structures/infrastructure present on and close to the site.

Possible ground movement mechanisms are outlined below:

- Heave movement: The London Clay is susceptible to short term and time dependant swelling after unloading, which will occur as a result of demolition of the existing building, and reduction in site levels to incorporate floor slabs and the basement excavation, creating upward ground movement.

- Settlement of underpins: Some settlement of underpins following construction is anticipated, however this can be limited by following good construction practice.

- Long term ground movements: The net loading on formation soils will generate ground movement, which could affect adjacent foundations. This takes into account existing stress conditions, unloading due to demolition of the existing building, additional loads from the new structure, installation movements of the underpins and the weight of soil removed.

- In the long term the structural loads are supported on piles and no substantial ground movements are predicted other than potential long term heave movements.

A number of key structures/assets within the zone of influence have been assessed to determine the impact from these ground movements. These structures/assets include the neighbouring properties at 30 Cleveland Street, Arthur Stanley House and the road and pavements of Tottenham Street, and the vaults beneath Tottenham Street.

A site layout plan is shown in Figure 2 and a Conceptual Site Model presented in Figure 3SPT ‘N60’ Values vs LevelFigure 5.

9.2 Ground Movements

An assessment of the vertical ground movements resulting from the proposed development has been undertaken using Oasys *PDISP (Pressure Displacement)* analysis software. *PDISP* assumes that the ground behaves as an elastic material under loading, with movements calculated based on the applied loads and the soil stiffness (E_u and E’) for each stratum input by the user.

9.2.1 *Excavation / Demolition Unloading*

Preliminary loads of the existing building and of the proposed new building have been provided by the structural engineers. The proposed development will involve demolition of the existing building which has an estimated structural dead load of 3,000kN and live load of 700kN. As the existing building is constructed on strip footings the stress relief due to the demolition unloading will be insignificant across the excavation footprint. Therefore unloading due to demolition of the existing building has not been applied in the PDISP model.

The new basement will be founded at a level of 22.72mOD and the new basement slab will be some 500mm thick. Based on the TZG trial pitting the existing slab basement slab is 150mm thick, so the excavated soil to construct the new basement will be 2.36m thick beneath the main building. The ground floor slab in the rear single storey extension is 230mm thick, beneath which 3.77m of soil will be excavated. The thickness of soil excavated beneath the vaults will be 2.29m (assuming no existing basement slab). The combined unloading expected due to demolition and excavation of the Made Ground or Lynch Hill Gravel with a unit weight of 19kN/m^3, (see Table 5), are shown in Table 6.

Table 6 Excavation Unloading for PDISP analysis

Reference	Depth of excavation m)	Unloading due to soil excavation (kPa)
No. 52 building	2.36	45
No. 52 rear single storey extension	3.77	72
No. 52 Vaults	2.29	44

9.2.2 *Structural loading*

9.2.2.1 Building loads

As the new development will be founded on piles below the depth of the proposed basement excavation, no structural loads for the new building have been applied in the ground movement PDisp analysis. This is a conservative approach with regard to heave assessment over the long term.

9.2.2.2 Underpin loading

The foundations of the existing basement party wall with No. 30 Cleveland Street are anticipated to be above the level of the new basement and will therefore require underpinning. It is understood that Arthur Stanley House (ASH) is supported by the two storey basement walls which have been constructed in front of the original party wall with No. 52. As the lower basement foundations are below the proposed basement level of No. 52, they will not require underpinning.

Underpins to 30 Cleveland Street will be founded within the Lynch Hill Gravel below the proposed excavation level at 22.72mOD. At 30 Cleveland Street the existing underpinned party wall is founded at 1.2m (24.03mOD)[1], below the existing basement level at 25.23mOD. Assuming the underpins will be 0.5m below the basement formation level, the new underpins will be approximately 1. 80m deep.

An allowable bearing pressure of 250kPa is recommended for a 1.0m wide underpin bearing on the Lynch Hill Gravel, based on the ground investigation data at ASH, with a design angle of friction, φ' of 36°. Underpin loading has not been applied to the PDisp model as the stress change between the depth of the existing party wall foundations and proposed new basement level is not expected to be significant given the shallow depth of underpinning.

9.2.3 PDISP Analysis Results

The total predicted vertical ground movements due to the basement and movements for both short (undrained) and long term (total) movements are summarised in Table 7. The PDISP analysis output summary is provided in Appendix E.

Table 7. Predicted Vertical Movement Summary

Stage	*Max heave within basement footprint (mm)*	*Max settlement within basement footprint (mm)*	*Max vertical movement at No. 30 Cleveland Street (mm)*
Short term	6.0	0.0	4.6
Total movements	7.8	0.0	6.2

The movements at the identified assets are discussed in Section 10 of this report.

10. DAMAGE IMPACT ASSESSMENT

10.1 Introduction

The ground movements for each of the identified potential impacts to the identified structures/assets are discussed separately below, based on cumulative movements for demolition, short and long term movement due to excavation, and underpin installation.

The calculated ground movements have been used to assess the potential 'damage categories' that may apply to the neighbouring properties due to the proposed development. The methodology proposed by Burland and Wroth[15] and later supplemented by the work of Boscardin and Cording[16] has been used, as described in CIRIA Special Publication 200 and CIRIA 760. General damage categories are summarised below in Table 8.

Table 8. Classification of damage visible to walls (reproduced from Table 2.5, CIRIA C760)

Category	*Description*
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm)
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks <3mm)
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but depends on number of cracks)
5 (Very severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks)

10.2 30 Cleveland Street

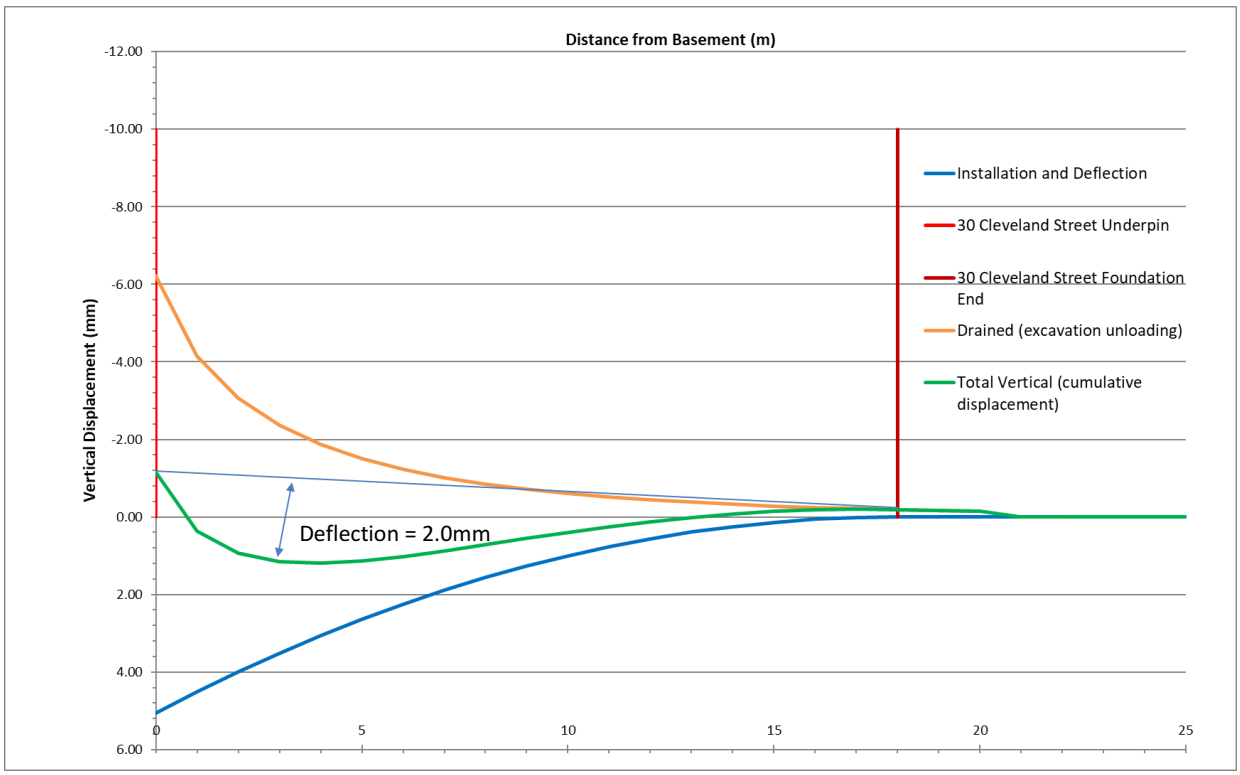
The impact assessment for the foundations at 30 Cleveland Street has been undertaken for section line A-A', shown on the site layout plan in Figure 2 allowing for excavation to a formation level of 22.72mOD.

The vertical displacement at the formation level due to excavation unloading is predicted to be a maximum of 6.2mm of heave beneath the underpins of which 4.6mm will occur in the short term, and a further 1.6m in the long term. An additional 5mm of settlement has been allowed for to take into account potential settlement due to underpin construction. It is assumed this dissipates from 5mm to 0mm parabolically over the 17.9m width of the foundation of No. 30 Cleveland Street. The total long term cumulative movements are predicted to be 1.1mm at the underpin. The vertical movement

[15] Burland, J.B., and Wroth, C.P., (1974). *Settlement of buildings and associated damage,* Stage of the art review. Conference on Settlement of Structures, Cambridge, Pentrech, London, pp 611-654.
[16] Boscardin, M.D., and Cording, E.G., (1989). *Building response to excavated induced settlement.* J. Geotech Eng, ASCE, 115(1), pp 1-21.

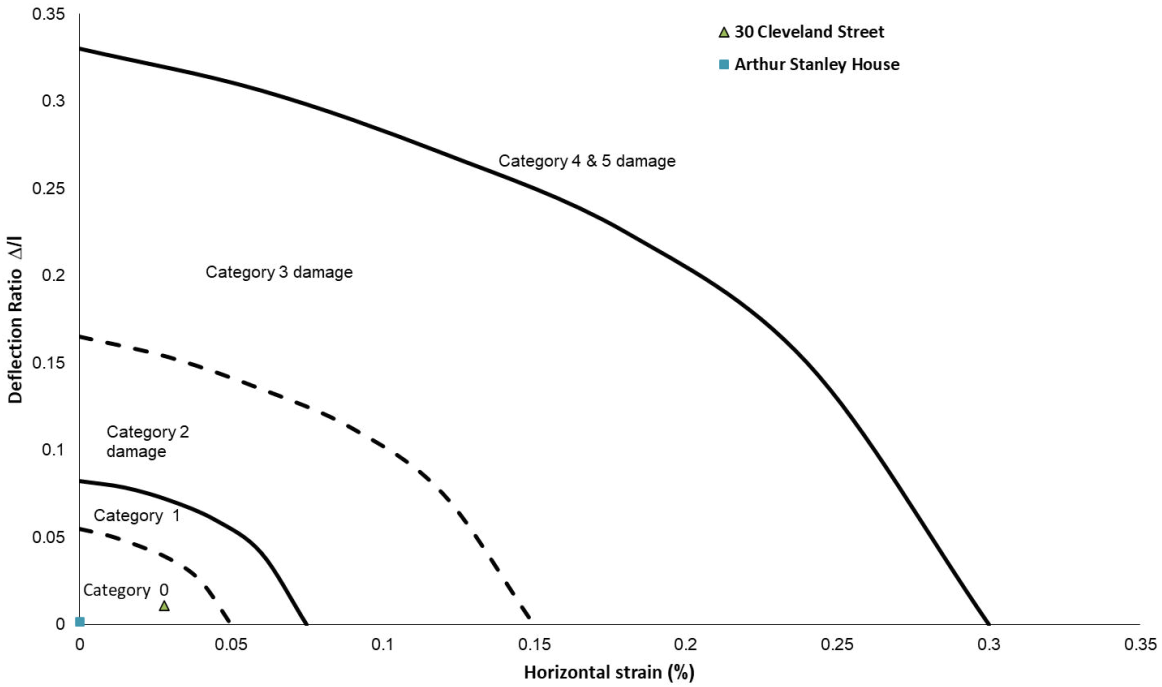
profile for 30 Cleveland Street party wall is presented in Plate 3. The horizontal movements at the existing structure but as the underpins are stiff concrete walls lateral movements are expected to be negligible. Assuming good construction practices and control, horizontal deflection in front of the underpinned wall are expected to be minimal (<2mm).

Plate 3. Cumulative vertical movements at foundations of 30 Cleveland Street Underpin



Assuming a good standard of workmanship the predicted Damage Categories are expected to not exceed Category 0 'negligible' damage, as shown in Plate 4.

Plate 4. Building damage assessment – 30 Cleveland Street



10.3 Arthur Stanley House

The neighbouring property of Arthur Stanley House has two storey basement at 20.98mOD which is around 1.74m deeper than the proposed basement formation level at No. 52 of 22.72mOD. Arthur Stanley House is a heavy 1960's RC frame structure and would not be affected by local excavations of this magnitude above the level of its foundations. Assuming a good standard of workmanship the predicted Damage Categories are expected to not exceed Category 0 'negligible' damage as a result of this basement development.

10.4 Tottenham Street

The ground movement assessment indicates a maximum cumulative vertical movement of 7.8mm heave.

The magnitude of ground movements predicted are not considered to pose a significant risk to the pavements or road of Tottenham Street, nor the services within these pavements.

11. CONTROL OF CONSTRUCTION WORKS (MONITORING STRATEGY)

The results of the ground movement analysis suggest the likely Damage Category to the neighbouring properties can be controlled to within Damage Category '0'.

To manage this during the works it is recommended that a monitoring strategy be put in place to observe and control ground movements during construction.

The monitoring strategy should be in broad accordance with the 'Observational Method' defined in CIRIA Report R185. Monitoring can be undertaken by installing survey targets to the top of the basement wall and face of the adjacent buildings. Prior to construction baseline readings should be established. Once construction commences regular readings should be taken and analysed to determine whether unacceptable horizontal movement, vertical movement or tilting has occurred.

Mitigation strategies should be prepared prior to construction and implemented if unacceptable movements occur.

Monitoring data should be checked against predefined trigger limits and reviewed regularly to assess and manage the damage category of the adjacent buildings as construction progresses.

It is recommended that a condition survey is undertaken on all adjacent walls and property facades prior to works commencing and ideally when monitoring baselines are established. Existing cracks or structural defects should be carefully recorded, documented and regularly inspected as construction progresses.

12. BASEMENT IMPACT ASSESSMENT

12.1 Land Stability

The site investigation has identified suitable founding stratum of the London Clay, which will provide favourable conditions for piled foundations.

The potential Damage Impact to surrounding structures within the zone of influence has been assessed as Category '0' in accordance with the Burland Scale.

It is recommended that prior to construction commencing, a condition survey be conducted and an observation strategy be put in place. Once construction begins the movement of the walls and the facades of the neighbouring properties should be regularly monitored.

12.2 Hydrogeology and Groundwater Flooding

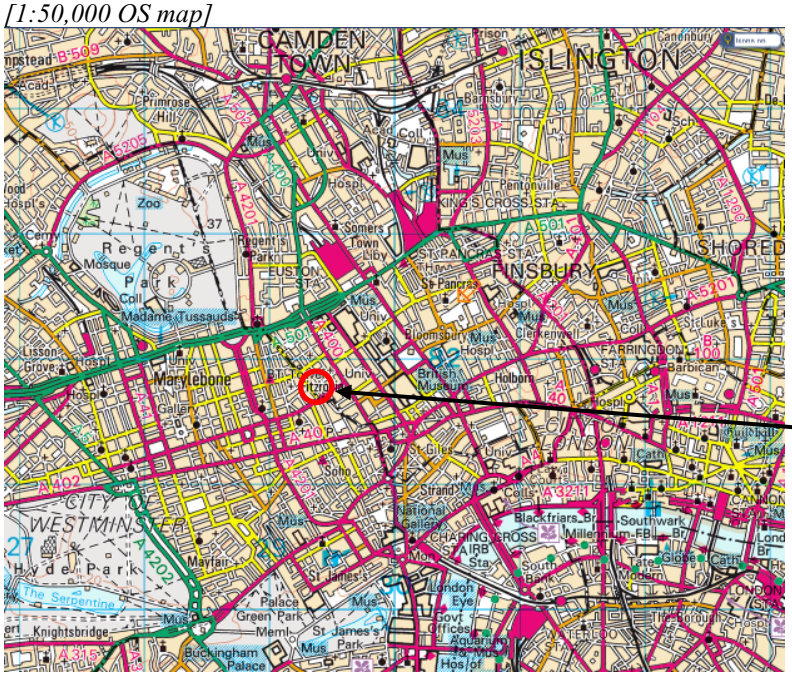
The BIA has concluded there is a negligible risk of groundwater flooding and that there are no impacts to the wider hydrogeological environment – no mitigation measures are therefore required.

