EUSTON TOWER

Basement Impact Assessment

December 2023

British Land

ARUP

British Land Property Management Limited

Euston Tower, 286 Euston Road

Basement Impact Assessment

Reference: 281835-GEO-RP-00003

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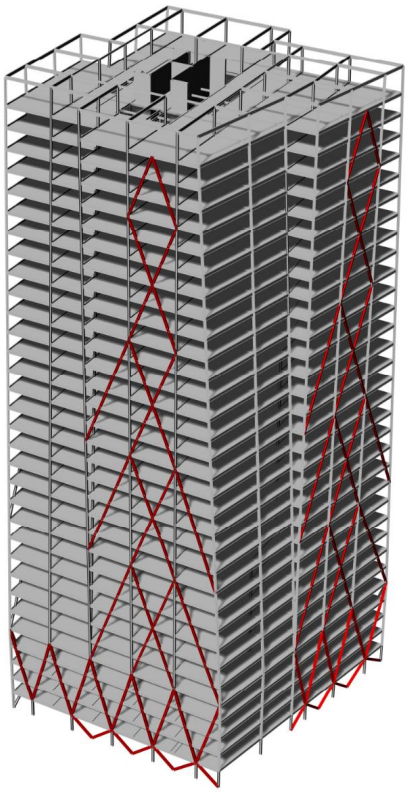

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Non-technical summary

This Basement Impact Assessment (BIA) report has been prepared by Ove Arup and Partners Ltd (Arup) on behalf of British Land Property Management Limited in support of a planning application at Euston Tower, 286 Euston Road, London NW1 3DP.

The proposed development comprises redevelopment of Euston Tower, including the partial retention (retention of existing core, foundations and basement), disassembly, reuse and extension of the existing building, to provide a 32-storey building for use as offices and research and development floorspace (Class E(g)) and office, retail, café and restaurant space (Class E) and learning and community space (Class F) at ground, first and second floors, and associated external terraces. Provision of public realm enhancements, including new landscaping, and provision of new publicly accessible steps and ramp. Provision of short and long stay cycle storage, servicing, refuse storage, plant, and other ancillary and associated works.

A new steel structural frame and new floorplates will be constructed, with the foundations and central core being reused. New supplementary foundations will be constructed to support the new superstructure where it extends beyond the extent of the existing piled raft. A local Basement 02 level is proposed underneath the existing single level basement to accommodate a water tank and plant room. The proposed local Basement 02 level has a plan dimension of approximately 7.45m x 33m (246 sqm), located to the west of existing pinwheel piled raft. The proposed FFL is +19.77mOD in relation to the general single level basement level of +23.9mOD.

The assessment presented in this BIA report is based on guidance provided in the following documents (listed in top-down hierarchy order):

- Camden Local Plan - Policy A5 ‘Basements’ (Camden 2017).
- Camden Planning Guidance (CPG) on Basements (Camden, 2021); and
- Camden geological, hydrogeological, and hydrological study. Guidance for subterranean development (Camden, 2010).

A screening assessment has been carried out in accordance with Camden geological, hydrogeological, and hydrological study. Guidance for subterranean development (Camden, 2010). It is concluded that the proposed development is unlikely to result in any groundwater or surface water issues. This basement impact assessment complies with the requirements of the Camden Local Plan - Policy A5 ‘Basements’ (Camden, 2017) and the latest Camden Planning Guidance on Basements (Camden 2021).

Preliminary ground movement assessment carried out in this report indicated that the neighbouring 1 Triton Square and 2 Triton Square do not fall within the zone of influence for ground movements associated with the proposed development. The southern façade of neighbouring North East Quadrant (10-30 Brock Street) falls within the zone of influence. However, the potential impact of the long-term settlements on 10-30 Brock Street is anticipated to be negligible.

The site falls within the 2015 Crossrail 2 Safeguarding Directions and is located to the west of Northern and Victoria line tunnels, to the north of St Johns Wood to Back Hill deep cable tunnel and Hammersmith & City, Circle and Metropolitan line tunnel). Third party consultation and engagement with the respective asset owners is in progress. Ground movement assessments will be carried out in separate standalone technical assessments for review by the respective third parties ahead of the proposed development as required.

1. Introduction

Ove Arup and Partners Ltd (Arup) have been commissioned by British Land Property Management Limited to carry out a Basement Impact Assessment to support the planning application for the proposed development of Euston Tower, 286 Euston Road, London NW1 3DP.

Euston Tower is the last largely unaltered building constructed as part of the Euston Centre estate for developer DE & J Levy between the years 1962-1972. The estate was designed by architect Sidney Kaye, Eric Firmin & Partners, and the structural engineer for the tower was John De Bremaeker & Partners who are believed to have designed both the sub and super-structure. The Euston tower superstructure was constructed by contractor George Wimpey between approximately 1965 and 1970; it is unclear whether they also constructed the substructure and foundations. The podium was refurbished at the turn of the millennium by architects Sheppard Robson with structural engineers Arup.

The proposed development comprises redevelopment of Euston Tower, including the partial retention (retention of existing core, foundations and basement), disassembly, reuse and extension of the existing building, to provide a 32-storey building for use as offices and research and development floorspace (Class E(g)) and office, retail, café and restaurant space (Class E) and learning and community space (Class F) at ground, first and second floors, and associated external terraces. Provision of public realm enhancements, including new landscaping, and provision of new publicly accessible steps and ramp. Provision of short and long stay cycle storage, servicing, refuse storage, plant, and other ancillary and associated works.

A new steel structural frame and new floorplates will be constructed, with the foundations and central core being reused. New supplementary foundations will be constructed to support the new superstructure where it extends beyond the extent of the existing piled raft. A local Basement 02 level is proposed underneath the existing single level basement to accommodate a water tank and plant room. The proposed local Basement 02 level has a plan dimension of approximately 7.45m x 33m (246 sqm), located to the west of existing pinwheel piled raft. The proposed FFL is +19.77mOD in relation to the general 1 level basement level of +23.9mOD.

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- Camden Local Plan - Policy A5 ‘Basements’ (Camden 2017);
- Camden Planning Guidance (CPG) on Basements (Camden, 2021); and
- Camden geological, hydrogeological and hydrological study. Guidance for subterranean development (Camden, 2010).

This BIA report is prepared by Arup as structural/ geotechnical and services designer of the proposed development. The report has been prepared or checked by a Chartered Civil Engineer (member of the Institution of Civil Engineers) and approved by a Chartered Civil Engineer (Fellow of the Institution of Civil Engineers.)

2. The site

2.1 Site location

Euston Tower (the site) is situated within the London Borough of Camden and the ward of Regent's Park. The site is bounded by Euston Road (south), Hampstead Road (east), Brock Street (north) and Regent's Place (west). The site covers an area of 8,079sqm, comprised of a single, ground plus an existing 36-storey tower. The tower has been largely vacant for several years, predominantly comprising office uses on the upper floors, however there are still retail uses currently in operation at ground floor level.

The site does not fall within a conservation area (CA); however, Fitzroy Square CA and Bloomsbury CA are both located in close proximity (south). There are no elements of the site that are statutory or locally listed. A Certificate of Immunity from listing has been submitted and at the time of submission is still pending in respect of the existing tower. There are several buildings located within a close radius of the site that are Grade I, Grade II, and Grade II* listed. The site has a PTAL rating of 6b indicating 'excellent' transport connectivity. The site is mainly served by Watten Street Underground Station (south), Euston Square Underground Station (east) and Great Portland Street Underground Station (west). There are also several bus routes that serve the site along Euston Road (south) and Hampstead Road (east).

The land surrounding the site consists of a range of uses. The site is designated within the Knowledge Quarter Innovation District (KQID), home to world-class clusters of scientific and knowledge-based institutions and companies specialising in life-sciences, data and technology and creative industries. The neighbouring Regents' Place comprises commercial, office and cultural land uses, as well as pedestrianised streets and public realm incorporated into the space. The closest residential properties are located along Drummond Street (north) and Hampstead Road (east).

The building is part of the mixed-use Regent's Place Estate, currently managed by British Land, as shown in Figure 1.

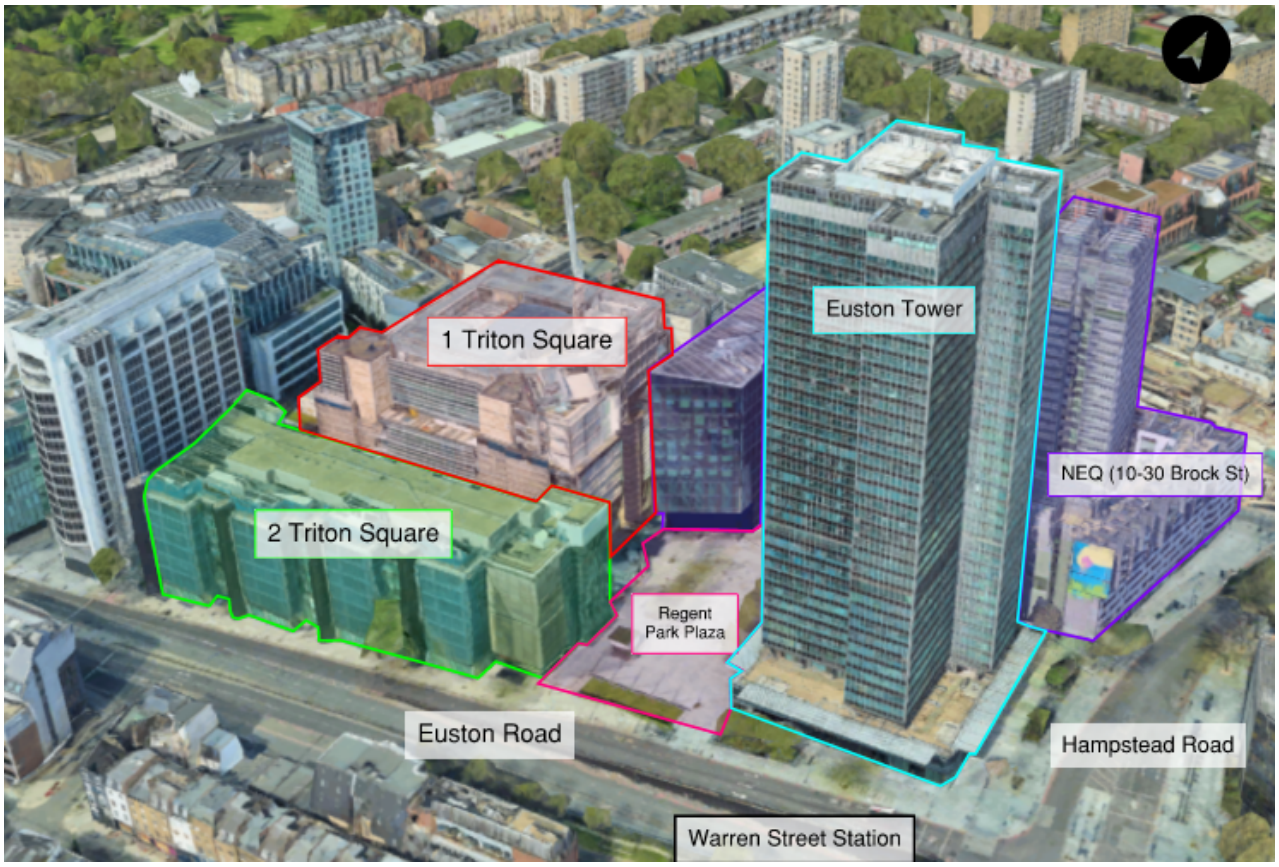


Figure 1: Site location plan (Google Earth, 2022)

2.2 Existing Euston Tower

Euston Tower is a 36-storey tall building standing on the northern edge of central London, situated in the south-west of the London Borough of Camden.

Located on the corner of Euston and Hampstead Road, at the top of Tottenham Court Road, the tower shares a busy intersection with the UCL Hospital campus and is directly opposite Warren Street Station. The current tower has a prominent presence, given its status as the tallest building in the borough aside from the nearby BT Tower, and as such acts as a physical landmark for London Euston, Euston Square and Warren Street stations as well as wayfinding for the wider neighbourhood.

Completed in 1970, Euston Tower is designed in the 'International Style'. Above a two-storey extruded glazed podium, the tower has a pinwheel plan clad in aluminium curtain walling with green reflective tinted glazing. It was designed as an office building to provide cellular office accommodation typical of the period and formed part of a wider masterplan known as The Euston Centre. It now stands on the eastern edge of the pedestrianised Regent's Place Estate.

Since its completion, the Euston Tower has undergone a small refurbishment, but beyond this its external form and façade remain as originally constructed. These elements of the building are in a generally poor condition, due to a combination of wear in use and the quality of the original detailing. Gradually it has been vacated, and since 2021, except for the retail at grade level, the building is entirely disused.

There is a large single-storey shared basement across Regents Place Estate, which is bounded by Drummond Street to the north, Hampstead Road to the East, Euston Road to the South and by Osnaburg Street to the west. Euston Tower is located in the southeast corner as indicated in Figure 2.

The basement will be retained as part of the new works. Reference can be made to the Structural Report (Arup, 2023) contained within the planning application for further details on the existing building structure and proposed modifications.

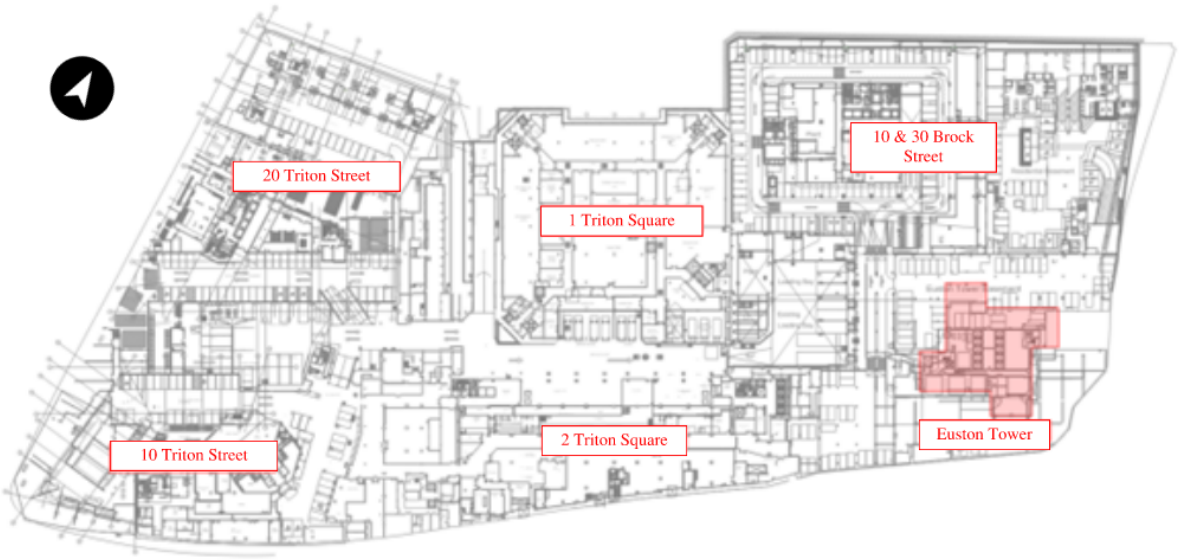


Figure 2: Large single-storey shared basement across Regents Place Estate

2.3 Site history

A geotechnical desk study has been carried out to determine the historical development of the site. Sources of information reviewed as part of the desk study are summarised as below:

- Envirocheck site history search.
- Historical Ordnance Survey mapping.
- Aerial/historic image searches.

- Publicly available information regarding tunnels including safeguarded alignments.
- Available drawings and reports from Arup project archives and those received from British Land.
- Historical maps, records, and fire insurance plans (Goad plans).
- Enquiries with parties involved with the original Euston Tower construction (or successors); and
- Archive searches for Euston Tower.

The historical development of the site is briefly summarised in
Table 1. Based on available information, Euston Tower is understood to have different commercial uses in the past. Some notable previous uses include Capital Radio broadcasting centre and government communications centre.

Table 1: Summary of site historical development

Year	Historical developments
c.1746	Greenfield. The site is not developed.
c. 1813	First development of the site with the majority of site being covered by terraced buildings. By 1989, the properties comprised shops, a pawnbroker, and vacant three-storey terrace buildings with single level basements in the south.
c. 1936	The vacant properties in the south are now occupied with a surgical instrument factory, a sign factory, and a toilet requisite factory.
c. 1957	A sheet metal works now occupies most of the southern plots with miscellaneous shops and units occupying the north.
c. 1963	Clearance of the southern area of site (Euston Road to Eden Street).
c. 1966	Construction of Euston Road/ Hampstead Road underpass (south of Euston Tower).
c. 1966-1970	Euston Centre development. Construction of Euston Tower (then known as Euston Centre Block A), comprising the existing 36-storey concrete framed tower with two-level podium and a single level basement carpark (common level basement, spanning across the site).
c. 1971	Euston Tower completed.
c. Late 1960s/ early 1970s	Construction of Euston Centre Block F immediately to the west of Euston Tower (Euston Centre Block A)
c. 1972-1974	Construction of buildings to the north of Euston Tower, 10-30 Brock Street.
c. 1990s	Demolition of 2 Triton Square area, including the connecting two-storey podium structure, in early-mid 90s, current adjacent building completed by 2006.
c. 2010-2012	Demolition and construction of buildings to the north of Euston Tower (Northeast Quadrant 10-30 Brock St).

2.4 Topography

The ground level public realm across the site footprint is relatively flat at approximately +28.0 metres above Ordnance Datum (mOD) as shown in the Plowman Craven topographic survey dated June 2018. The drawings are included in Appendix A.

The single level basement slab level at the site is typically around +23.9mOD SSL or 4.1 metres below ground level (mbgl). Towards 1 Triton Square situated west of the site, the basement slab level drops down to approximately +21.7mOD via a step, to allow access for larger service vehicles via a loading bay.

2.5 Neighbouring buildings and assessment methodology

Camden Planning Guidance (CPG) on Basements (Camden, 2021) states that the anticipated damage category for neighbouring structures should not exceed category 1 'very slight' on the Burland scale. The Burland assessment methodology referenced in the CPG has been adopted for projects internationally and has been used by the Building Research Establishment and the Institution of Structural Engineers, London.

The classification system is based on the ease of repair of potential damage. Burland Scale categories 0 ('negligible'), 1 ('very slight'), and 2 ('slight') refer to aesthetic damage, category 3 ('moderate') and 4 ('severe') relate to serviceability and function, and 5 ('very severe') represents damage which relates to stability. Further details are provided within the CPG on Basements (Camden, 2021) guidance document.

Neighbouring structures are identified below and described in the following sections.

- 10-30 Brock Street – Northeast Quadrant (NEQ)
- 1 Triton Square
- 2 Triton Square

The zone of influence for ground movements refers to the area with calculated vertical ground movements greater than +/-1mm. A screening ground movement assessment has been carried out to identify the zone of influence.

- A limited extent of the Northeast Quadrant (10-30 Brock Street) southern façade falls within the zone of influence, and is assessed in this report.
- The assessment showed that 1 Triton Square and 2 Triton Square do not fall within the zone of influence for ground movements associated with the proposed redevelopment.

For further details of the methodology for ground movement assessment, refer to Section 6 of this report.

2.5.1 1 Triton Square

An eight-storey reinforced concrete frame commercial building with a single-level service basement which connects to wider basement for Euston Tower and under Regent's Park Plaza. The superstructure is located approximately 50m west from the Euston Tower superstructure. 1 Triton Square was originally developed in the early 1990s and was substantially modified to provide additional storeys by 2020.

Figure 3 shows the view of 1 Triton Square, looking west from Euston Tower.

Figure 3: 1 Triton square looking west from Euston Tower (image taken 10/11/2023, Arup)

2.5.2 2 Triton Square

A seven-storey concrete frame commercial building with a single level basement located southwest of Euston Tower. It is currently the head office for Santander UK. The building was completed in 2001. Figure 4 shows a view of 2 Triton Square looking west from Euston Tower.

Figure 4: 2 Triton Square looking west from Euston Tower (image taken 10/11/2023, Arup)

2.5.3 10-30 Brock Street - North East Quadrant (NEQ)

Situated immediately north of Euston Tower, NEQ (as shown in Figure 5) covers 10 and 20-30 Brock Street where development began in late 2000s and was completed in 2013.

- 20-30 Brock Street (The Triton Building) comprises a 26-storey residential tower with accompanying eight-storey block. 20-30 Brock Street has a double-level basement connecting to the single-level basement under Euston Tower.
- 10 Brock Street is commercial office space and comprises a part-9, part-11, and part-16 storey block. 10 Brock Street has a double-level basement which connects to the single-level basement under Euston Tower.

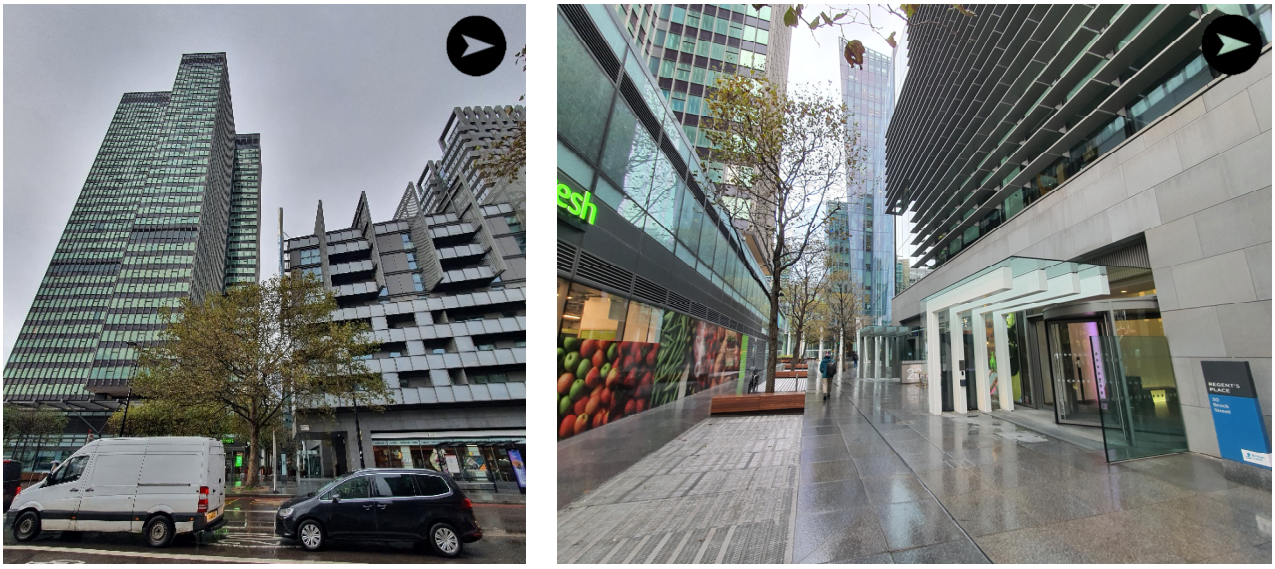


Figure 5: a) 10-30 Brock Street (North East Quadrant) looking west from Hampstead Road; b) 10-30 Brock Street pedestrian zone (images taken 10/11/2023, Arup)

2.6 Neighbouring highway assets

A review of publicly owned land in immediate proximity to the site has been carried out using the "Mayor of London – Map of Publicly Owned Land" GIS web app. The map, as presented in Figure 6, indicates land owned by Transport for London to the south of the site boundary under Title number: NGL375743, including the Euston Road, highway underpass structure and the public realm. A further small parcel of land (NGL375743) is indicated to be within TfL ownership immediately adjacent to the south-east corner of the existing building.