12.3 Hydrology, Surface Water Flooding and Sewer Flooding

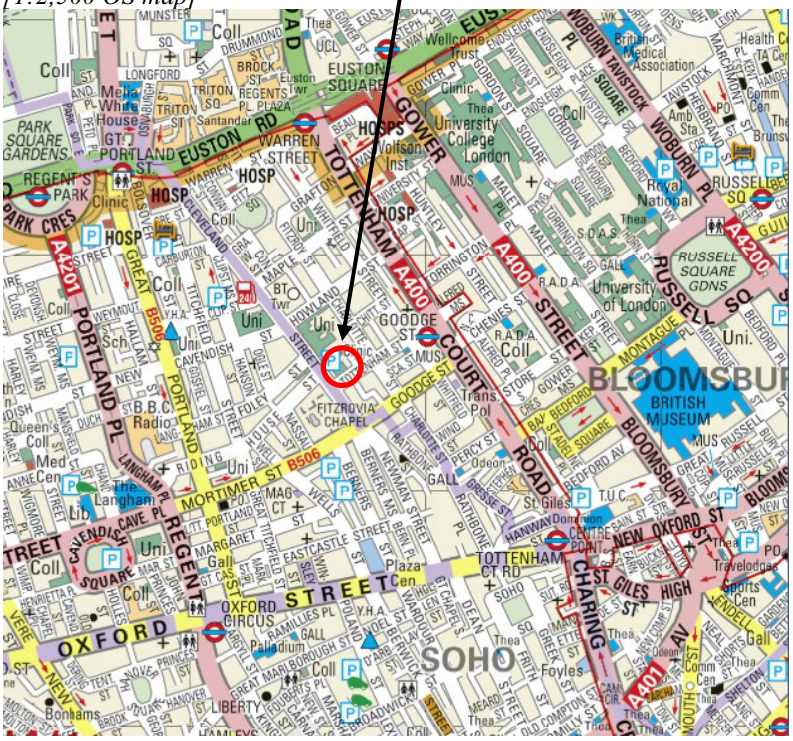
The BIA has concluded there is a very low risk of surface water/sewer flooding and that there are no impacts to the wider hydrogeological environment – no mitigation measures are therefore required.

FIGURES

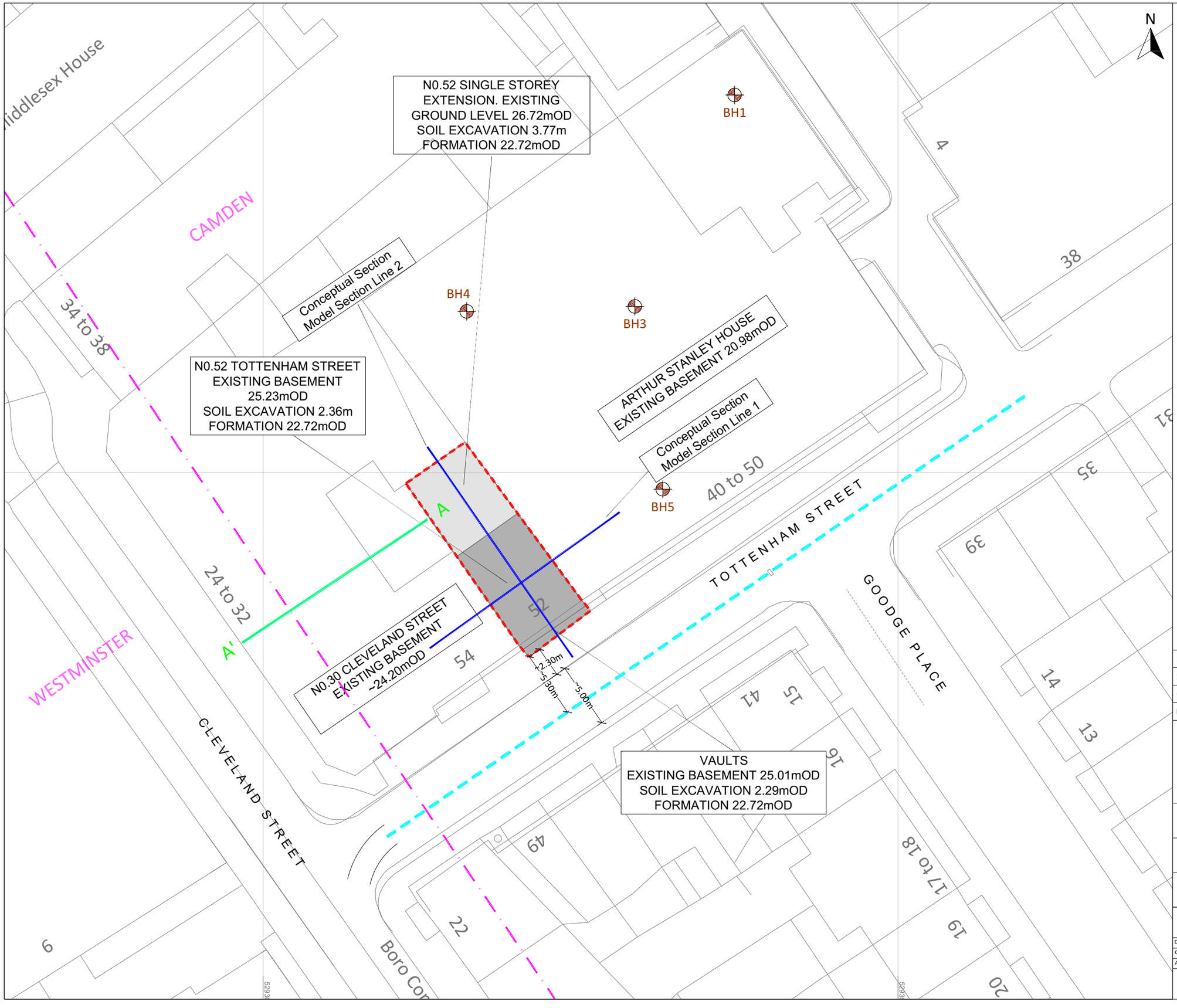
[1:50,000 OS map]



[1:2,500 OS map]



Client	Project	Job No
Flower Island (UK) Ltd	**52 Tottenham Street, London**	**CG/28961**
CGL	Title: **Site location plan**	**Figure 1**



Rev	Date	Comments
2	25/06/20	
1	30/04/20	
0	27/02/19	

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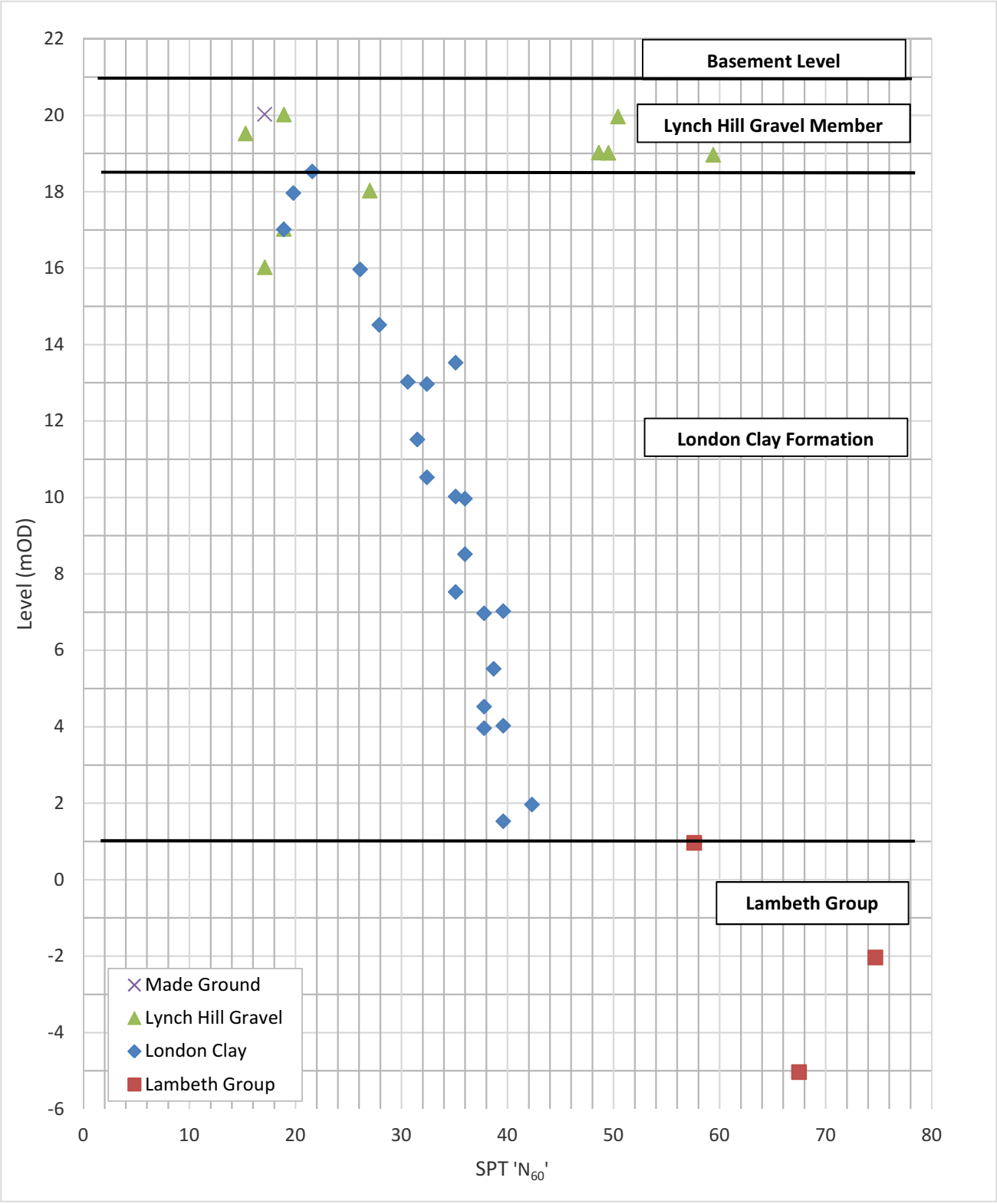
Project
52 Tottenham Street, London

Client
Flower Island (UK) Ltd.

Drawing title
Figure 2 - Site Layout Plan

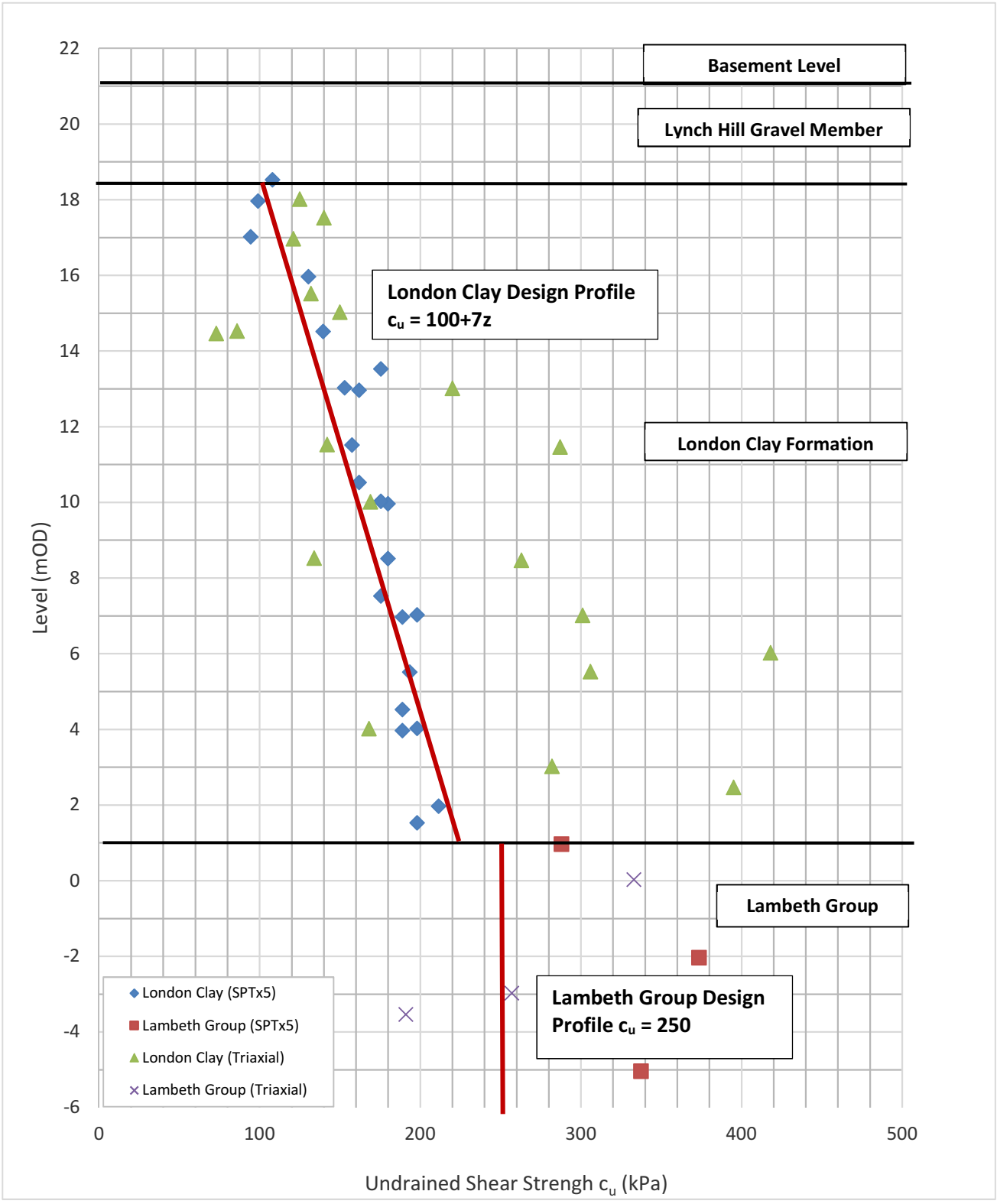
Scale(s)	Job No.
NTS	**CG/28961**

Drawn	TSB	25/06/20	Dwg No. **CG/28961-001**	Rev. **2**
Checked	RJB	26/06/20		
Approved	IMM	25/06/20		



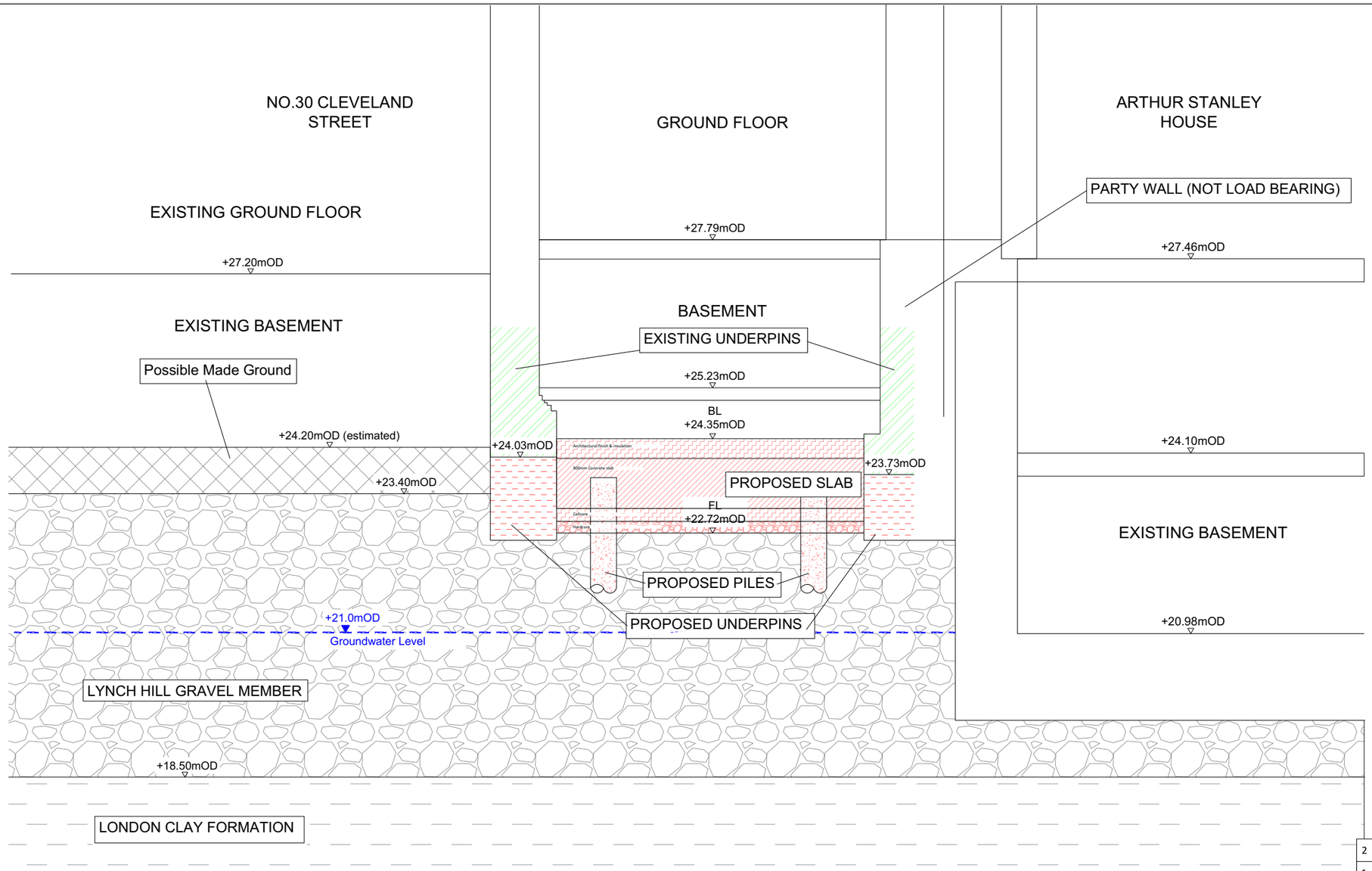
Note: SPT plot reproduced from CGL Arthur Stanley House Ground Investigation, 2018 from Planning Application Ref. 2018/44297/P