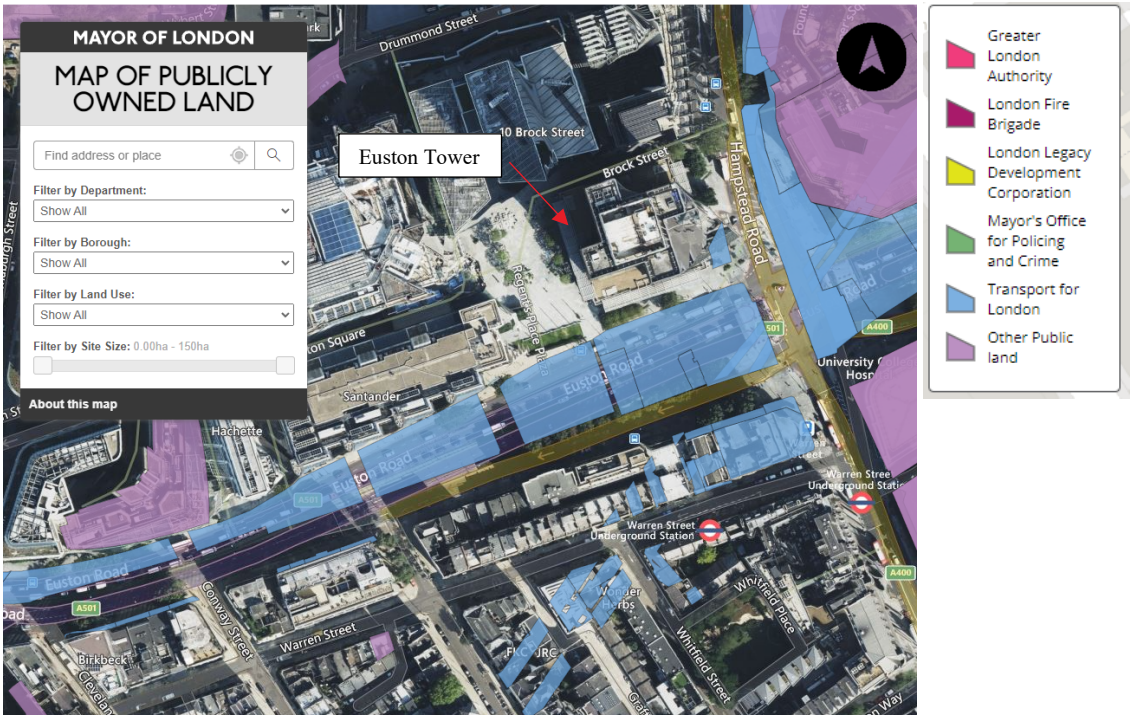


Figure 6 - Map of publicly owned land (source https://apps.london.gov.uk/public-land/ accessed 16/1/22)

The Euston Road underpass is an approximately 20m deep diaphragm wall underpass underneath the intersection with Hampstead Road and is located approximately 14m from the basement of the Euston Tower site. The underpass was constructed around 1961-1966 as part of public realm and highway improvements to dual Marylebone to Euston Road. The location is slightly to the north of the original location of Euston Road to avoid conflict with the London Underground Limited (LUL) cut and cover tunnels (Hammersmith City & Metropolitan lines) and involved demolition of Eden Street.

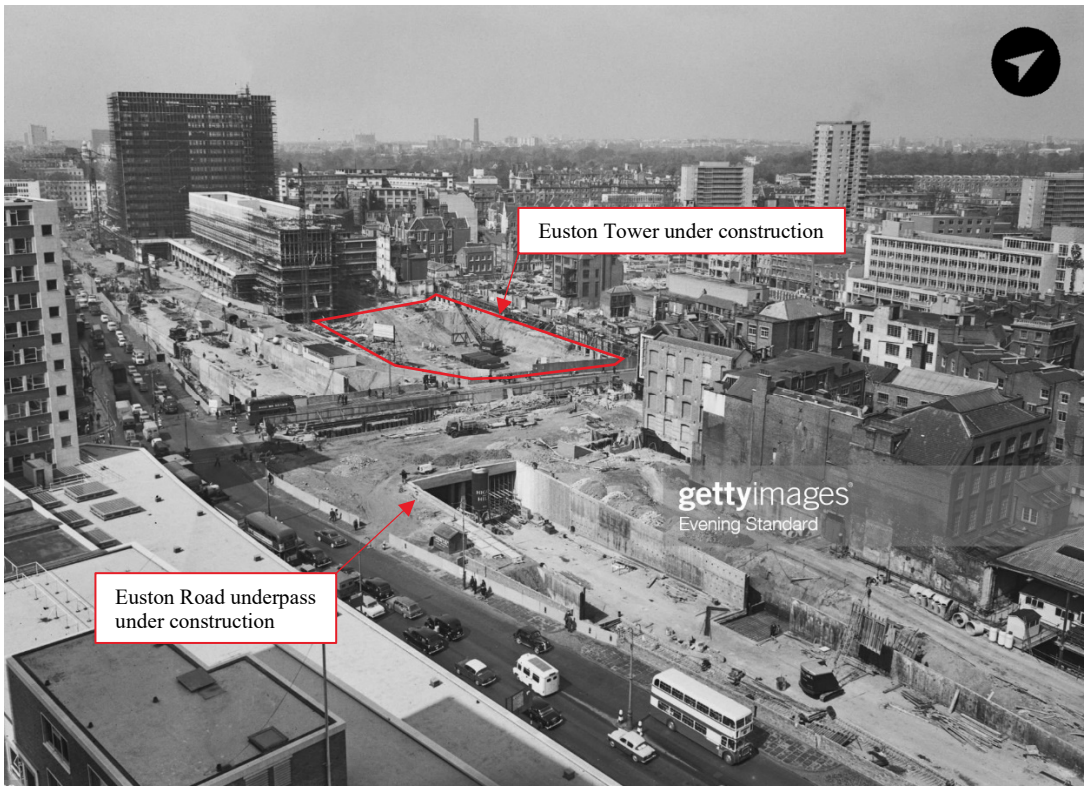


Figure 7 - Euston Road underpass under construction (Evening Standard, 1965)

Figure 8 - Euston Road Underpass under construction ~1966 Source- A London Inheritance/ London Metropolitan Archives https://alondoninheritance.com/london-streets/a-lost-bank-and-the-adam-and-eve-pub-on-the-corner-of-euston-road-and-hampstead-road/attachment/eus

2.7 Tunnels and utilities

Various utilities are identified as present east and south of the site boundaries, as shown in the Plowman Craven topographic survey dated June 2018 (see Appendix A). A Groundwise statutory utility search was commissioned by Arup in December 2019 (Report ref. URO6731.1DM).

A summary of the assets identified is provided in Table 2. Site constraints plans showing tunnels and utilities are included in Appendix B.

The following deep tunnels have been identified in proximity to the site:

- A cable route between St Johns Wood and Back Hill runs under Euston Road west-east, approximately 6m south of the site, with a crown level at approximately +11.0mOD.
- The Northern line and Victoria line are located approximately 8m east and 31m south-east of the site respectively at track levels of approximately +1mOD (27mbgl) and -5mOD (34mbgl) respectively; and
- The Hammersmith and City, Circle & Metropolitan lines run underneath Euston Road, 37m south of the site at a track level of approximately +18mOD (10mbgl).

Table 2 - Summary of tunnels and utilities identified from statutory search.

Asset	Provider	Details
Sewers	Thames Water	Large brick sewers between 1143mmx762mm (4m south of basement, under Euston Road) and 1372mmx864mm (7m east of basement, under Hampstead Road)
Water mains		Water mains of trunk 18" & 8" (possibly cast-iron based on dimensions), Indicated in the search response to be at approximately 1.0m depth. Unknown pressure at the time of writing.
Electricity	UK Power Networks	Multiple cables and contain HV and LV at approximately 0.5m depth with diameter unknown along the east side on

Asset	Provider	Details
		Hampstead Road, round the corner onto Euston Road heading west.
Gas	Cadent	A low pressure (LP) main at approximately 1.3m depth mains running along the east side on Hampstead Road, round the corner onto Euston Road heading west. Diameter is 125mm polyethylene within 200mm ductile iron.
Telecommunications	BT, Colt, Instalcom Ltd, SSE, Verizon, Virgin Media, Vodafone	Indicated in the search response to be at approximately between 0.2 and 1.0m below ground level. Diameter unknown.
Transport	LUL/Transport for London (TfL) power assets	Traffic control cables up to 0.5m depth. HV and LV track and road cables also present along Euston Road and up to Hampstead Road
	London Underground lines	Victoria line Northern line Hammersmith & City, Circle & Metropolitan Line.

Figure 9 shows the location of TfL assets as identified within a statutory utility search (deep tunnels) during November 2019.

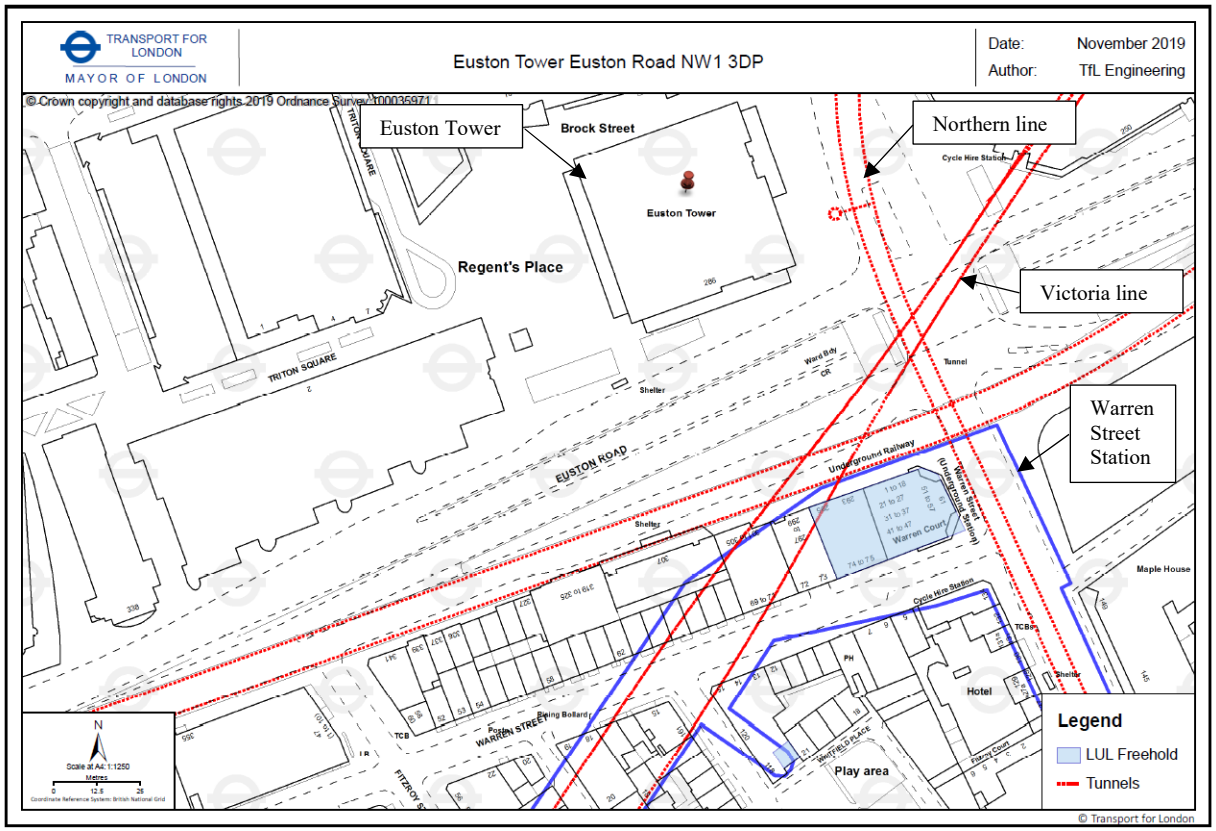


Figure 9 – TfL/LUL Statutory utility search response dated 7 November 2019, obtained via Groundwise. The location of Warren Steet station is shown in blue.

An initial meeting with the TfL Infrastructure Protection team took place on 3rd November 2023 to discuss the proposed development of Euston Tower and to seek initial feedback on the scheme proposals.

2.8 Future infrastructure

The Crossrail 2 safeguarded zone provides the anticipated route of the tunnels, as well as land at ground level, that may be used for the future construction of the tunnels, station, and shafts. The safeguarded route was published in 2015 together with notes for guidance. The site location and safeguarding limits (2015) defined in the 2015 safeguarding directions are shown in Figure 10. Further details can be found at: https://crossrail2.co.uk/discover/safeguarding/.

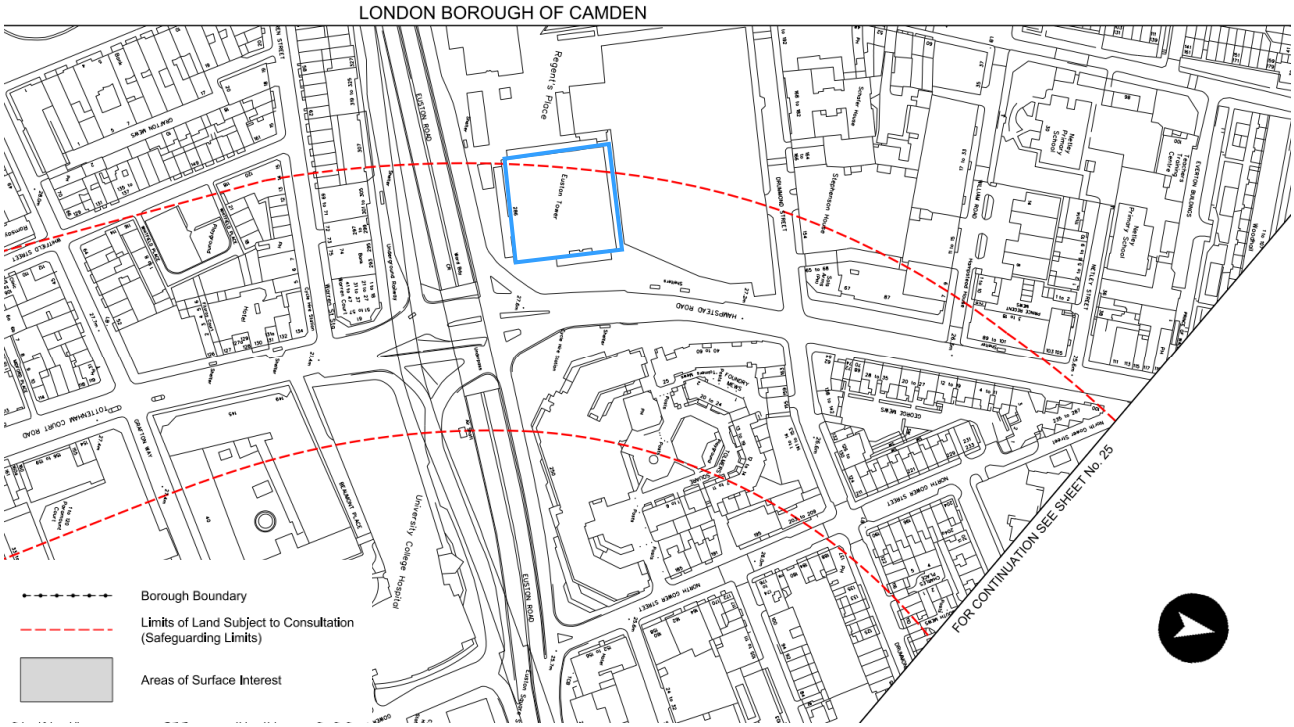


Figure 10 - Crossrail 2 safeguarding directions Sheet No24. March 2015. [MMD-307346-C-DR-SG-XX-1124]

The safeguarded limits of Crossrail 2 (2015) shown on the Crossrail 2 interactive map is shown in Figure 11a. The safeguarded limits crosses most of the Euston Tower site and the alignment is shown to cross the south-eastern corner of the junction of Euston Road and Hampstead Road. The viewer and further details can be found at the following URL:

https://cr2.maps.arcgis.com/apps/webappviewer/index.html?id=21a7f72dfd0c443db5733bd81a707a67.

It is understood that the route alignment has evolved since the safeguarding directions were published in 2015 and the latest route alignment iteration has been requested from the Crossrail 2 Safeguarding Manager. The latest Mk20.1 alignment received from the Crossrail 2 Safeguarding Manager on 9/10/2023 is shown in Figure 11b. The proposed alignment is slightly closer to the location of Euston Tower than that shown in the publicly available webmap presented as Figure 11a, however shows that the proposed alignment is to the east of the location of Euston Tower beneath Hampstead & Euston Roads, and that the proposed development is not located within the tunnel exclusion zone or alignment adjustment zone.

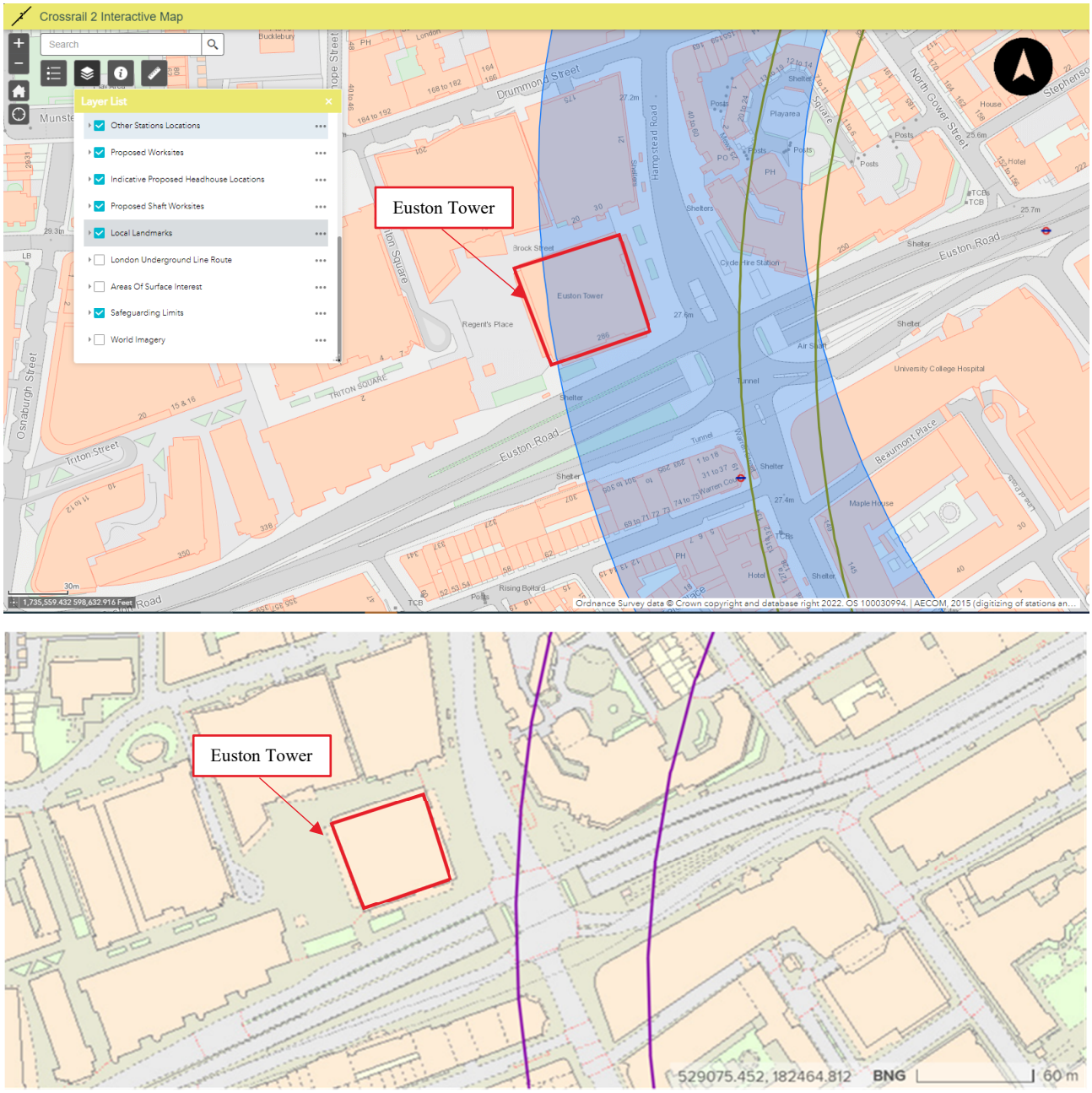


Figure 11 - Crossrail 2 safeguarding map extract – a) accessed 13/1/2023 b) Mk20.1 provided by CR2 9/10/23.

The safeguarding processes for Crossrail 2 require vertical and horizontal exclusion zones for future tunnels to be maintained, together with a technical approval process for consenting schemes within this zone. Details of the exclusion zone definition and alignment adjustment zone are given in the Information for Developers (April 2021) and reproduced in Figure 12. It is anticipated that the future Crossrail 2 tunnel will be deeper than the existing London Underground lines and have a diameter of ~8m.

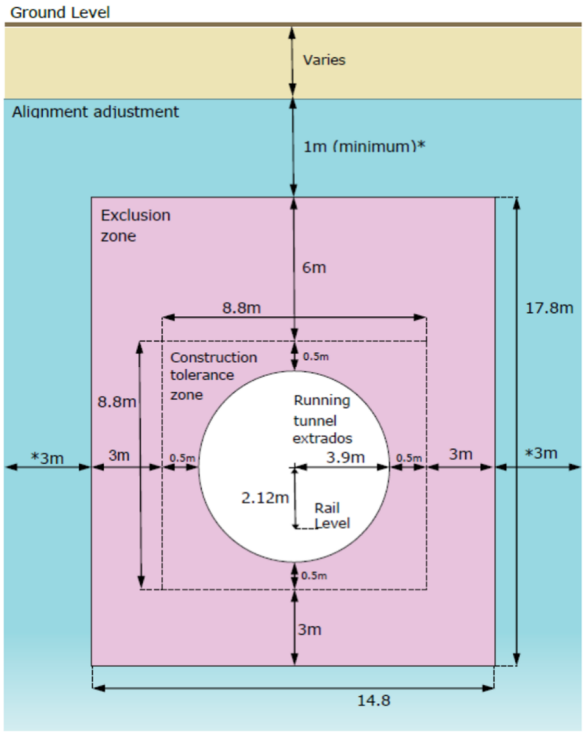


Figure 12 - Exclusion zone section from the Crossrail 2 Information for Developers, (April 2021)

As a result of future Crossrail 2 train services, there is the potential for vibrations to be transmitted to the buildings which could be re-radiated as ground borne noise within the building.