Client	Project	Job No
Flower Island (UK) Ltd	**52 Tottenham Street, London**	**CGL/28961**
	Title	
	SPT 'N_{60}' Values versus Level	**Figure 3**



Note: SPT plot reproduced from CGL Arthur Stanley House Ground Investigation, 2018 from Planning Application Ref. 2018/44297/P

Client	Project	Job No
Flower Island (UK) Ltd	**52 Tottenham Street, London**	**CG/28961**
CGL	Title: **Undrained Shear Strength, c_u versus Level**	**Figure 4**



KEY

- MADE GROUND
- LYNCH HILL GRAVEL MEMBER
- LONDON CLAY FORMATION
- Groundwater Level

Notes

1. Do not scale from this drawing.
2. Section taken from DSDHA section drawing '297-SK135' (18/02/19).

Rev	Date	Comments
2	25/06/20	
1	30/04/20	
0	28/02/19	

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Project: **52 Tottenham Street, London**

Client: **Flower Island (UK) Ltd.**

Drawing title: **Figure 5 - Conceptual Site Model Section Line 1**

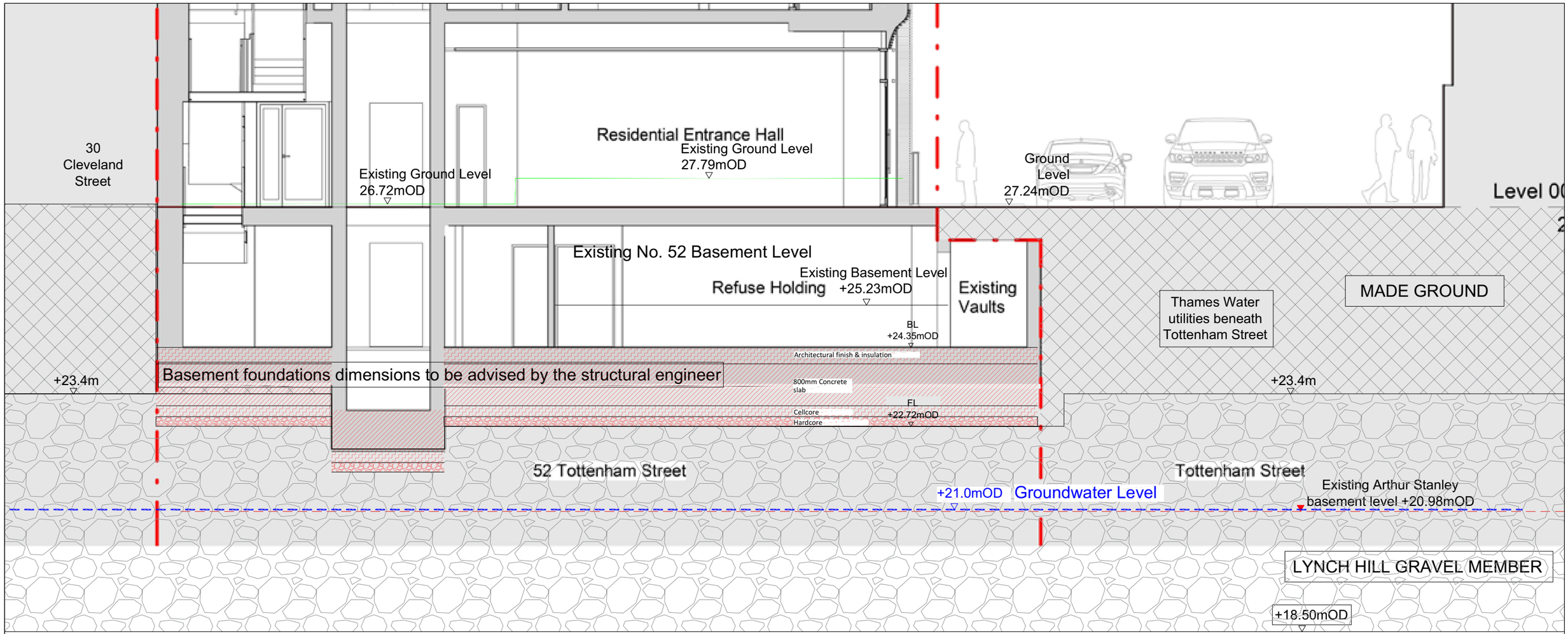
Scale(s): **NTS**

Job No.: **CG/28961**

Drawn	TSB	25/06/20
Checked	RJB	25/06/20
Approved	IMM	25/06/20

Dwg No.: **CG/28961-002**

Rev.: **2**



KEY

- MADE GROUND
- LYNCH HILL GRAVEL MEMBER
- LONDON CLAY FORMATION
- Groundwater Level

Notes

1. Do not scale from this drawing.
2. Section taken from DSDHA section drawing '297-SK135' (18/02/19).

Rev	Date	Comments
2	25/06/20	
1	30/04/20	
0	28/02/19	

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Project: **52 Tottenham Street, London**

Client: **Flower Island (UK) Ltd.**

Drawing title: **Figure 6 - Conceptual Site Model Section Line 2**

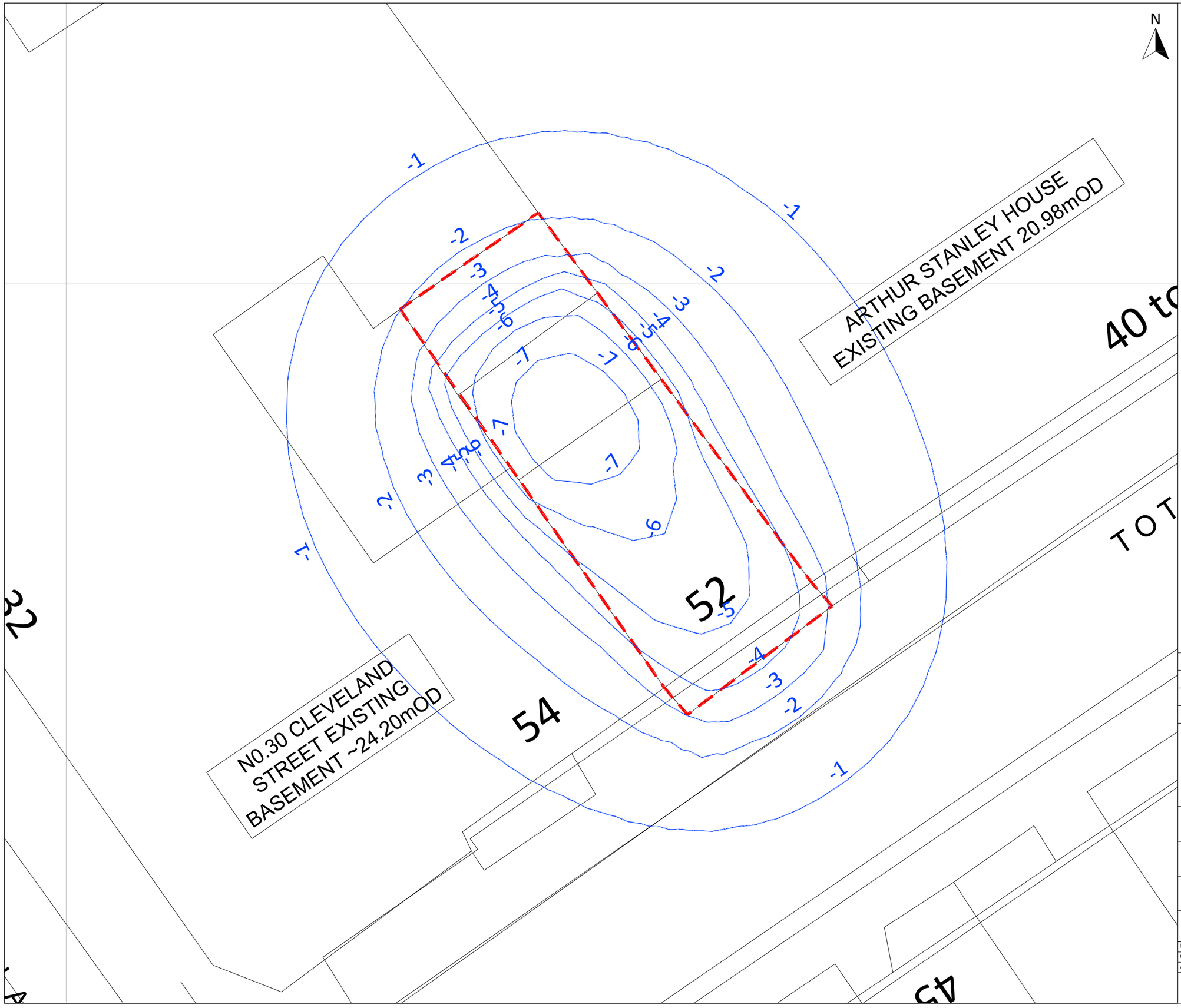
Scale(s): **NTS**

Job No.: **CG/28961**

Drawn	TSB	25/06/20
Checked	RJB	25/06/20
Approved	IMM	25/06/20

Dwg No.: **CG/28961-003**

Rev.: **2**



KEY

Contour line

Notes

1. Contours are in mm.
2. Contour intervals are 1mm.
3. Positive contour values indicate settlement and negative values indicate heave.

Rev	Date	Comments
2	26/06/19	
1	30/04/19	
0	04/03/19	

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Project
52 Tottenham Street, London

Client
Flower Island (UK) Ltd.

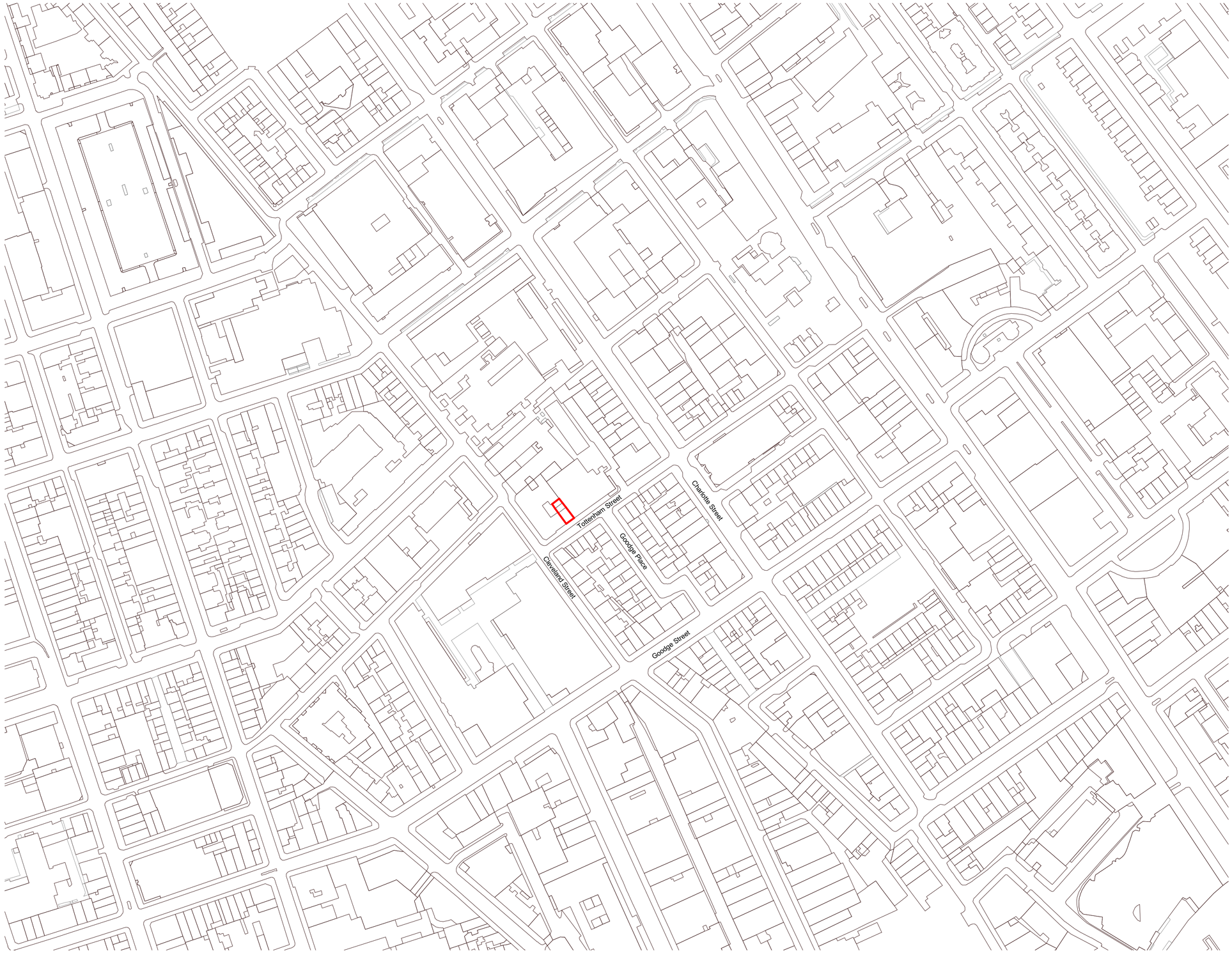
Drawing title
Figure 7 - PDISP - Total vertical movement

Scale(s)	Job No.
NTS	**CG/28961**

			Dwg No.	Rev.
Drawn	TBP	25/06/20	**CG/28961-004**	**2**
Checked	RJB	25/06/20		
Approved	IMM	25/06/20		

APPENDIX A

Proposed Development Drawings



1 / P10.000 Site Location Plan
1 : 1250

0 50m 100m 200m

NOTES

N

GENERAL NOTES:

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DRAWING NUMBERING:

10.000 Existing Drawings
20.000 Proposed Plans
30.000 Proposed Elevations
40.000 Proposed Sections

KEY:

Site Boundary

PLANNING

rev	date	author / check	comments

DSDHA
357 Kennington Lane London SE11 5QY
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W www.dsdha.co.uk

project

52 Tottenham Street
London, W1T 4RN

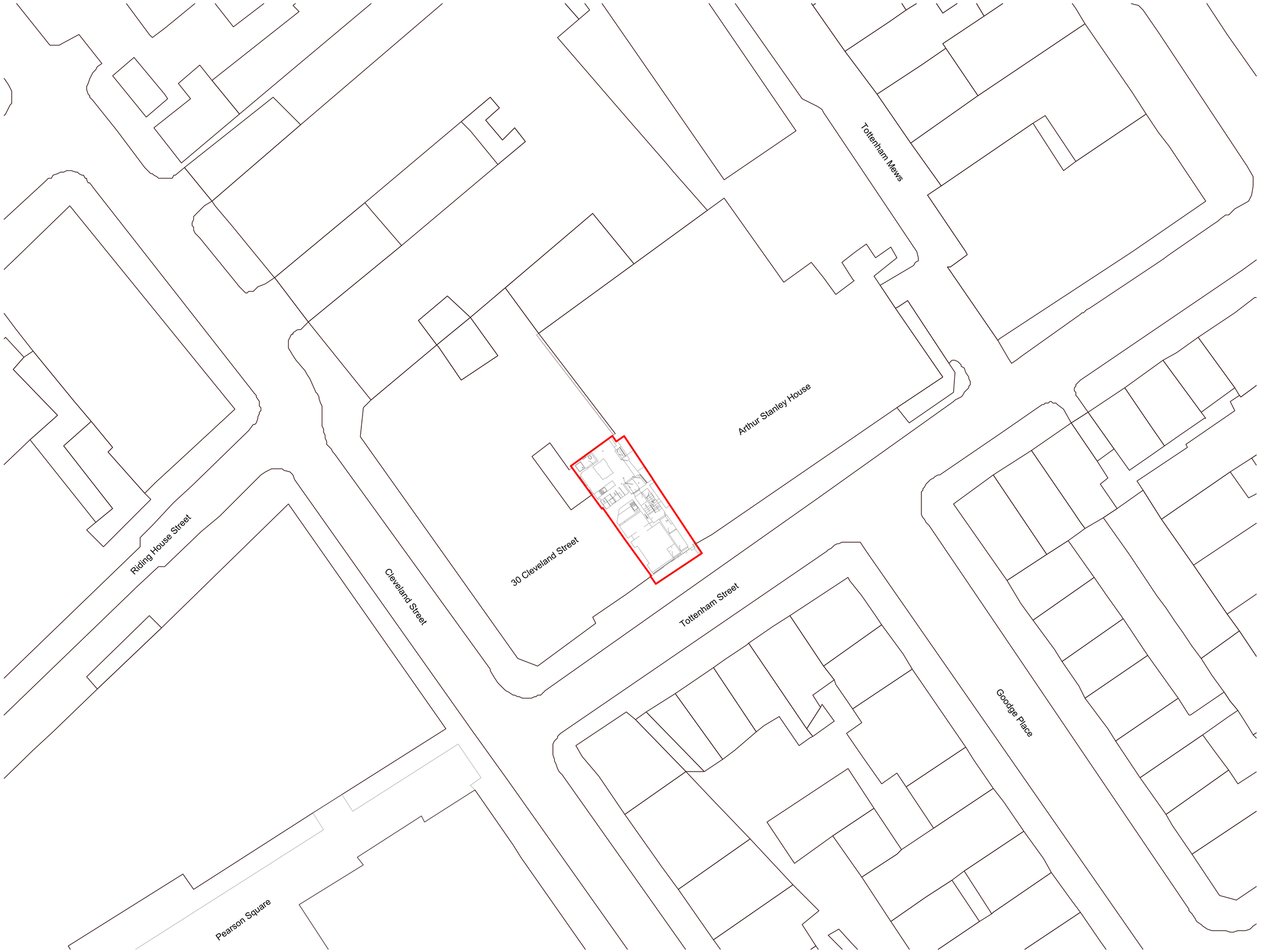
drawing title

Site Location Plan

drawn	size	date	scale
	A1	22/04/20	1 : 1250

drawing number: 297 _P10.000

revision:



1 P10.001 Existing Site Plan
1 : 200

0 1m 5m

NOTES

N

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52 Tottenham Street
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drawing title

Existing Site Plan

drawn	size	date	scale
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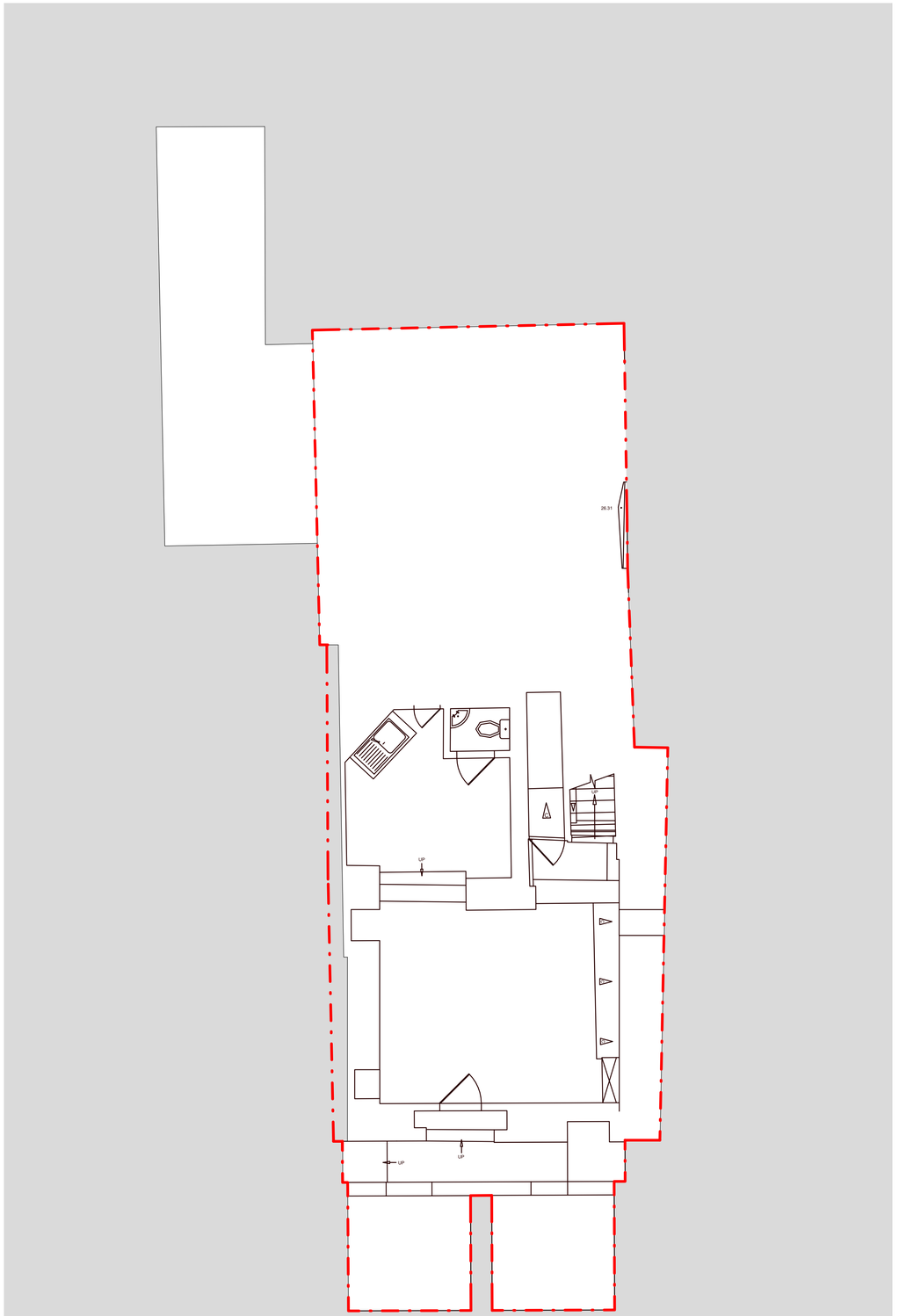
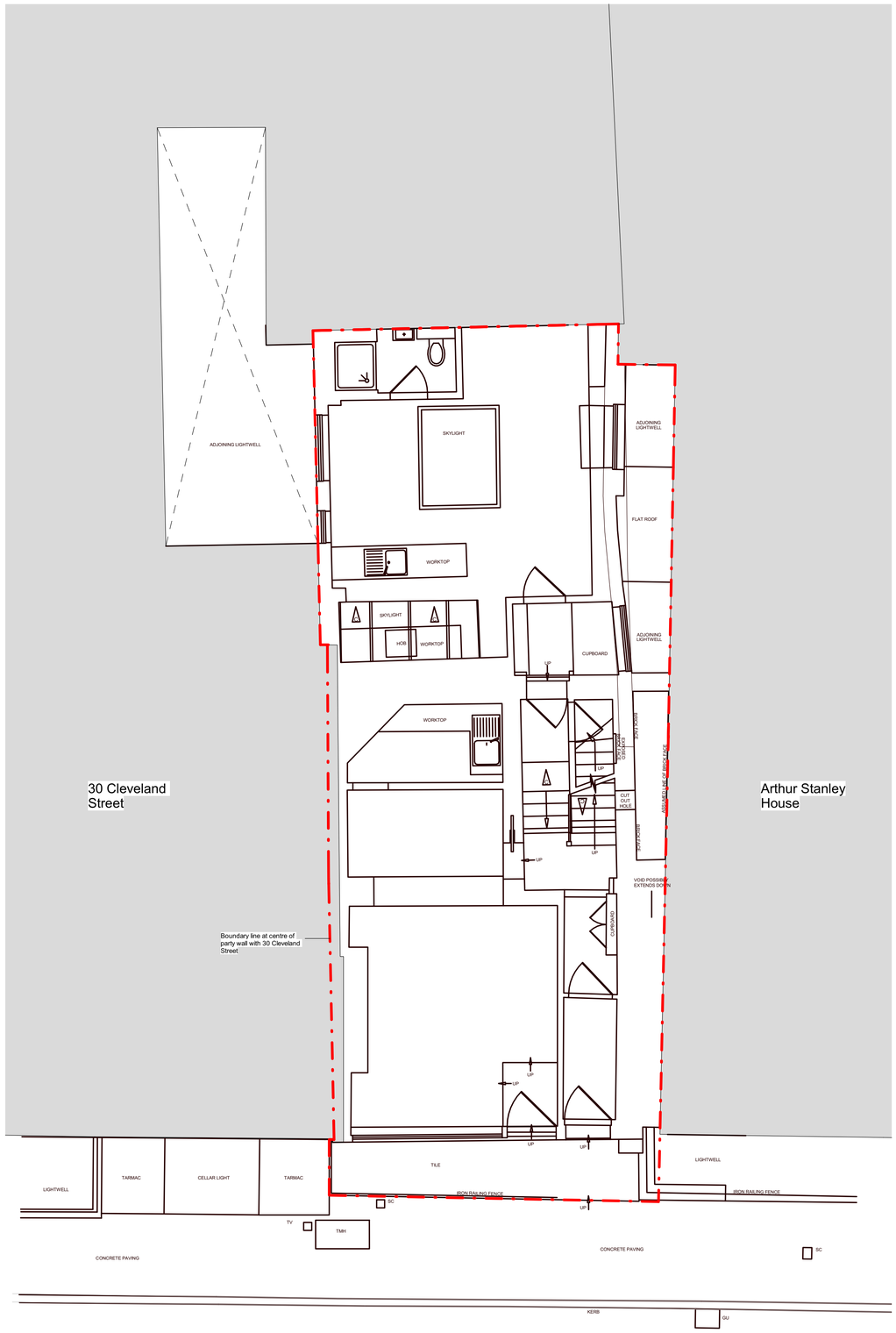
drawing number: 297 _P10.001

revision:



1 P10.100 Existing Level B1
1 : 50



Tottenham Street

2 P10.100 Existing Level 00
1 : 50

0 1m 5m

NOTES

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40.000 Proposed Sections

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drawing title

Existing Level B1 and 00

drawn	size	date	scale
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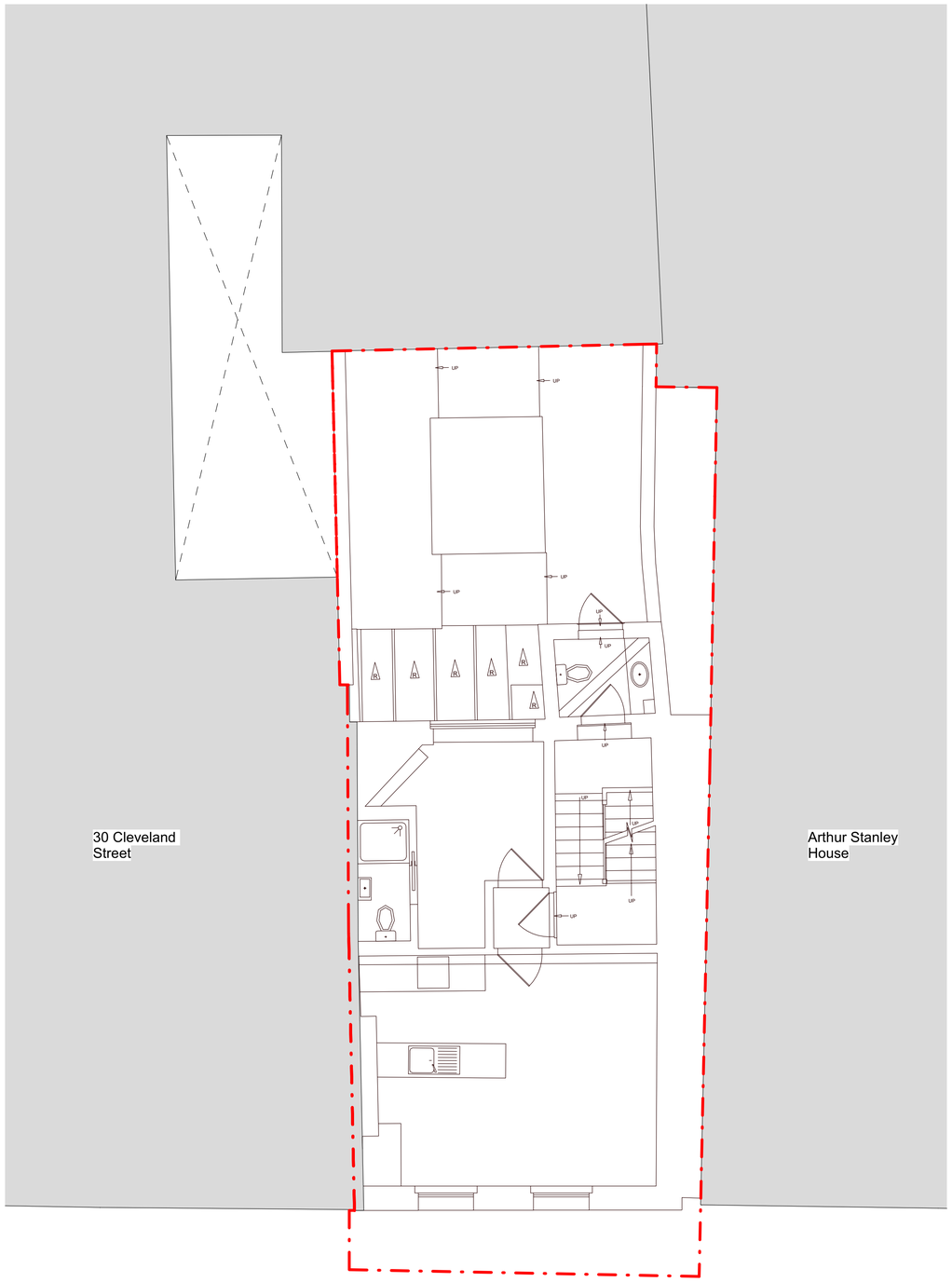
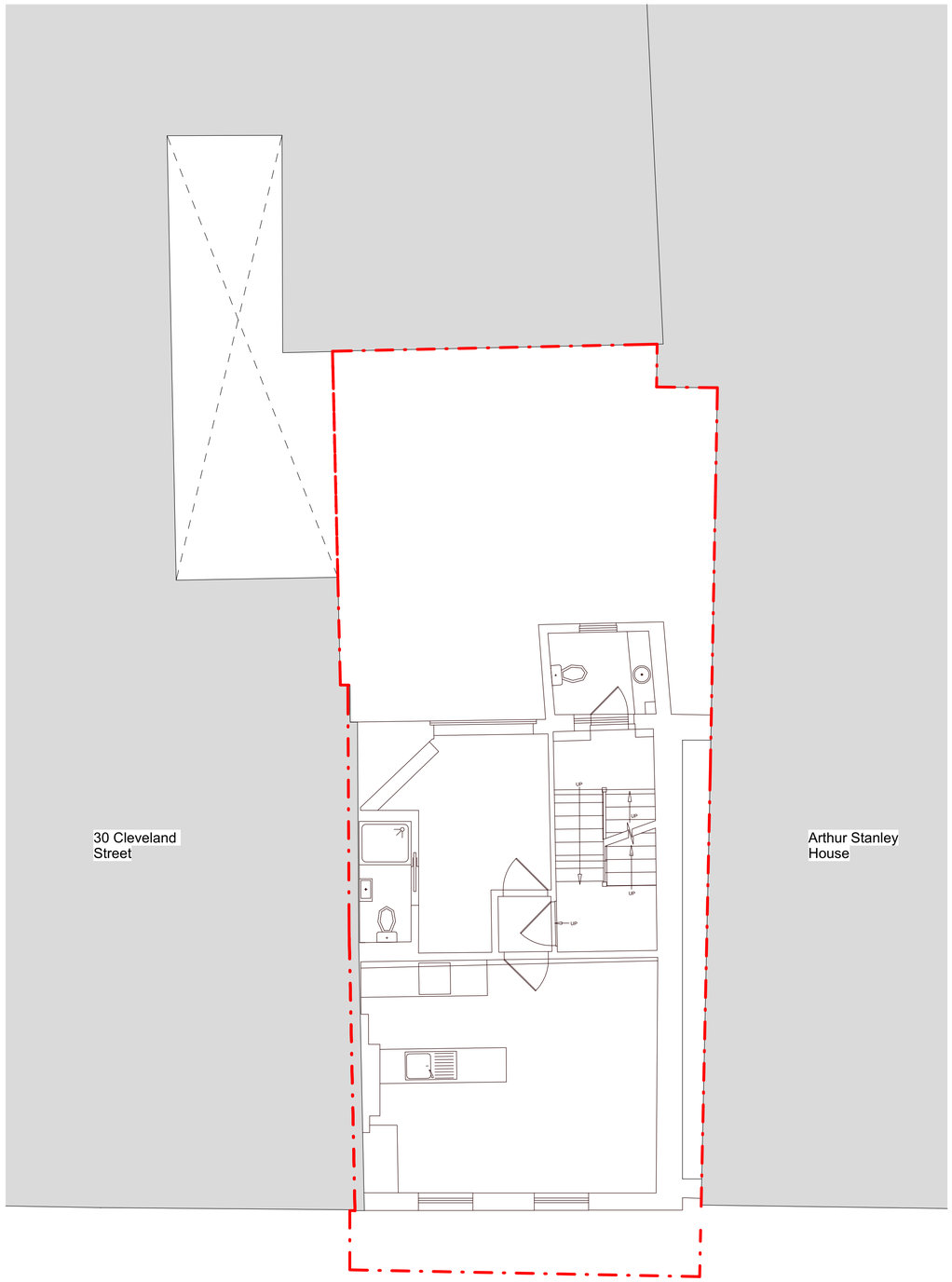
drawing number: 297 _P10.100

revision:



1 P10.101 Existing Level 01
1 : 50



2 P10.101 Existing Level 02
1 : 50

0 1m 5m

NOTES

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drawing title

Existing Level 01 & 02

drawn	size	date	scale
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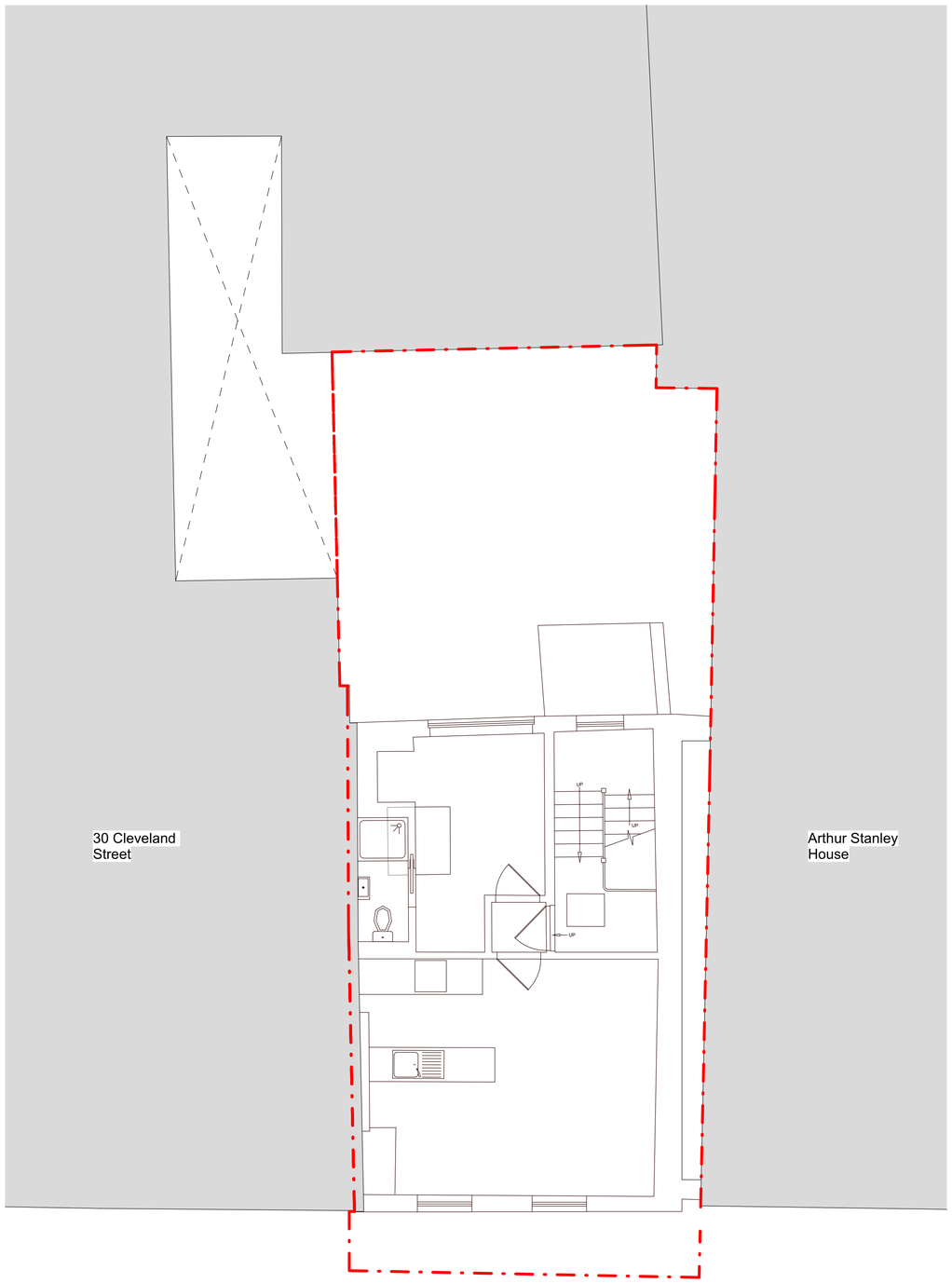
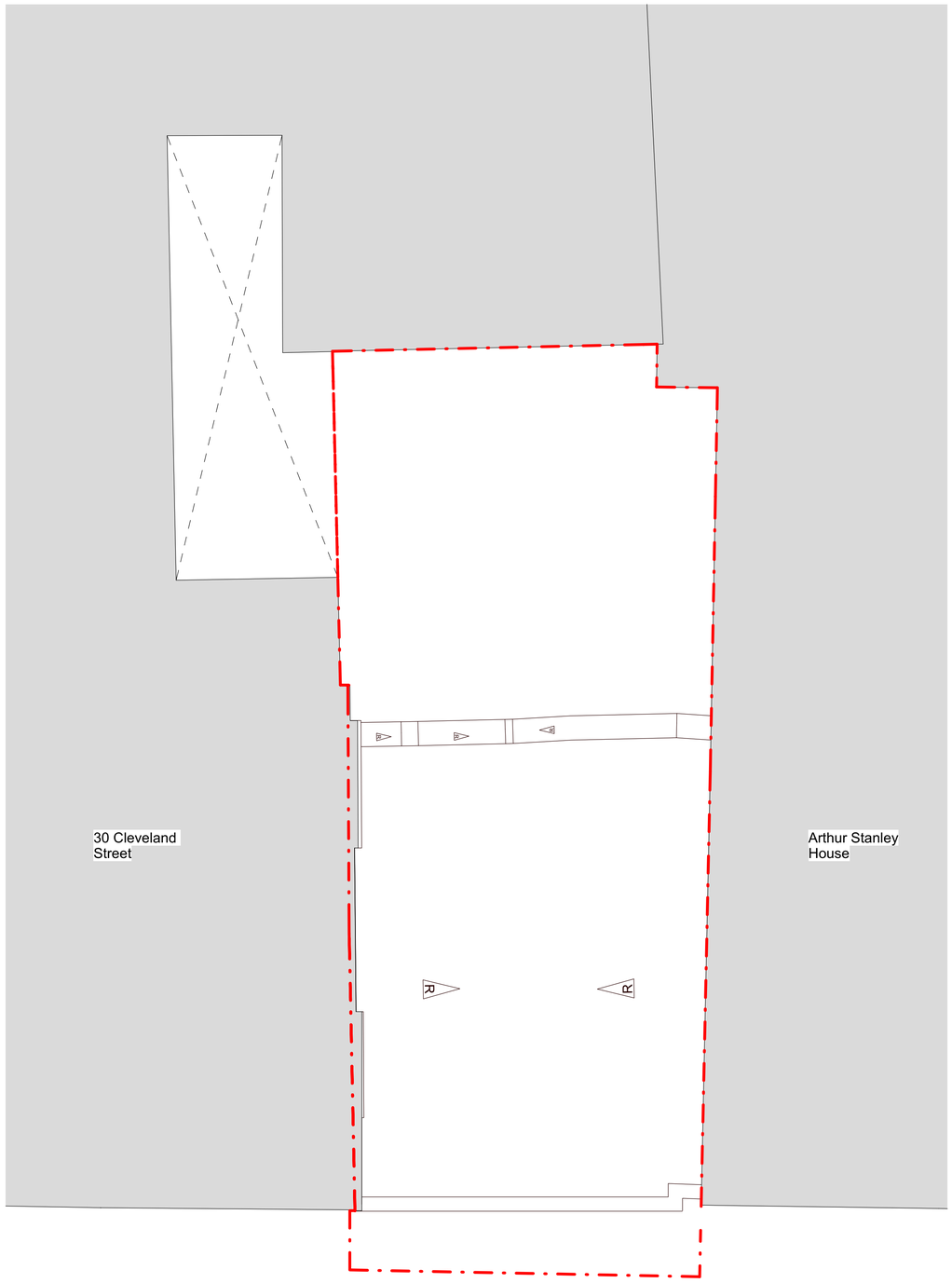
drawing number: 297 _P10.101

revision:



1 P10.102 Existing Level 03
1 : 50



2 P10.102 Existing Roof Level
1 : 50

0 1m 5m

NOTES

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10.000 Existing Drawings
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30.000 Proposed Elevations
40.000 Proposed Sections

KEY:

Site Boundary

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rev	date	author / check	comments

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drawing title

Existing Level 03 & Roof

drawn	size	date	scale
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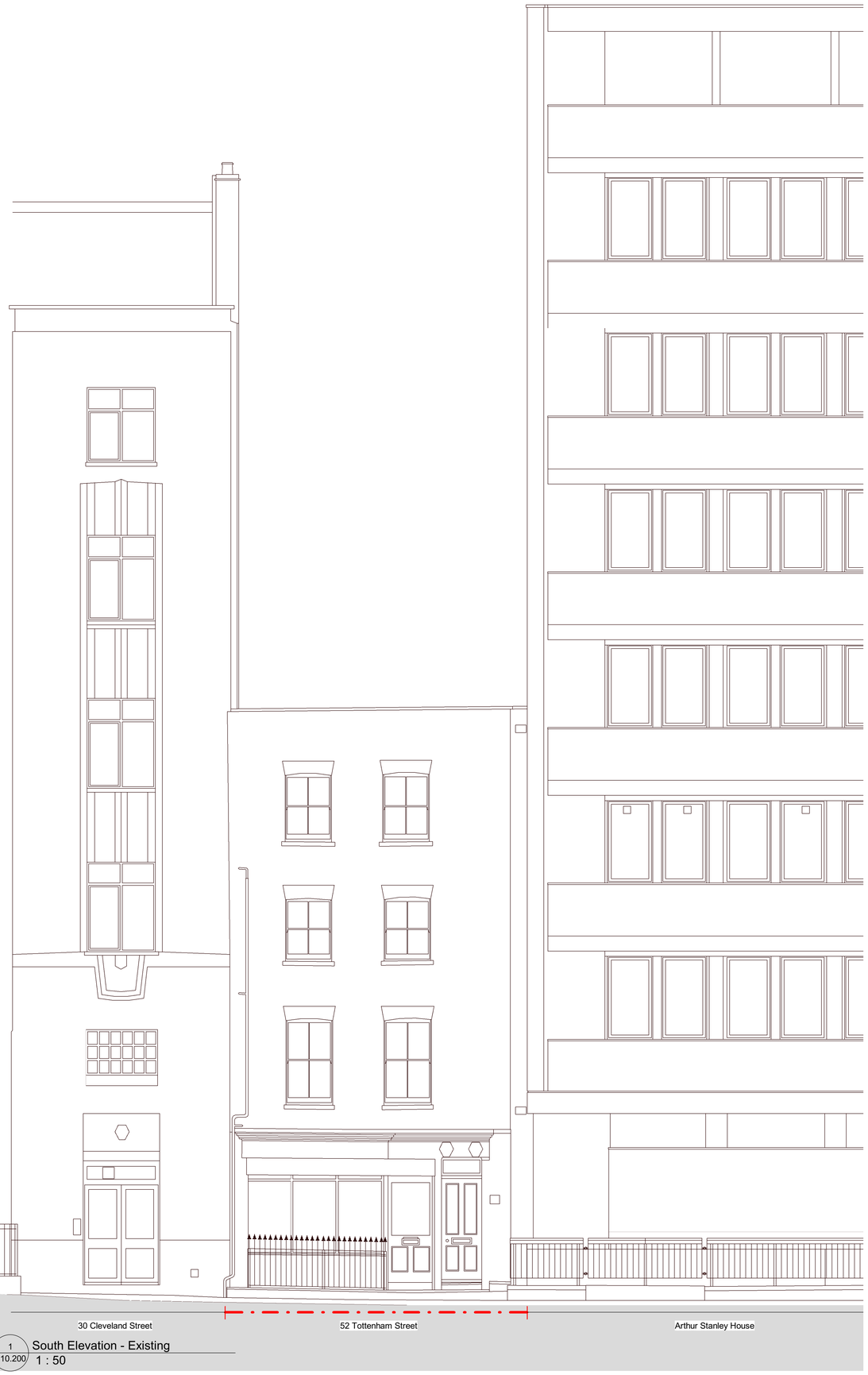
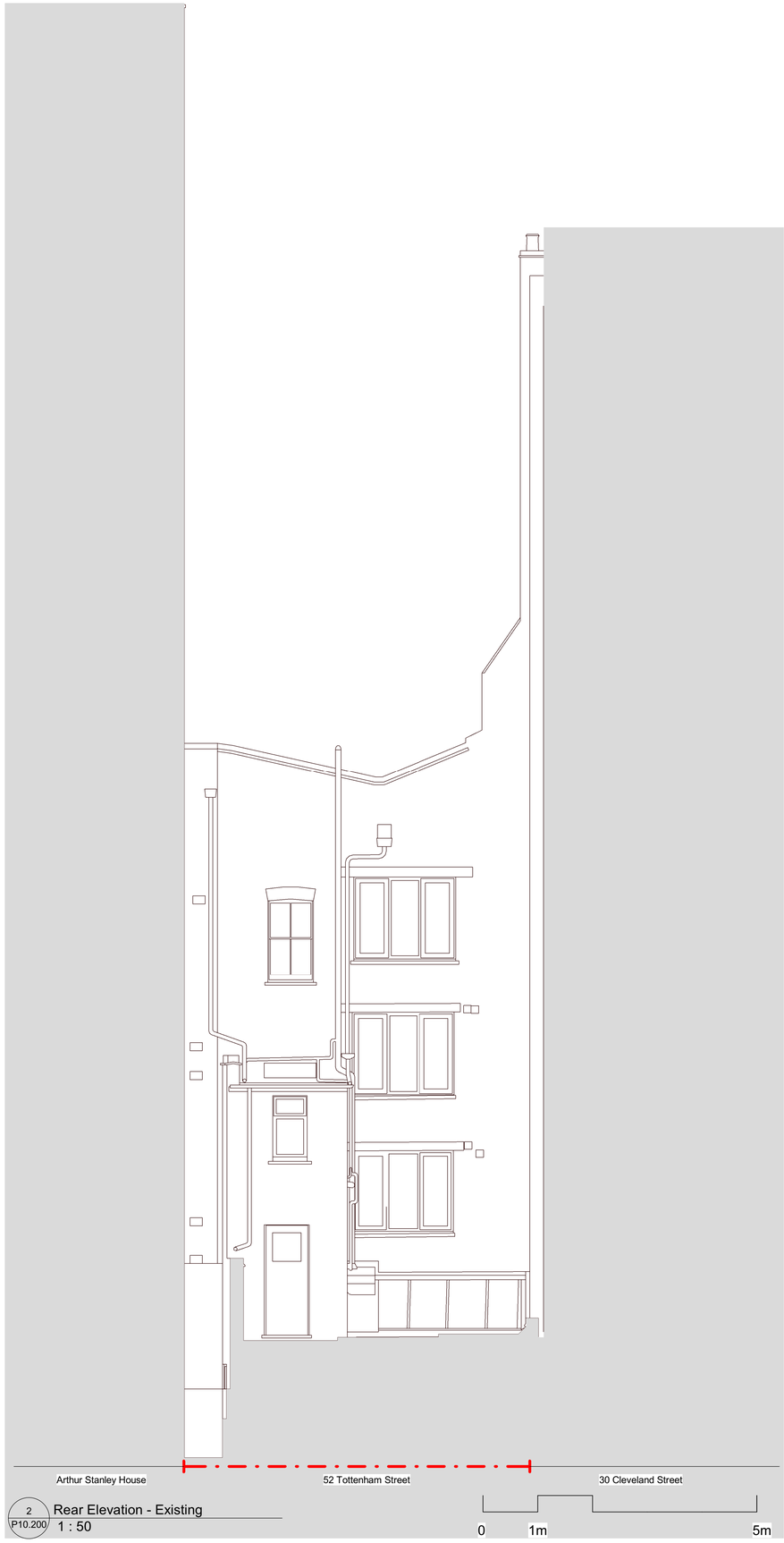
drawing number: 297 _P10.102

revision:



1 P10.200 South Elevation - Existing
1 : 50



2 P10.200 Rear Elevation - Existing
1 : 50

NOTES

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20.000 Proposed Plans
30.000 Proposed Elevations
40.000 Proposed Sections

KEY:

Site Boundary

PLANNING

rev	date	author / check	comments

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drawing title

Existing Tottenham Street & Rear Elevation

drawn	size	date	scale
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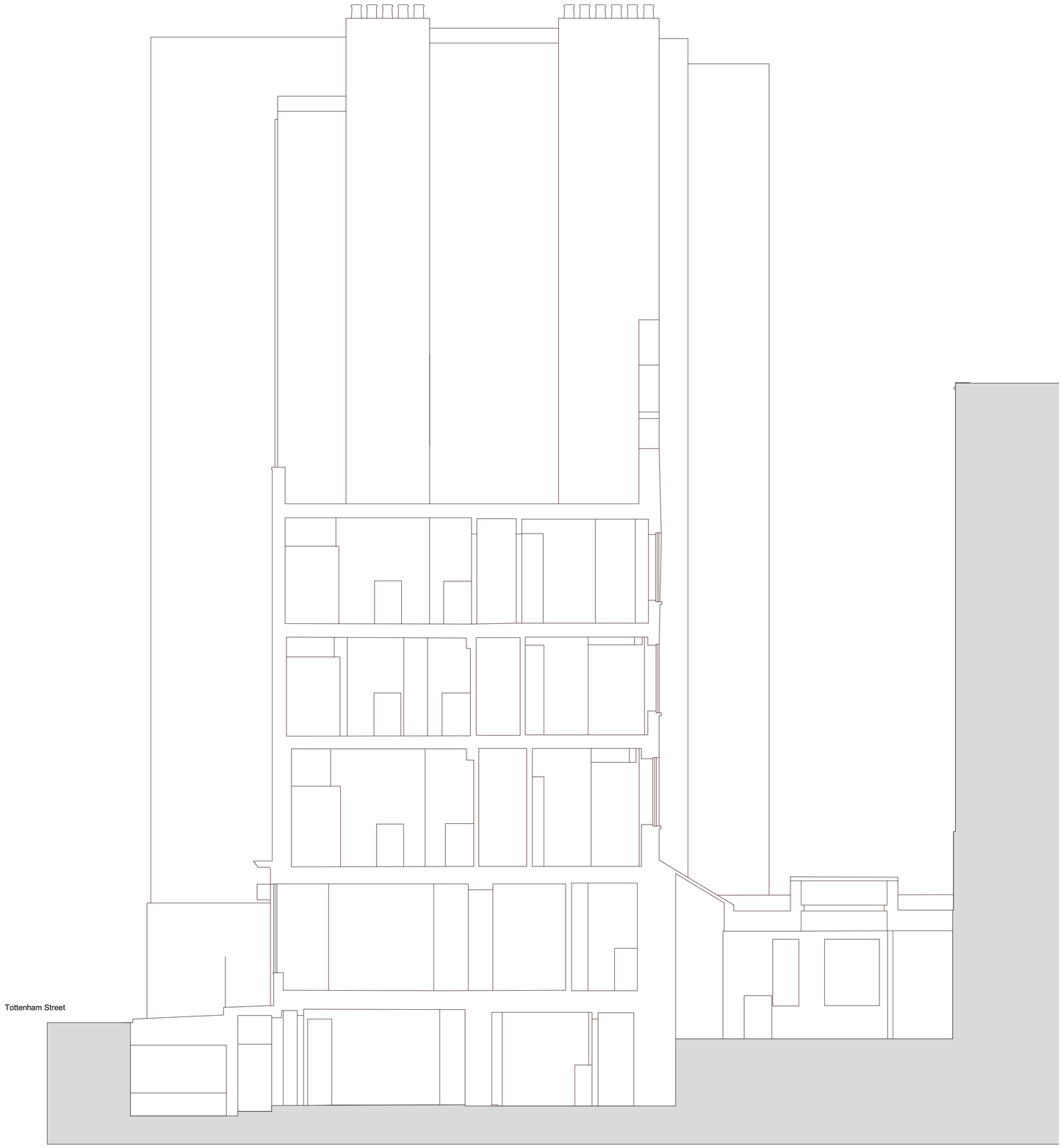
drawing number: 297 _P10.200

revision:



1
P10.300
Existing Section
1 : 50

0 1m 5m

NOTES

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KEY:

Site Boundary

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rev	date	author / check	comments

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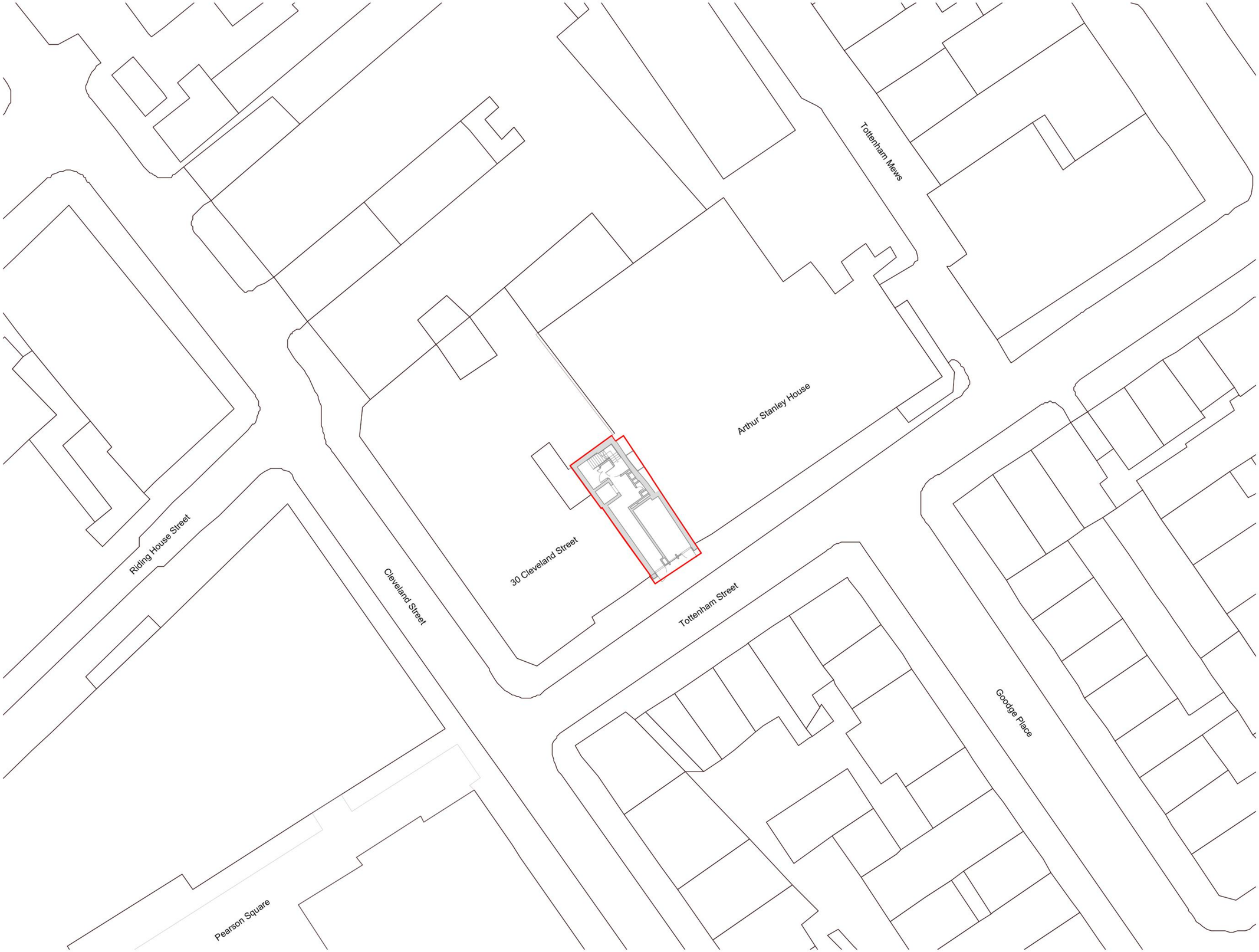
drawing title

Existing Section

drawn	size	date	scale
	A1	22/04/20	1 : 50

drawing number: 297 _P10.300

revision:



1 P20.000 Proposed Site Plan
1 : 200

0 1m 5m

NOTES

N

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10.000 Existing Drawings
20.000 Proposed Plans
30.000 Proposed Elevations
40.000 Proposed Sections

KEY:

Site Boundary

A 16/06/20 Revision A

PLANNING

rev	date	author / check	comments

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52 Tottenham Street
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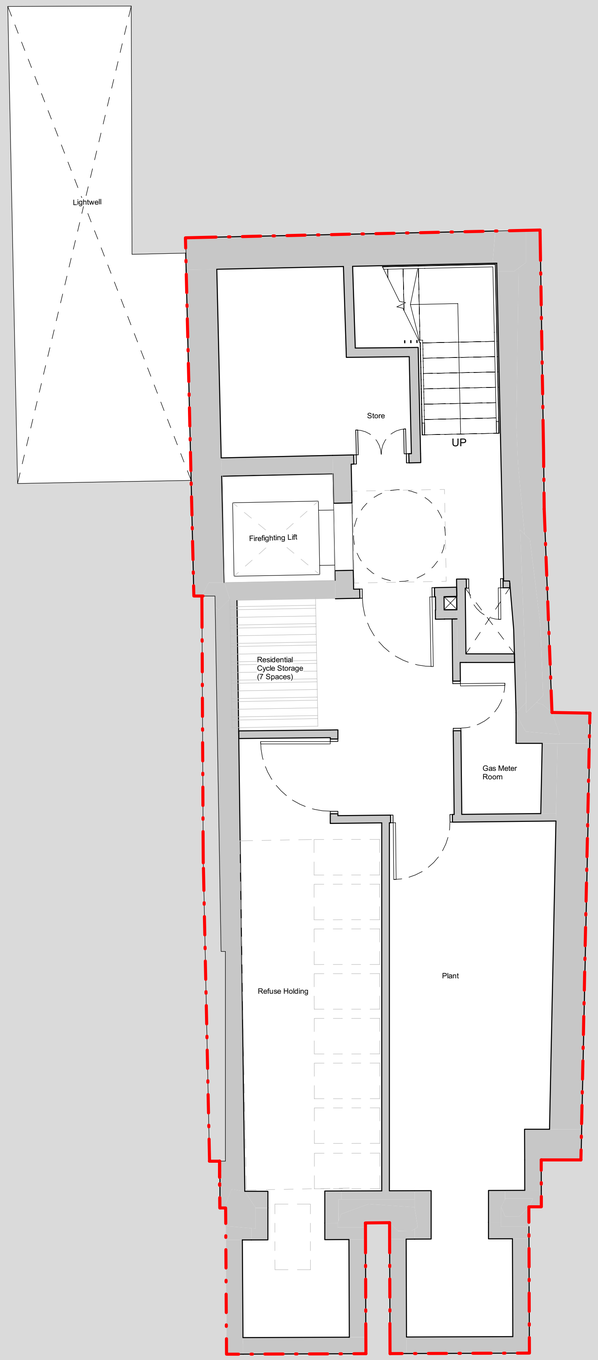
drawing title

Proposed Site Plan

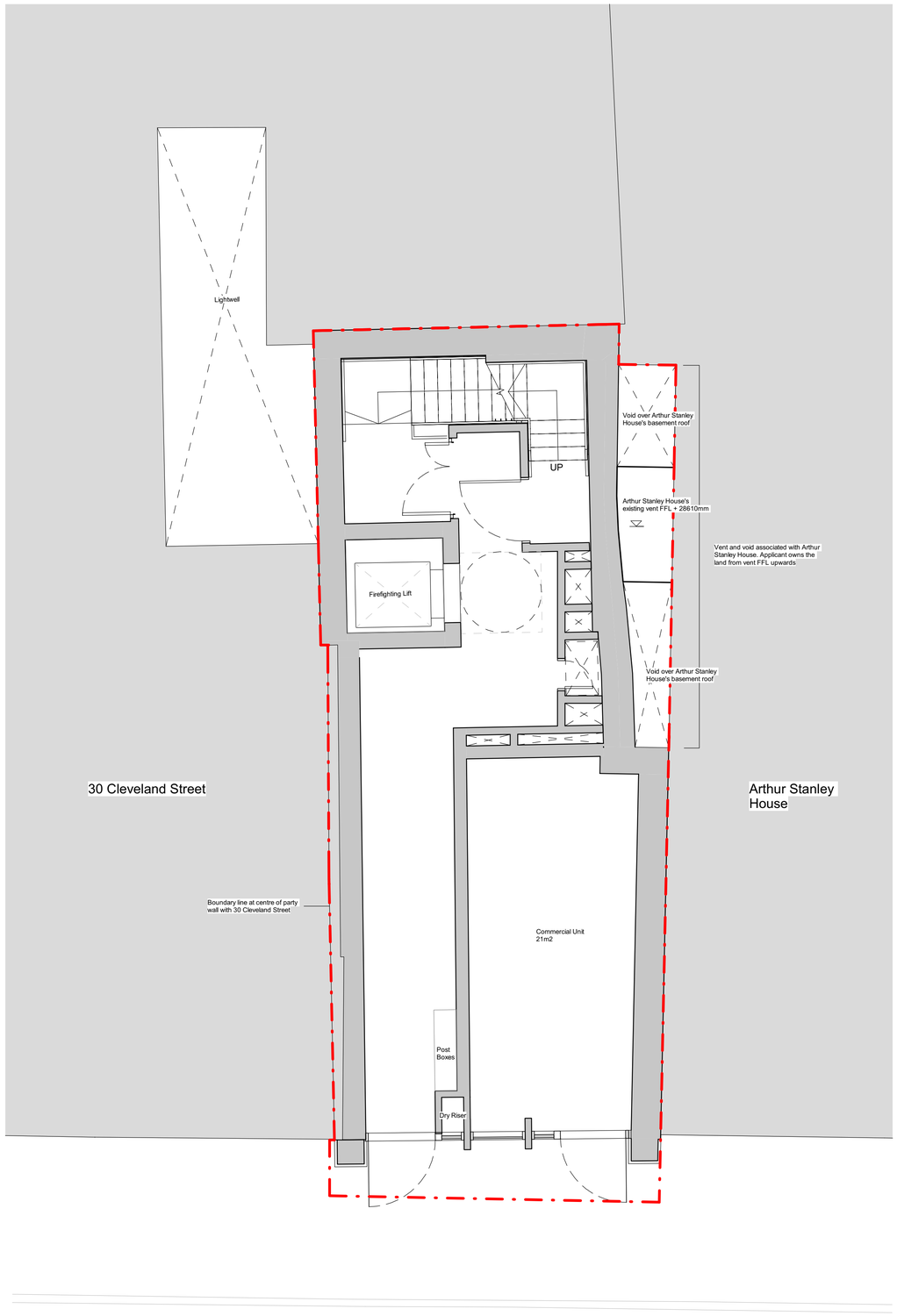
drawn	size	date	scale
	A1	22/04/20	As indicated

drawing number: 297 _P20.000

revision: A



1 P20.100 Basement Plan
1 : 50



2 P20.100 Ground Floor Plan
1 : 50

0 1m 5m

N

NOTES

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52 Tottenham Street
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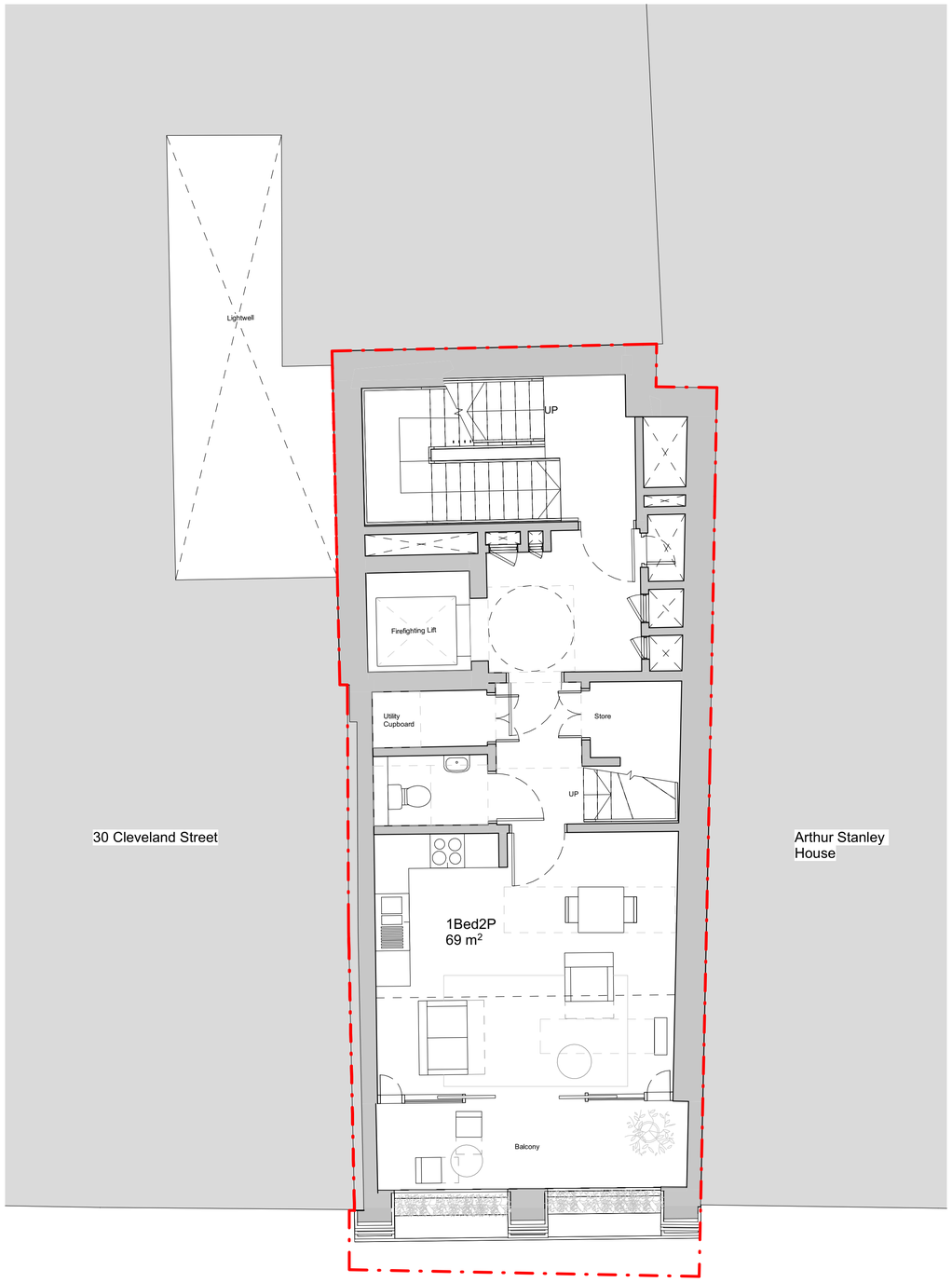
drawing title