Engagement is in progress with TfL & Crossrail 2 to confirm the latest alignment proposals and to inform the subsequent design process. It is anticipated that Crossrail 2 would be a consultee to any planning application at the site. An initial meeting with the Crossrail 2 Safeguarding Manager took place on 3rd November 2023 to discuss the proposed development of Euston Tower, to confirm the principles of the safeguarding process and to determine the latest alignment information.

2.9 Unexploded ordnance

Assessment for the potential of encountering unexploded ordnance is outside the remit of this report. Based on the London Metropolitan Archives bomb damage map (shown in Figure 13), the Euston area was recorded as subject of bombing during World War II with most of the site receiving blast damage. Buildings which suffered damage beyond repair and total destruction were located within the eastern portion of site and immediately to the south of the site respectively. A review of UXO risk maps provided online by Zetica indicated the site as 'high risk'.

A detailed UXO risk assessment is recommended ahead of intrusive works at the site.

Figure 13 - Layers of London Bomb damage map from the London Metropolitan Archives webmap (https://www.layersoflondon.org/ accessed 17/01/2023)

2.10 Flood risk assessment

A flood risk assessment (FRA) has been carried out by Arup relating to this application. The document assesses the flood risk at the site from various sources and presents the proposed drainage strategy for the redevelopment. For the detailed assessment please refer to the Flood Risk Assessment report (Arup, 2023, Report ref.: 281835-ARP-XX-XX-RP-CD-0001).

The key findings of the FRA are outlined as follows:

- The site is located within Flood Zone 1, an area of low probability of flooding.
- Flood risks from tidal/ fluvial sources, pluvial sources, groundwater, artificial sources, and infrastructure failure are all considered to be low.
- Considerations have been given to both risk to the site, and potential offsite risk as a result of the proposed redevelopment, in accordance with the requirements of Chapter 14 of the National Planning Policy Framework (NPPF).
- Based on current understanding of site setting and the proposals, it is considered that the redevelopment can be carried out and operated safely and would not increase flood risk elsewhere.
- The existing drainage network will be retained as there is no change to the site footprint.
- It is assumed that there is no infiltration due to the presence of basement beneath the building footprint.
- Attenuation will be provided within a combination of blue roof systems and storage within the basement. It is proposed where possible, the inclusion of tanked permeable paving and provision of urban vegetation and green roofs to increase water cleansing; and
- Foul water flows are expected to increase due to the proposed alterations and increased floorplate, so it is likely that these flows will be pumped within the building to the existing point of connection.

3. Ground conditions and ground model

3.1 Regional geology

Published British Geological Society (BGS) 1:50,000 series solid and drift geological mapping is presented in Figure 1 of Appendix C. The superficial geology at the location of the site consists of Lynch Hill Gravel (part of the River Terrace Deposits). The outcrop of the boundary between Lynch Hill Gravel and Langley Silt ('Brickearth') is located approximately 200m to the north of the site. No indication of faults, drift-filled hollows ('scour hollows') or other distinct geological features are identified on the available mapping in the immediate vicinity of the site.

The BGS 1920s edition of the solid and drift geological map is shown in Figure 2 of Appendix C. This map does not show the outcrop of Langley Silt but shows a direct transition between the River Terrace Deposits and London Clay approximately 300m to the north of the site. Approximately 150m to the east of the site a stream or watercourse is indicated. The Lost Rivers of London by Barton (1992) was reviewed to determine the presence of former river features in proximity to the site.

Figure 3 of Appendix C presents an indicative section of the London basin from 1994 BGS 1: 50,000 series geological map, consisting of River Terrace Deposits overlying London Clay, Lambeth Group, Thanet Sand and Chalk.

Contour maps from the more recent BGS 1:50,000 series geological maps presented in Figure 4 of Appendix C indicate that the base of London Clay is expected to be between 0mOD and -5mOD and the top of the Upper Chalk is at around -30mOD.

3.2 Site investigations

Previous project site investigations researched and availible in the vicinity of Euston Tower include:

- 12 no. boreholes (BH1 to BH12) and 9 no. trial pits (TP1 to TP9) – Regents Place and Triton Square Geotechnical Investigation Report, Laing Technology Group Limited (LTG), dated April 1995. The site location plan and two closest logs (BH12 and TP8) are included in Appendix D.
- 1 no. borehole (BH1) at 1 Triton Square- Related to the recent refurbishment and foundation strengthening project undertaken by British Land, dated 2017; and,
- 6 no. boreholes (BH1 to BH 6) – Tolmers Square Geotechnical Investigation Report, dated 1977. The site location plan and borehole logs have been included in Appendix D.

In relation to the proposed development at Euston Tower, an initial intrusive foundation and geotechnical investigation has been undertaken between February and July 2022.

- The aim of the investigation was to determine the suitability of a foundation re-use scheme and to investigate the existing piled foundations, ground, and groundwater conditions local to the Euston Tower.
- Excavations were carried out to the toe level of several existing piles to confirm the length and soil stratigraphy and properties, and to obtain samples for laboratory testing.
- Samples of the substructure steel and concrete were taken for examination and testing.

3.3 Stratigraphy

Figure 14 presents a west to east geological cross-section, summarising existing previous local borehole information from Regents Place, Tolmers Square together with stratigraphy encountered from the 2022 foundation investigation.

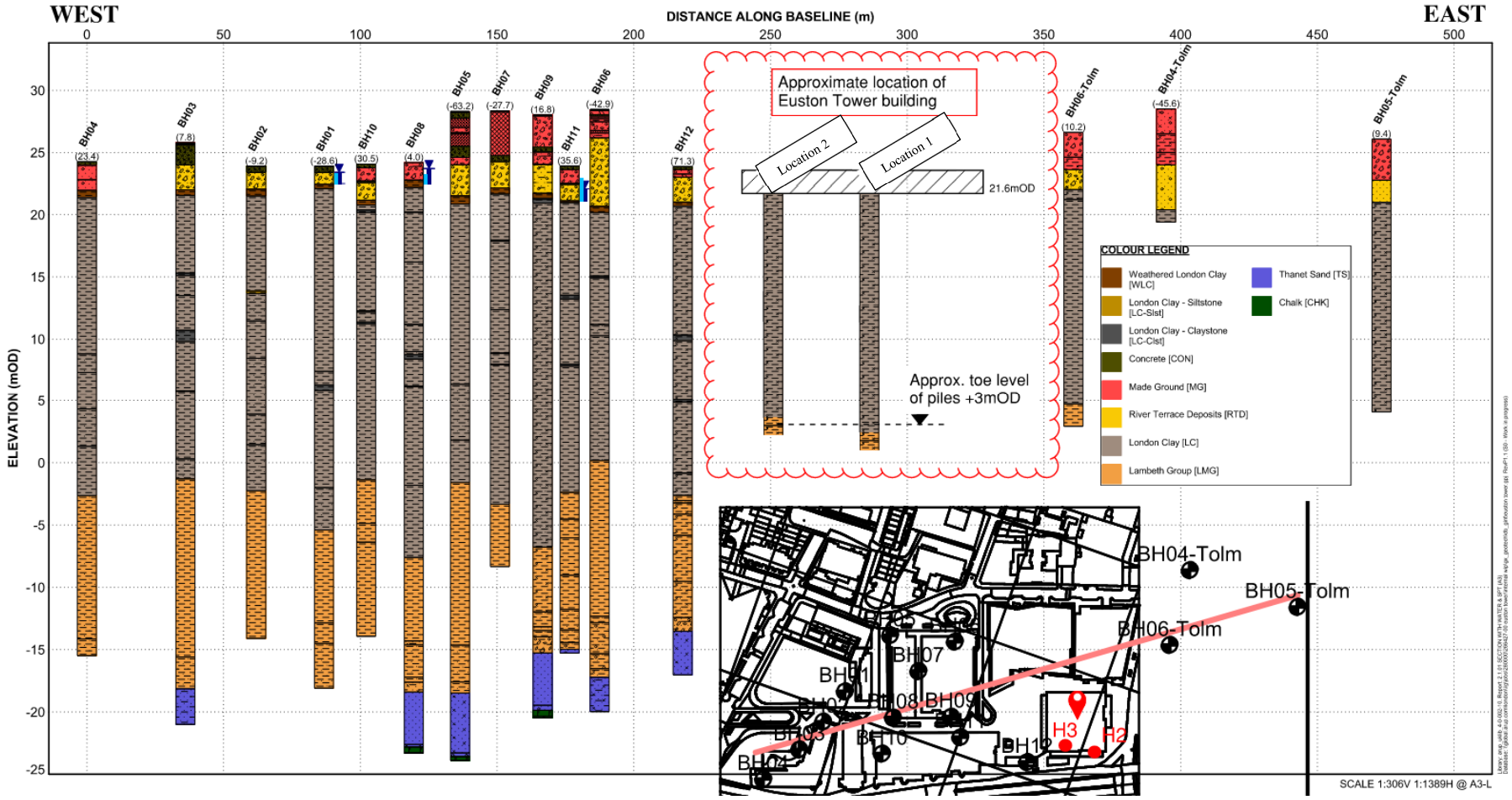


Figure 14 - West-east geological cross-section

Table 3 shows the stratigraphy encountered at the nearest investigation locations. The anticipated stratigraphy adopted for design and assessment is presented in Table 4.

Table 3: Summary of encountered stratigraphy from nearby site investigations.

Stratum	Euston Tower foundation investigation Locations 1 & 2[1]			BH12[2]			BH6[3]		
	Depth (mbgl)	Top of stratum level (mOD)	Thickness (m)	Depth (mbgl)	Top of stratum level (mOD)	Thickness (m)	Depth(mbgl)	Top of stratum level (mOD)	Thickness (m)
Fill / Made Ground	0	+28.0	4.4	0.25	+23.62	0.6	0	+26.62	3
River Terrace Gravel	4.4	+23.6	1.6	0.85	+23.02	2	3	+23.62	1.6
London Clay (weathered)	6	+22.0	0.5	2.85	+21.02	0.35	4.6	+22.02	0.8
London Clay	6.5	+21.5	16.9	3.2	+20.67	23.3	5.4	+21.22	16.5
Lambeth Group Formation	23.4	+4.6	*	26.5	-2.63	10.9	21.9	+4.72	>1.8*
Thanet Sand	-	-	-	37.4	-13.53	>3.5*			
End of hole	-	-	-	40.9	-17.03	n/a	23.7	+2.92	n/a

Notes:

* Borehole/Trial pit terminated within stratum. Thickness not determined.

1. Euston Tower Foundation Investigation Locations 1 & 2 undertaken in December 2022 in relation to the proposed development.

2. Regents Place and Triton Square Geotechnical Investigation Report, Laing Technology Group Limited (LTG), dated April 1995.