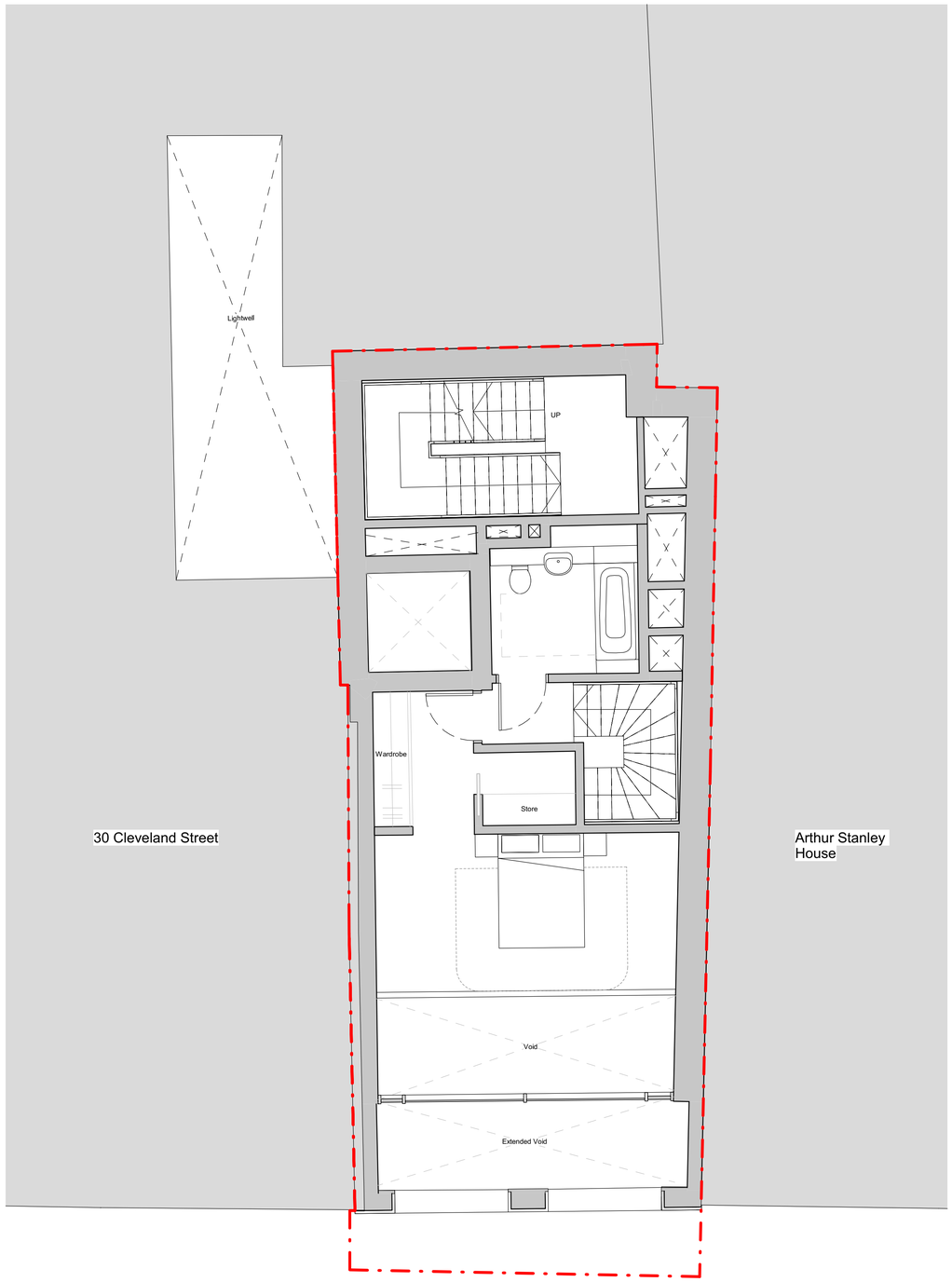
GA Plan - Level B1 & 00

drawn	size	date	scale
	A1	22/04/20	1 : 50

drawing number	revision
297 _P20.100	A



1 P20.101 Level 01 & 03 Floor Plan
1 : 50



2 P20.101 Level 02 & 04 Floor Plan
1 : 50

0 1m 5m N

NOTES

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40.000 Proposed Sections

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A 16/06/20 Revision A

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rev	date	author / check	comments

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52 Tottenham Street
London, W1T 4RN

drawing title

GA Plan - Level 01 - 04

drawn	size	date	scale
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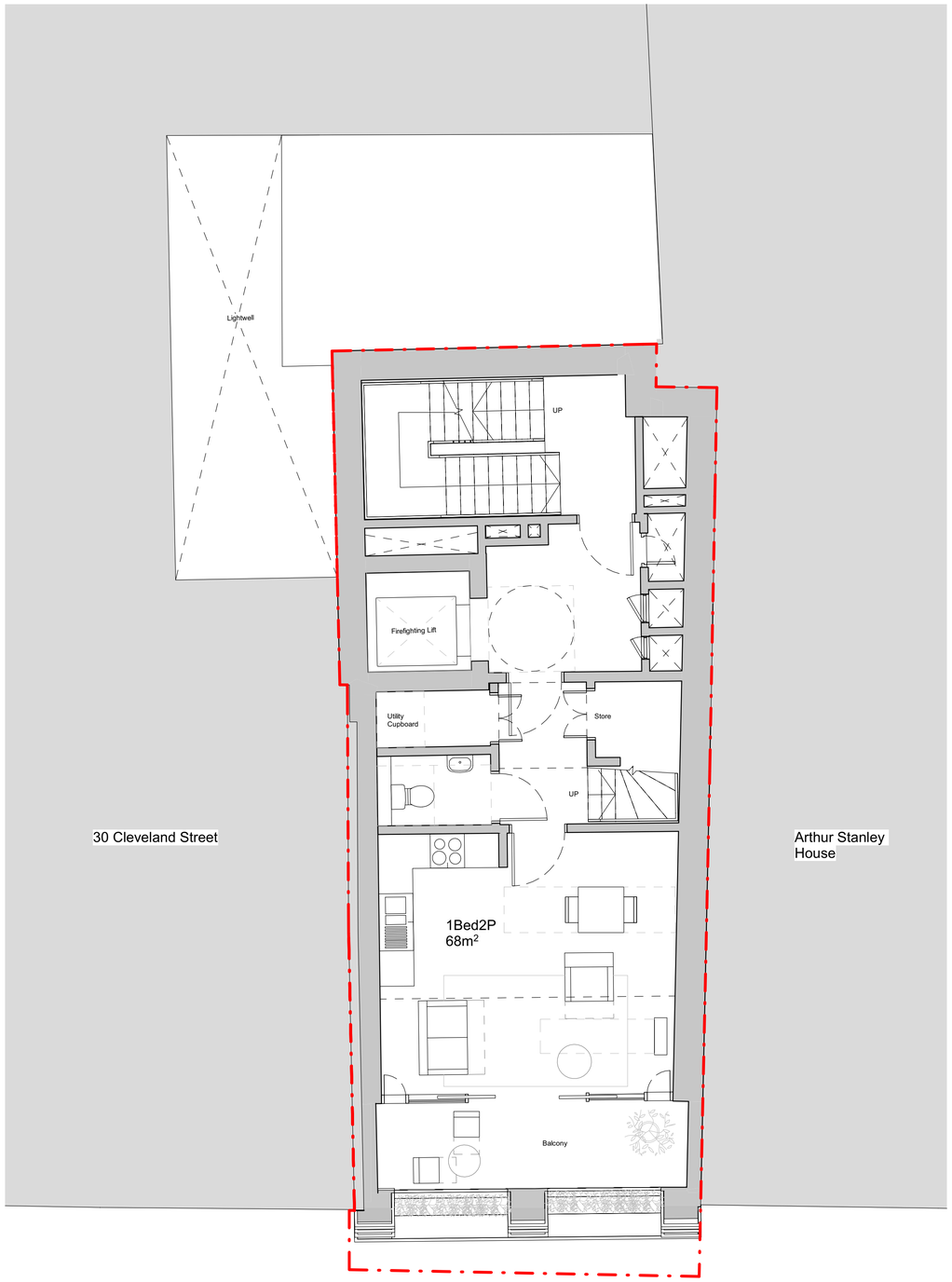
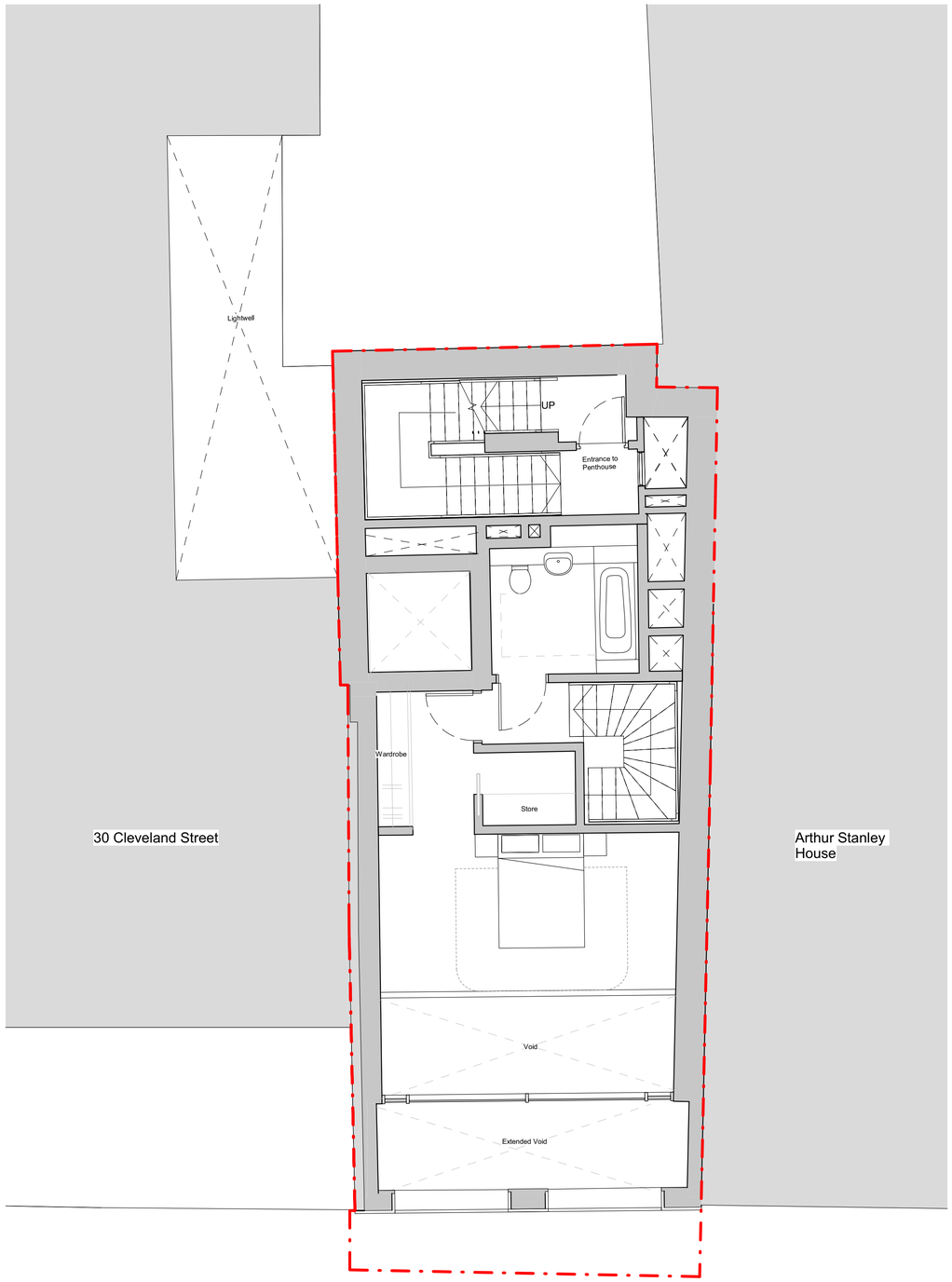
drawing number	revision
297 _P20.101	A



1 P20.102 Level 05 Floor Plan
1 : 50



2 P20.102 Level 06 Floor Plan
1 : 50

0 1m 5m N

NOTES

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40.000 Proposed Sections

KEY:

Site Boundary

A 16/06/20 Revision A

PLANNING

rev	date	author / check	comments

DSDHA
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project

52 Tottenham Street
London, W1T 4RN

drawing title

GA Plan - Level 05 & 06

drawn	size	date	scale
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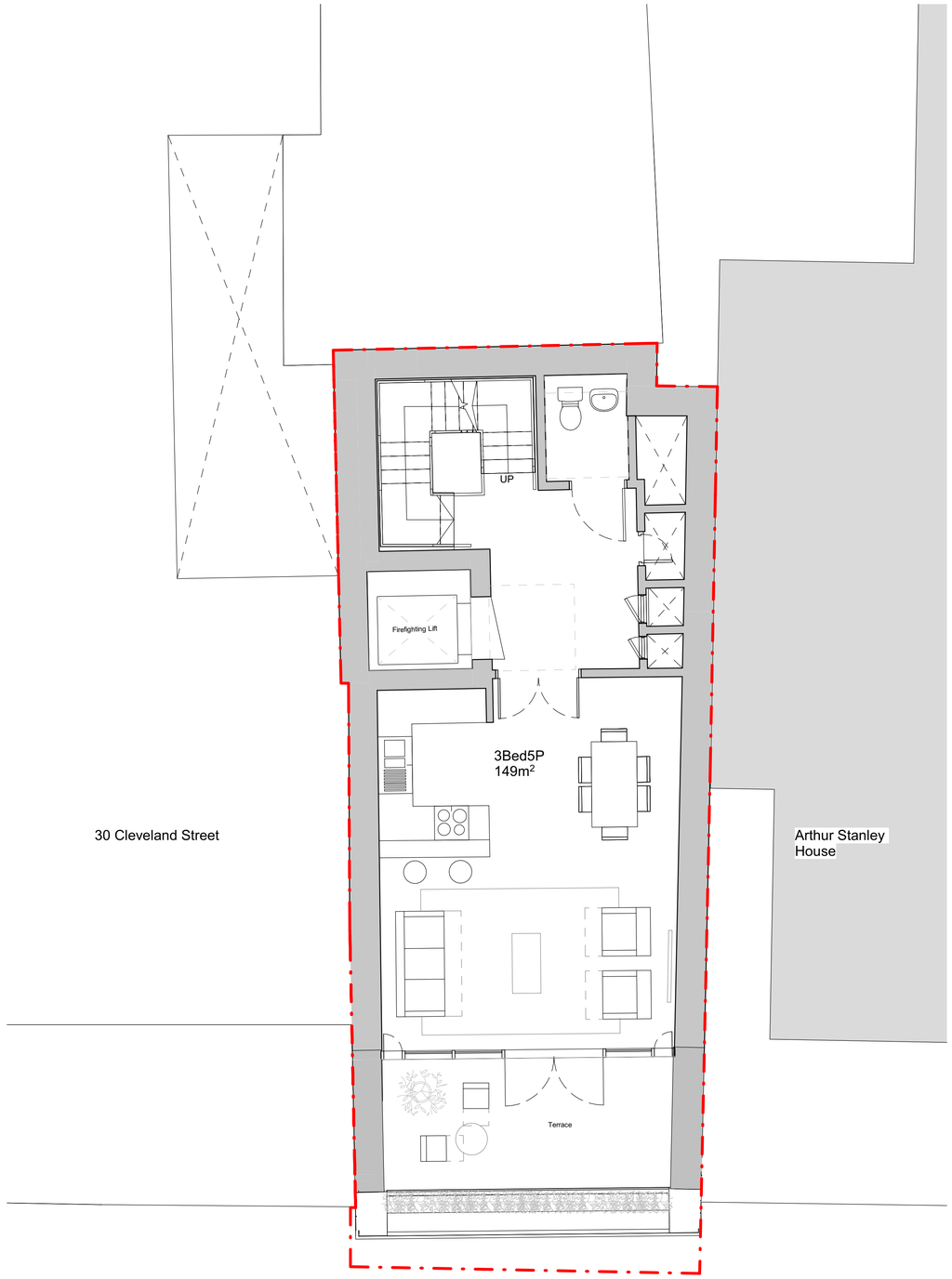
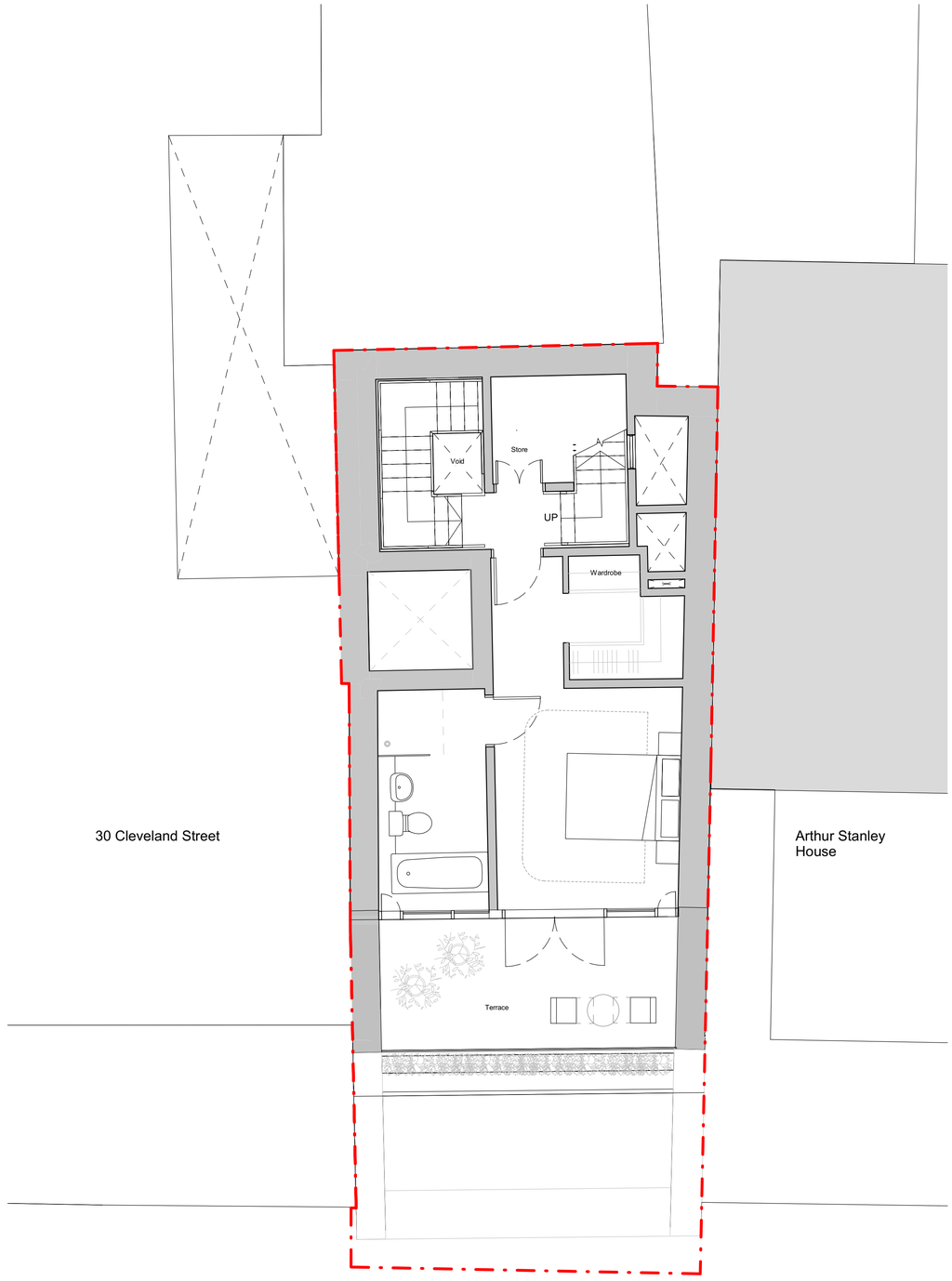
drawing number	revision
297 _P20.102	A



1 P20.103 Level 07 Floor Plan
1 : 50



2 P20.103 Level 08 Floor Plan
1 : 50

0 1m 5m

N

NOTES

GENERAL NOTES:

The internal layouts and ancillary areas of buildings will be subject to design development.

The precise location of walls, internal doors, columns, risers and the detailed layout of bathroom and kitchen areas will be the subject of non-material changes and may vary from the internal layouts set out in these plans.

These minor alterations will not affect the position and arrangements of external doors and windows nor will they affect the relative relationship between habitable rooms and windows.

All materials shown or highlighted are indicative only and may be subject to changes made during detailed design development.

All structure is subject to ongoing design co-ordination and development.

Information on height and extent of neighbouring buildings beyond the application site boundary is indicative only and not based on measured survey.

DRAWING NUMBERING:

10.000 Existing Drawings
20.000 Proposed Plans
30.000 Proposed Elevations
40.000 Proposed Sections

KEY:

Site Boundary

A 16/06/20 Revision A

PLANNING

rev	date	author / check	comments

DSDHA
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T 020 7703 3555
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52 Tottenham Street
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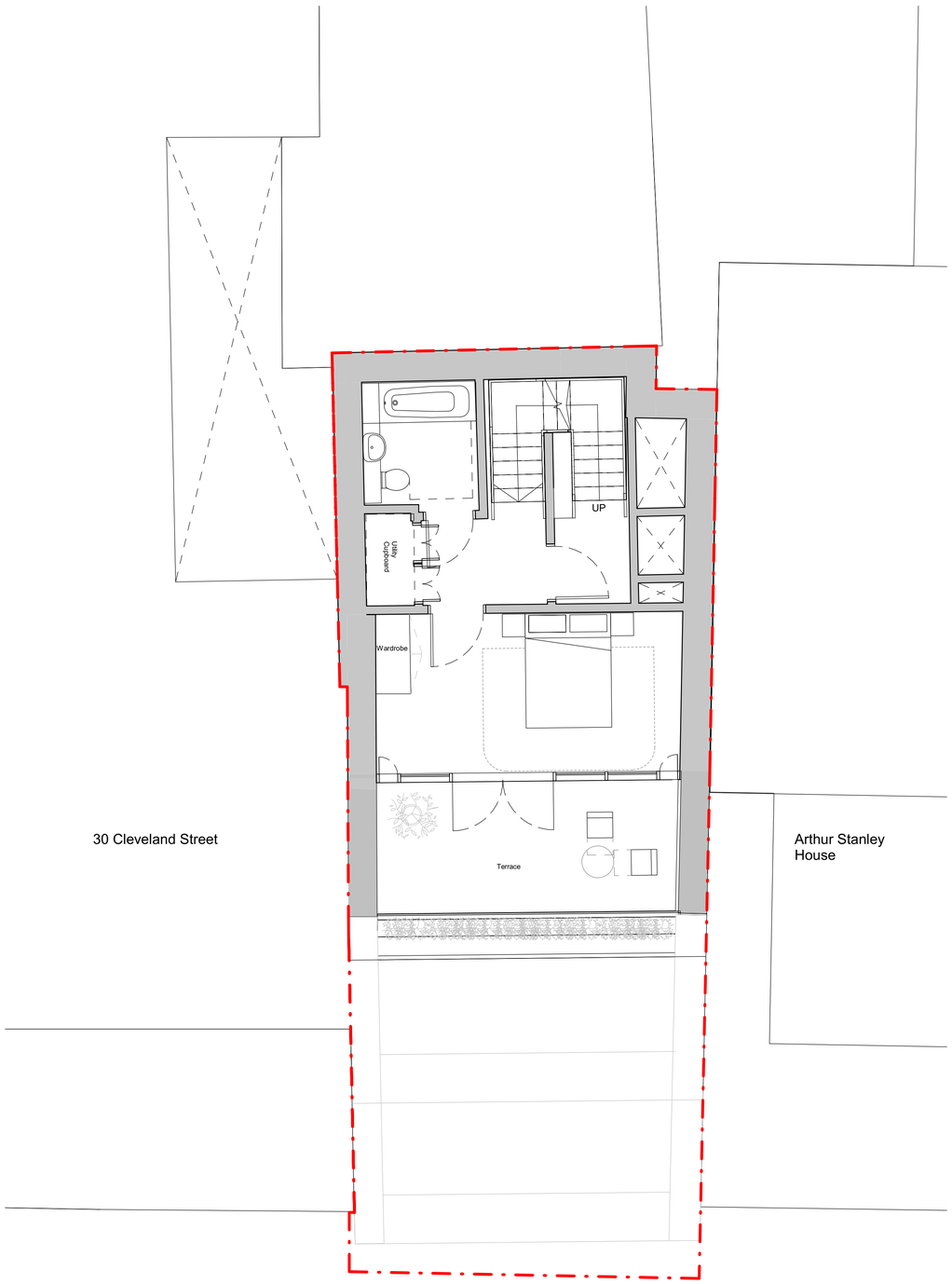
drawing title

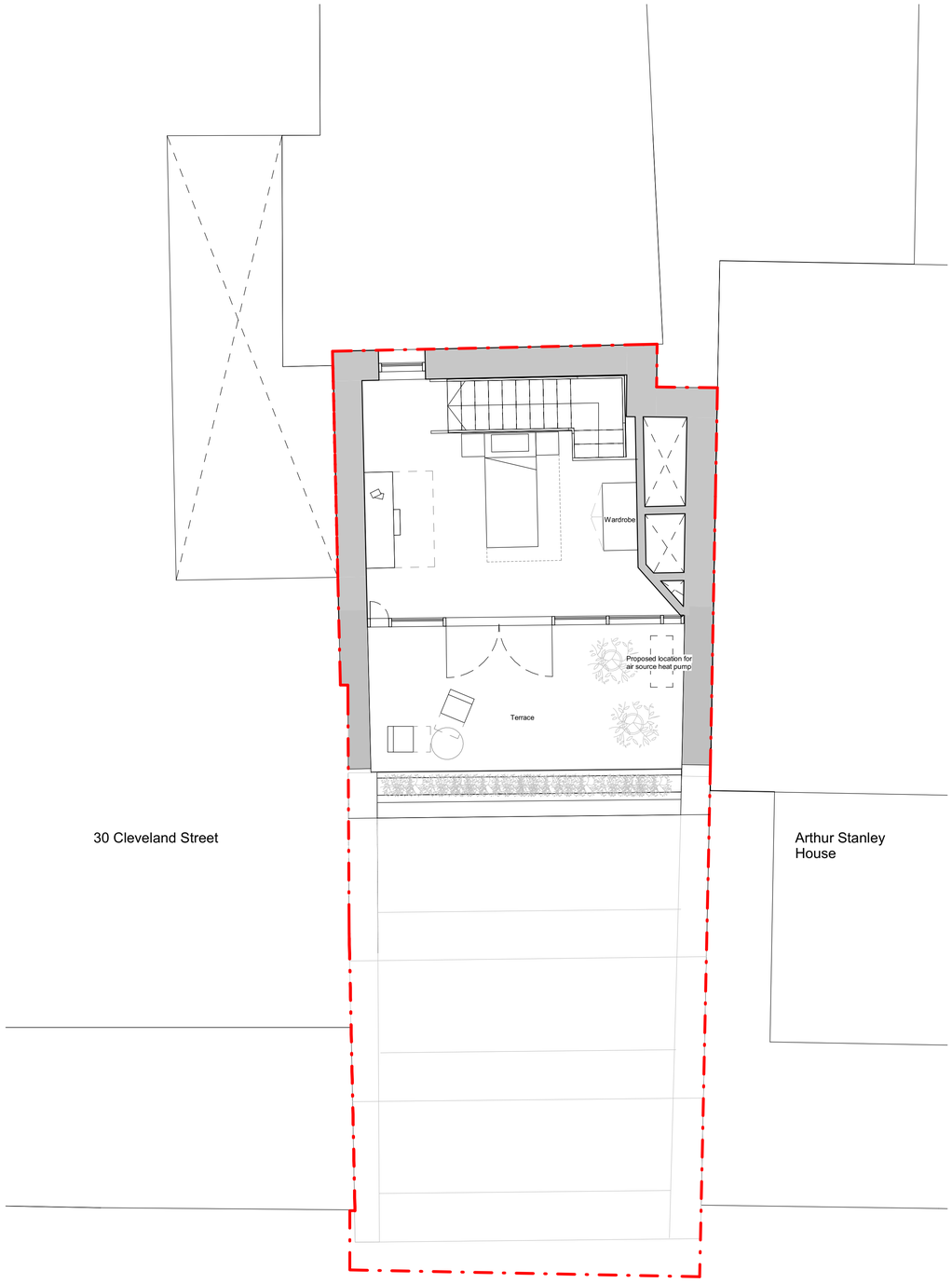
GA Plan - Level 07 & 08

drawn	size	date	scale
	A1	22/04/20	1 : 50

drawing number	revision
297 _P20.103	A



1 P20.104 Level 09 Floor Plan
1 : 50



2 P20.104 Level 10 Floor Plan
1 : 50

0 1m 5m

N

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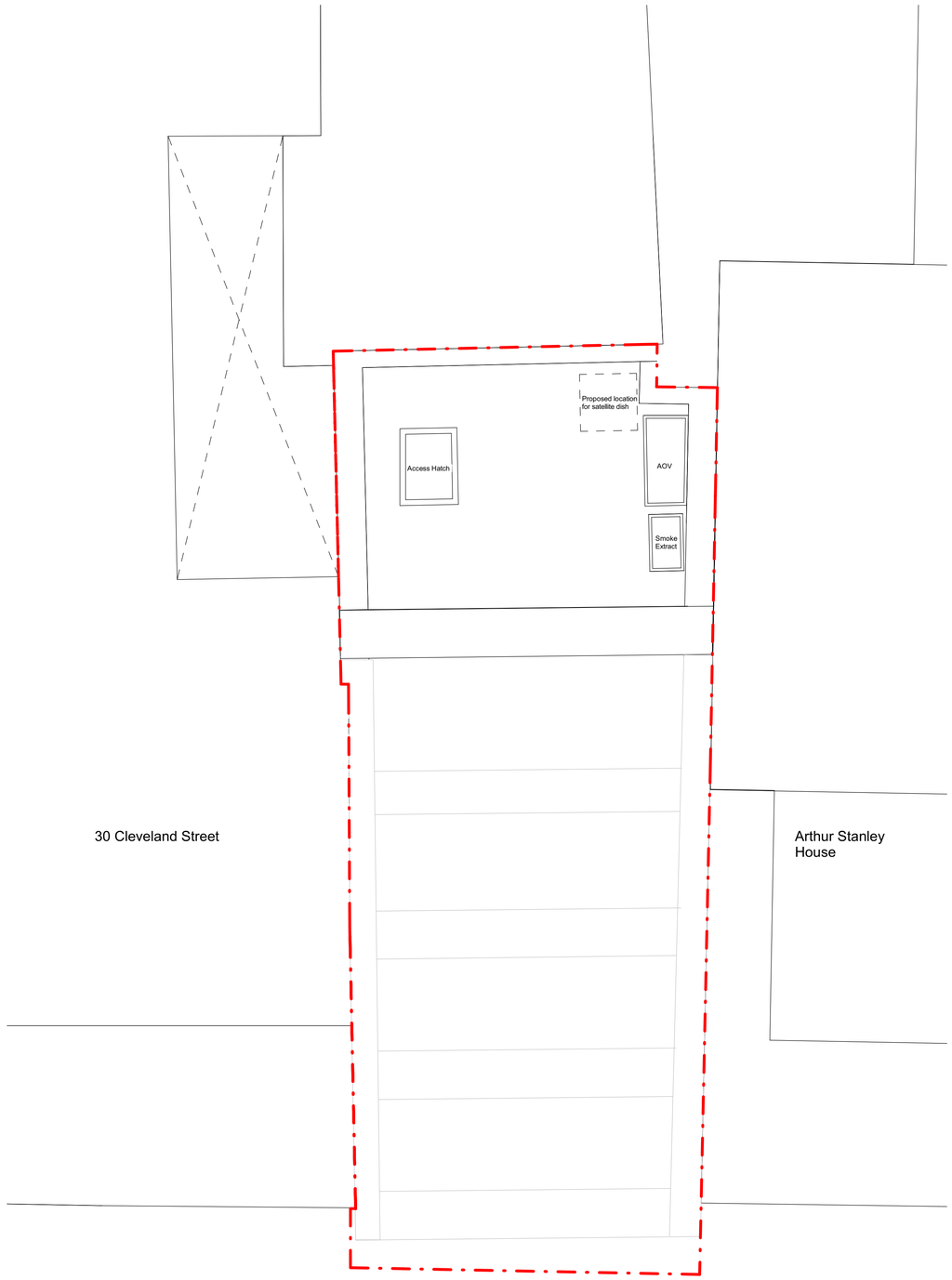
drawing title

GA Plan - Level 09 & 10

drawn	size	date	scale
	A1	22/04/20	1 : 50

drawing number	revision
297 _P20.104	A



1 / P20.105 Roof Plan
1 : 50

0 1m 5m

N

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drawing title

GA Roof Plan

drawn	size	date	scale
	A1	22/04/20	1 : 50

drawing number	revision
297 _P20.105	A