3. Tolmers Square Geotechnical Investigation Report, dated 1977.

Table 4: Anticipated site stratigraphy

Stratum	Description	Thickness (m)	Top of stratum level (mOD)
Ground level	-	-	+28.0
Fill / Made Ground	SAND and GRAVEL with demolition and building waste (brick and mortar cobbles)	0.3	+28.0
River Terrace Gravel	Medium dense, yellow-brown, fine to coarse SAND and sub-angular to rounded, fine to coarse flint GRAVEL. Medium to coarse orange-brown sand and fine to medium gravel	1.6	+23.6
London Clay (weathered)	Firm, brown and yellow-brown mottled Silty CLAY	0.5	+22.0
London Clay	Stiff to very stiff dark grey, brown Silty CLAY. Occasional grey green silt veins/pockets and shell debris. Clay is very to extremely closely fissured. Interbedded claystone's. Becoming very stiff from 10.8m below top of London clay. Becoming very sandy from 22.3m below top of London Clay.	17.5	+21.6
Lambeth Group Formation (formerly known as Woolwich and Reading Beds)	Very stiff, grey mottled red and brown Silty CLAY with occasional bands of fine to medium grained sand. Becoming very stiff to hard. Becoming hard Sandy CLAY 6.9m below top of layer.	17.5	+4.0
Thanet Sand	Very dense, grey, fine to medium grained sand. Occasional interbedded pockets of silt/clay	3.5*	-13.5
Note: * Borehole terminated at 40.9mbgl within Thanet Sand. Layer thickness and underlying strata not proven within available investigations.			

3.4 Ground model

For the purposes of the Basement Impact Assessment presented in this report, a preliminary ground model has been adopted for ground movement assessment, as shown in Table 5. The formation level of existing basement was taken at +21.6mOD, based on the 2022 foundation investigation findings is taken as the upper ground surface.

Table 5: Preliminary ground model adopted for ground movement assessment.

Stratum	Top of stratum level	Undrained shear strength	Vertical undrained Young's modulus	Vertical drained Young's modulus
	(mOD)	(kPa)	(MPa)	(MPa)
London Clay Formation	+21.6 (Underside level of existing basement)	$80 + 5z^1$	$E_{u,v} = 40 + 2.5z^1$ $(E_{u,v} = 500\ c_u)$	$E'_v = 25.6 + 1.6z^1$ $(E'_v = 320\ c_u)$
Lambeth Group	+4.0	$168 + 5z^2$	$E_{u,v} = 84 + 2.5z^2$ $(E_{u,v} = 500\ c_u)$	$E'_v = 53.8 + 1.6z^2$ $(E'_v = 320\ c_u)$
Thanet Sand	-13.5	-	-	$E'_v = 200$
Chalk	-20.0	Assumed to be rigid boundary		

Notes:

1. z^1 denotes depth in metres below London Clay Formation surface.
2. z^2 denotes depth in metres below Lambeth Group surface.
3. The undrained shear strength and stiffness profiles for Lambeth Group (Clay) are assumed to be a continuation from the respective overlying London Clay Formation profiles.

Figure 15 shows the supporting undrained shear strength results from UT100 unconsolidated undrained (UU) triaxial tests.

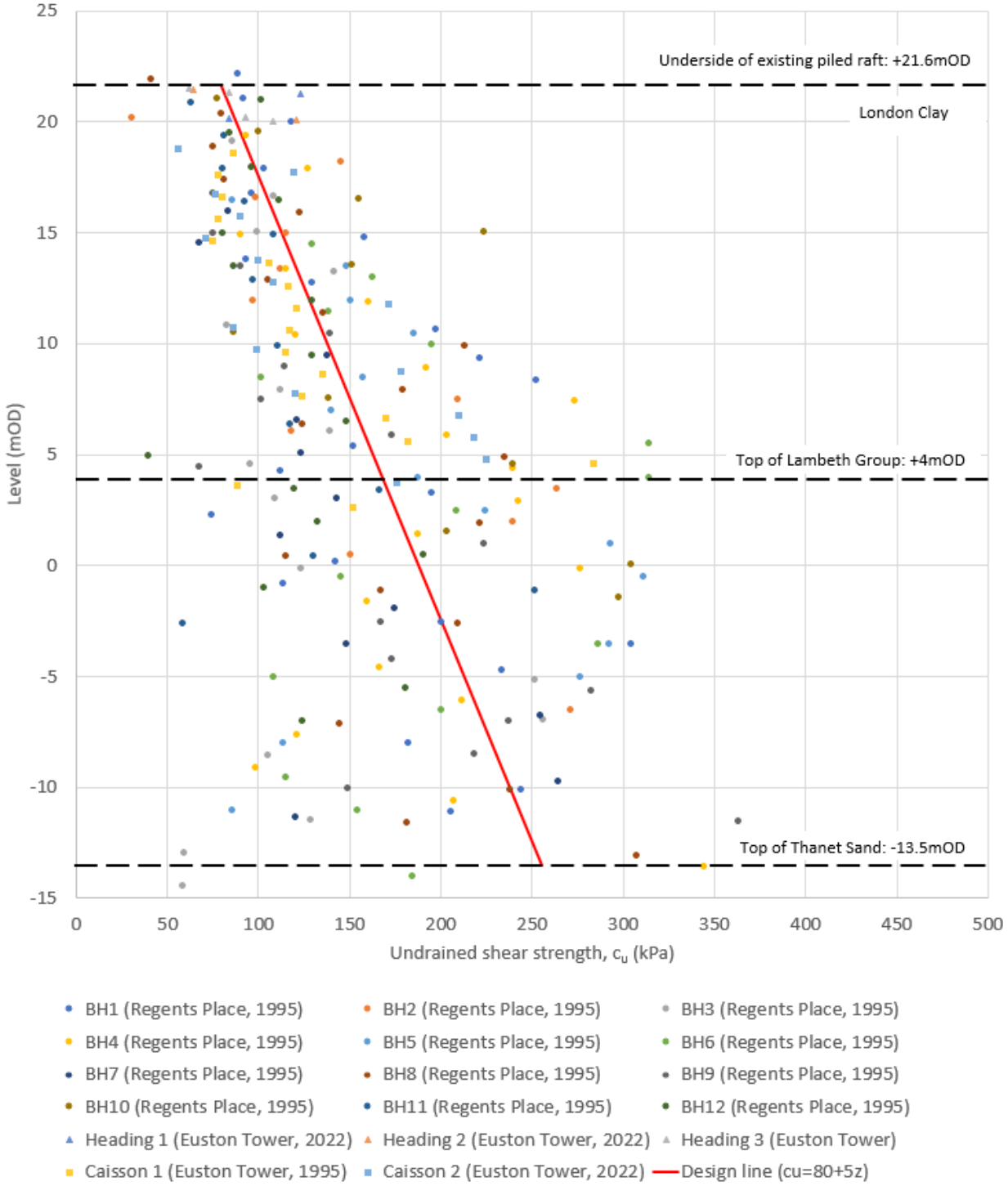


Figure 15: Undrained shear strength from Undrained Unconsolidated triaxial results on 100mm diameter samples.

3.5 Groundwater

A map of the Lost Rivers of London is shown in Figure 16. There are no lost rivers recorded within the site extent.

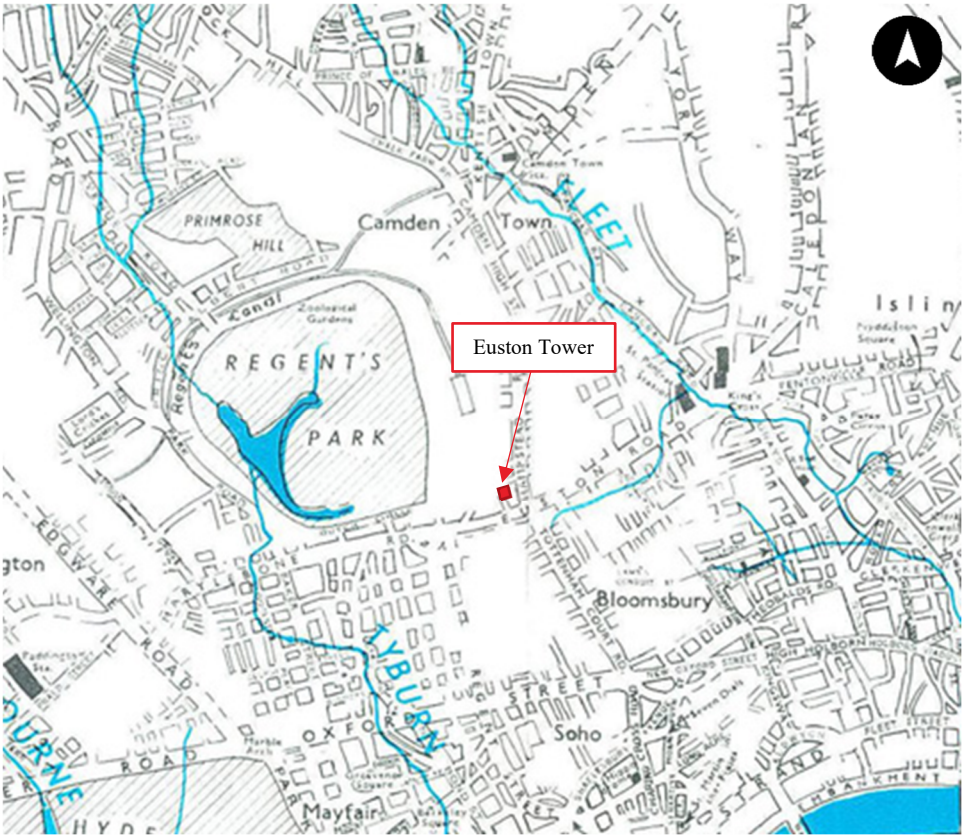


Figure 16 - Lost rivers of London (https://www.hiddenhydrology.org/, accessed 17/01/2023)

As relevant to the basement impact assessment, groundwater is anticipated in the shallow aquifer within the superficial deposits (principally the River Terrace Deposits). Groundwater is expected to be either in continuity within the aquifer or encountered as perched, due to variation in the surface of impermeable strata (clays and/or by the presence of buried man-made structures).

A summary of groundwater readings from nearby investigation locations are included below in Table 6. The groundwater readings are typically between 1m (+22.87mOD) and 1.8m (+22.07mOD) below top of the basement slab (+23.87mOD) at the location of BH12. These readings relate to the development of 1 Triton Square within the Regents Place estate.

Table 6: Monitored groundwater levels from nearby site investigations.

BH	Monitored Groundwater Level (mOD)	Source (refer notes)
BH12 (water strike)	+22.87	(1) – year 1995
TP08 (water strike & recharge)	+22.62	(1) – year 1995
CH03 (standpipe)	+22.5	(2) – year 2017
CH02 (standpipe)	+22.4	(2) – year 2017
BH101 (standpipe)	+22.25	(2) – year 2017
CH01 (standpipe)	+22.10	(2) – year 2017
BH11 (standpipe)	+22.07	(1) – year 1995
Notes:		

BH	Monitored Groundwater Level (mOD)	Source (refer notes)
(1) Regents Place and Triton Square Geotechnical Investigation Report, LTG, April 1995 (2) 1 Triton Square Geotechnical Report, Arup, 2017		

Groundwater was also encountered in the River Terrace Deposits during recent foundation strengthening works carried out at 1 Triton Square (2018-2019). Water levels were generally controlled for raft and pile cap construction works by localised temporary works and pumping.

During the 2022 foundation investigation at Euston Tower, water was encountered within the superficial deposits and was controlled by localised temporary works and pumping.

4. Screening assessment

4.1 Screening assessment methodology

The screening assessment criteria used to guide this Basement Impact Assessment is taken from London Borough of Camden guidance for subterranean development 'the Arup Report' (Camden, 2010). The screening assessment including potential impact and mitigation is set out in the tables under the following Sections 4.2 to 4.4. A summary of the key impacts and proposed mitigation is presented in Section 0.

4.2 Subterranean Screening Assessment

Question	Response	Proposal/ Mitigation
1a. Is the site located directly above an aquifer?	Yes. Made Ground and River Terrace Deposits are present outside and beneath the existing basement footprint.	The proposals do not include widening the plan extent of existing basement. Localised deepening within the River Terrace Deposits and London Clay underneath the existing basement is proposed to construct Basement 02 level plant/tank space.
1b. Will the proposed basement extend beneath the water table surface?	Yes. Groundwater is present within Made Ground and River Terrace Deposits.	Proposed local Basement 02 plant/tank level beneath the existing single level basement involve localised excavation within River Terrace Deposits and London Clay. Provision for temporary water control and retaining wall should be made.
2. Is the site within 100m of a watercourse, well (used/ disused) or potential spring line?	No.	N/A
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No.	N/A
4. Will the proposed basement development result in a change in the proportion of hard surfaced/ paved areas?	No.	N/A
5. As part of the 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.	N/A Refer to Flood Risk Assessment report (Arup, 2023, Report ref.: 281835-ARP-XX-XX-RP-CD-0001).
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 local point (not just the pond chains on Hampstead Heath) or spring line?	Yes	A portion of the local B02 basement proposed as part of the application will be below the water table. This will be waterproofed by design to resist water ingress to the space, tied in to the existing basement.

4.3 Stability Screening Assessment

Question	Response	Proposal/ Mitigation
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No.	N/A
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No.	N/A

Question	Response	Proposal/ Mitigation
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No.	N/A
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No.	N/A
5. Is the London Clay the shallowest stratum at the site?	No. However, existing pile cap for tower building founded directly on London Clay.	N/A
6. Will any trees be felled as part of the proposed development and/ or are any works proposed within any tree protection zones where trees are to be retained?	Yes, the tree planting is to be adjusted as part of the development, however trees are located within engineered tree pits.	The existing and proposed trees are within engineered tree planting troughs and/or otherwise not expected to cause ground movement at the basement formation level due to depth.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/ or evidence of such effects at the site?	London Clay stratum present is susceptible to shallow shrink swell effects generally, following established guidance.	The foundations/basements for the development are at greater than 5m depth below ground, and trees are located within engineered tree pits.
8. Is the site within 100m of a watercourse or potential spring line?	No.	N/A
9. Is the site within an area of previously worked ground?	Yes. Made Ground is present on site and has been modified over site's development history.	Existing basement has removed majority of Made Ground so extent remaining is limited. Further investigations are recommended if fill is to be considered as a bearing stratum in design.
10a. Is the site within an aquifer?	Yes. Made Ground and River Terrace Deposits are present outside existing basement footprint.	The existing basement within the site is directly underlain by London Clay. The proposals do not include widening the plan extent of existing basement.
10b. Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Yes.	Temporary water control provisions are recommended for proposed Basement 02 excavation within the River Terrace Deposits and London Clay.
11. Is the site within 50m of Hampstead Heath ponds?	No.	N/A
12. Is the site within 5m of a highway or pedestrian right of way?	Yes. The edge of existing basement is located within 3m of existing pedestrian walkways.	Contractor to agree proposed hoarding line to minimise impact on public right of way and agree with Camden planning authority.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes. The proposed Basement 02 level will be deeper than the existing single level basement. However, 2-level basements are present at neighbouring 10-30 Brook Street, so this will be less deep than adjoining basements.	Ground movement assessment has been carried out in Section 6.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g., railway lines?	Yes. The site falls within the 2015 Crossrail 2 Safeguarding Directions (see Appendix E for correspondence from Crossrail 2). The site is located to the west of Northern and Victoria line	Third party consultation and engagement with Crossrail 2 will be carried out. A preliminary ground movement assessment will be carried out separately to assess the impact of proposed

Question	Response	Proposal/ Mitigation
	tunnels, to the north of St Johns Wood to Back Hill deep cable tunnel and Hammersmith & City, Circle and Metropolitan line tunnel)	redevelopment on existing and future tunnels.

4.4 Surface Flow and Flooding Screening Assessment

Question	Response	Proposal/ Mitigation
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No.	N/A
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.	N/A
3. Will the proposed basement development result in a change in the proportion of hard surfaced/ paved areas?	No.	N/A
4. Will the proposed basement development 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.	N/A
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No.	N/A
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 flood zone 1 – an area of low probability of flooding.	N/A

4.5 Summary of potential impacts and mitigations

The following key potential impacts have been identified from the screening assessment. Recommendations for further assessment are made:

Subterranean screening assessment:
An aquifer is present at the site location. The proposed local B02 basement would introduce local cut-off of the shallow aquifer to the London Clay aquiclude through the River Terrace Deposits (upper aquifer). However, the size of the local B02 basement is not significant in relation to the site footprint.
Refer to the Flood Risk Assessment report (Arup, 2023, Report ref.: 281835-ARP-XX-XX-RP-CD-0001) for assessment of surface water and SUDS.

Stability Screening Assessment:
Ground movement assessments for assets falling within the zone of influence associated with the proposed redevelopment are recommended. The zone of influence for ground movements refers to area with calculated vertical ground movements greater than +/-1mm.

The relative depth of the proposed Basement 02 is deeper than the existing single level basement for the Euston Tower building. Ground movements that will impact neighbouring buildings are to be assessed (presented in Section 6.)

The site falls within the 2015 Crossrail 2 Safeguarding Directions and therefore consultation is expected to be required. The site is located to the west of Northern and Victoria line tunnels, to the north of St Johns Wood to Back Hill deep cable tunnel and Hammersmith & City, Circle and Metropolitan line tunnel.

In relation to TfL and utility assets, third party consultation and engagement with the respective asset owners will be carried out. A preliminary ground movement assessment will be carried out separately to assess the impact of proposed redevelopment on existing and future assets.

Surface flow and flooding

Refer to Flood Risk Assessment report (Arup, 2023, Report ref.: 281835-ARP-XX-XX-RP-CD-0001).

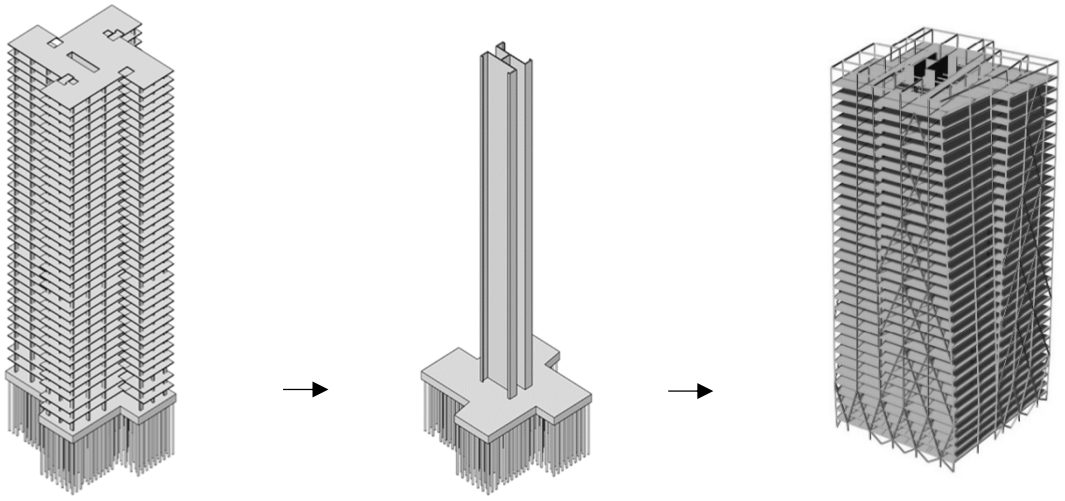
The cumulative effects of basement development are not considered to be significant or require assessment.

5. Basement design

5.1 Proposed development

The proposed development of Euston Tower involves the deconstruction of the existing floorplates from roof to ground floor level, with the central core, foundations and basement retained. A new structural frame and new floorplates will be constructed, with the foundations and central core being reused. New supplementary foundations will be constructed to support the new superstructure where it extends beyond the extent of the existing pile cap.

Figure 17 illustrates the general proposed redevelopment stages for Euston Tower in outline.



a) Existing tower structural model

b) Retained core, basement, and foundation after partial deconstruction

c) New proposed structural model

Figure 17: Proposed redevelopment of Euston Tower building

5.2 Proposed basement geometry

The existing single level basement between the Euston Tower building and surrounding the building is to be retained. A local Basement 02 level is proposed underneath the existing single level basement to accommodate a water tank and plant room. The proposed Basement 02 level has a plan dimension of approximately 7.45m x 33m (246 sqm), located to the west of existing pinwheel piled raft as illustrated in Figure 18. The proposed FFL is +19.77mOD in relation to the general 1 level basement level of +23.9mOD.

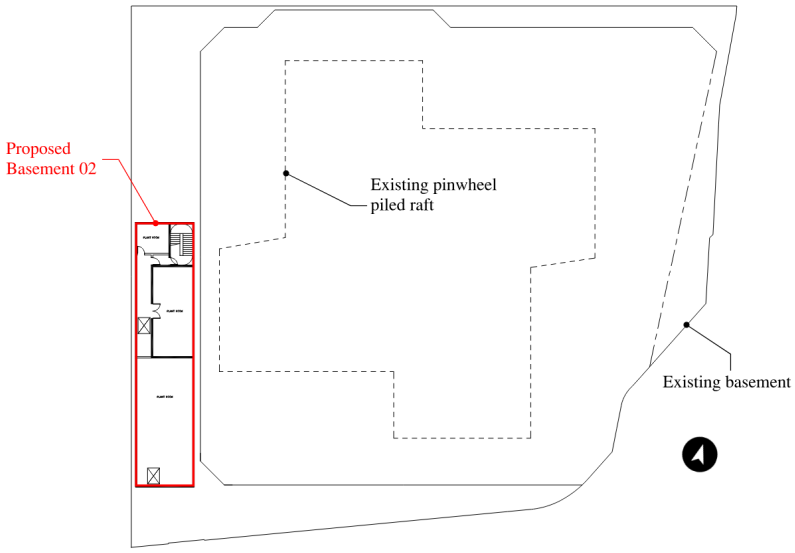


Figure 18: Proposed Basement 02 plan (extract from 3XN drawing no.: ET_DR-A_20098)

5.3 Foundations

5.3.1 Existing foundations

The 2022 foundation investigation demonstrated that piles are arranged in groups beneath the columns and structural cores. Figure 19 illustrates the understanding of pile arrangements under the tower. The reinforced concrete piles were discovered to be straight shafted with diameter of 2ft (610mm) and were approximately 19m long. Intrusive investigations have found the piles to be reinforced to full pile depth.

The pinwheel raft/ pile cap was found to be 2.8m thick, with a structural thickness of 2.4m. The raft extends over the entire footprint of the existing tower and is used to spread the load from individual columns into the pile groups. The piled raft was found to be in good condition given its age, despite being sparsely reinforced compared to current modern standards. No corrosion of reinforcing steel has been observed.

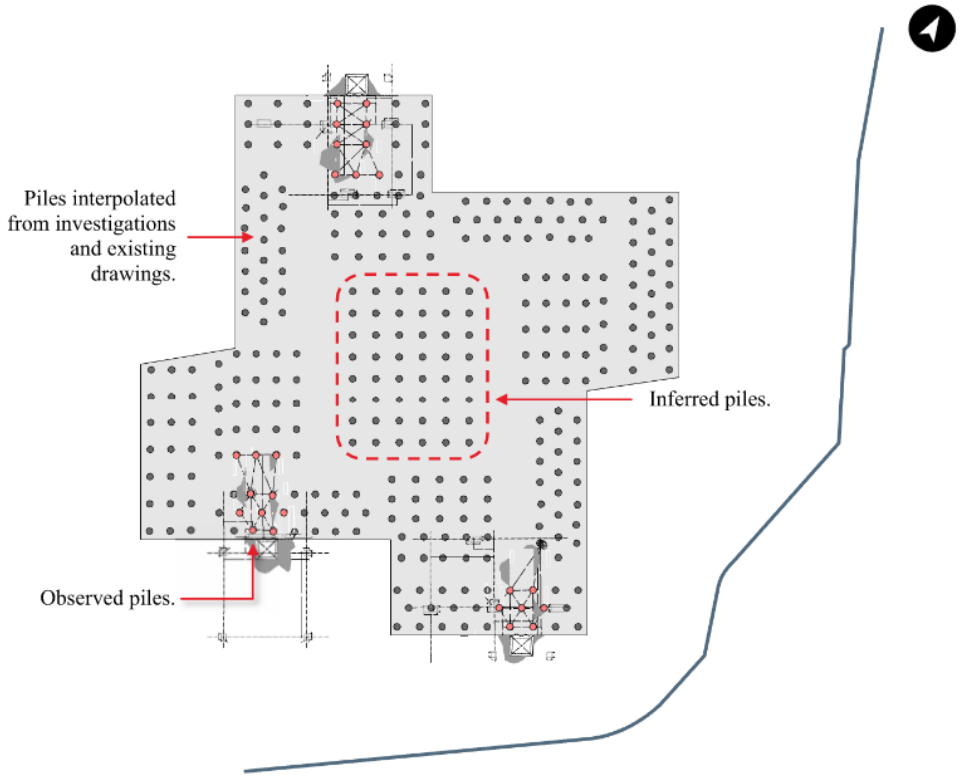


Figure 19: Plan showing anticipated existing foundations of Euston Tower

5.3.2 New foundations

Due to the limited knowledge of the existing foundations, a load balance approach is to be adopted where the new applied loading on the existing foundation is kept less than or equal to the existing loading regime. Basement load spreading structures are proposed to transfer loading from new column locations to the previous column locations in the basement. A new 1500mm thick piled raft with 900mm diameter piles is proposed to support new columns landing outside of the existing pinwheel piled raft, as shown in Figure 20.

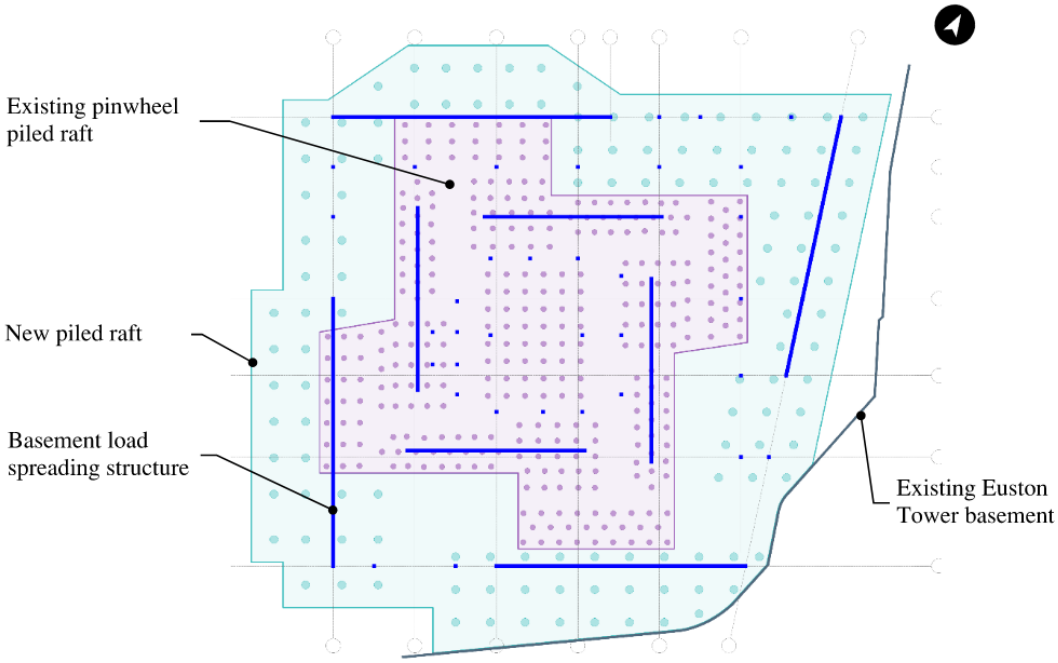


Figure 20: New foundations showing existing and new piled raft areas.

5.4 Construction sequence

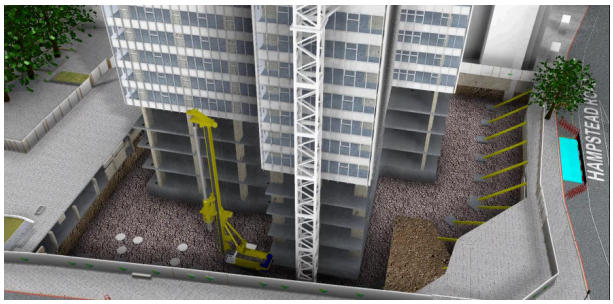
For the purposes of the basement impact assessment presented in this report, the currently anticipated construction sequence for the proposed redevelopment is illustrated in Figure 21 and outlined below in summary:

- Site enabling works.
- Deconstruction of Euston Tower floorplates starting from roof level downwards
- Deconstruction of ground floor slab and installation of temporary props to support the existing retaining wall.
- Earthworks to provide piling platform level within basement for new foundations.
- Installation of foundation piles for new building superstructure and temporary retaining wall (contiguous piled wall or sheet pile wall) around proposed local Basement 02.
- Localised excavation to Basement 02 formation level with temporary propping as necessary
- Construction of new piled raft & substructure
- Construction of ground floor slab and new building floorplates above

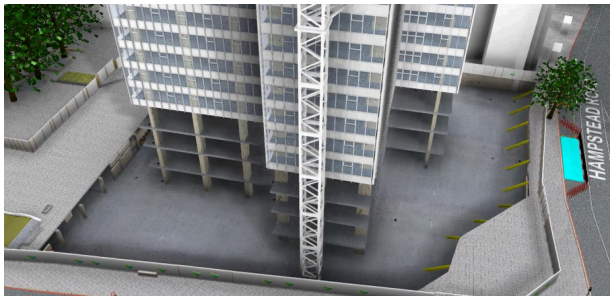
A 'bottom-up' traditional construction of the proposed local Basement 02 and temporary retention of the existing basement using high support temporary propping is proposed. The temporary works and construction sequence will be further developed at later design stage and following engagement with specialist contractors and temporary works designers.

For further details refer to the Construction Management Plan included with the application.

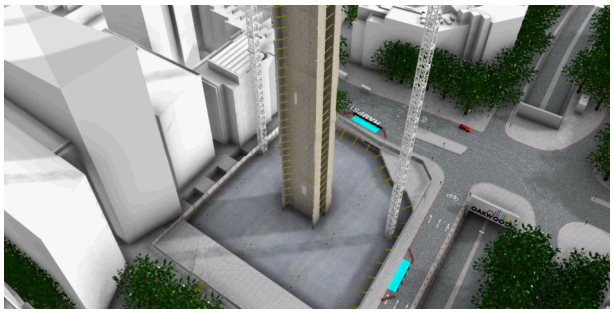
a) Deconstruction of floorplates starting from roof level downwards. Removal of ground floor slab and installation of temporary props to support the basement wall.



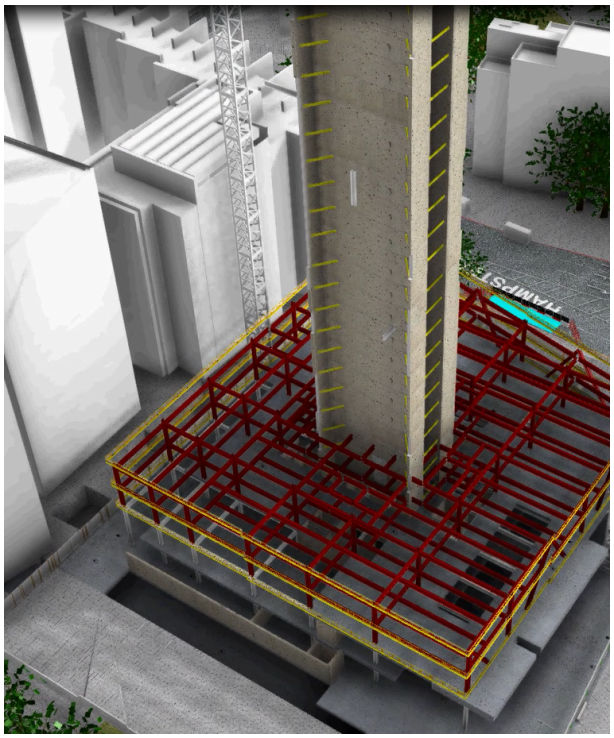
b) Installation of additional foundation piles within the basement.



c) Casting of new piled raft (localised deepening for local proposed Basement 02 not shown)



d) completion of floorplate deconstruction to ground level



e) Construction of ground floor slab and new floorplates above

f) completion of new structure and building

Figure 21: Current anticipated indicative construction sequence (extract from indicative proposal, May 2023)

6. Preliminary ground movement assessment

6.1 Scope of the assessment

A preliminary ground movement assessment for the proposed development has been carried out within this Basement Impact Assessment. The zone of influence for ground movements associated with the proposed development has been determined, followed by assessment of potential impact on neighbouring buildings. Camden Planning Guidance (CPG) on Basements (Camden, 2021) and Policy A5 on basement states that the anticipated damage category for neighbouring structures should not exceed category 1 'very slight' on the Burland scale. The ground movement assessment is described further in the following sections.

The impact of ground movements on third party utility assets (Thames Water, Gas, London Underground and Future Crossrail 2 etc) will be assessed in separate technical assessments for review by the respective third parties ahead of the proposed development.

6.2 Ground movements

6.2.1 Introduction

Ground movements arising from change in loading to the ground have been quantified and considered cumulatively to assess the impact on neighbouring buildings. It is noted that the principal cause of ground movement is the unloading and reloading of the ground from partial deconstruction and construction of new development. The new local B02 basement construction is a small proportion of the calculated ground movement and zone of influence does not extend outside the site boundary. The following sections describe the methodology and results of the ground movement assessment undertaken.

The horizontal movement of the retaining walls to form the B02 local basement area are not considered in the assessment as the surrounding basement of the building encompasses a 45-degree influence zone, expressed from the base of the excavation. Therefore, the effect of the basement construction considered is limited to the unloading/reloading of the ground.

6.2.2 Ground movement assessment

Sources of ground movements arising from the development due to change in loading are outlined as follows:

1. Unloading due to partial deconstruction of existing superstructure
2. Unloading due to localised excavation of proposed local Basement 02.
3. Loading due to addition of new superstructure

Oasys PDISP, analysis software, has been used to calculate ground movements in the short and long-term using undrained and drained conditions respectively. Settlements and/or heave are calculated in PDISP by using a linear elastic soil model and the Boussinesq method for stress distribution. The Boussinesq method calculates the stresses in the soil due to applied loads using equations derived by Boussinesq (1885). In the analysis, settlements/ heave above the applied load is conservatively assumed to be the same as that at the level of applied load. Soil structure interaction effects are not considered in the analysis.

Three key stages have been considered for ground movement assessment and are presented in Table 7.

Table 7: Key stages considered for ground movement assessment.

Considered key stages	Changes in loading	Soil conditions
During construction	Partial deconstruction unloading + basement excavation unloading	Undrained
End of construction (short term)	Partial deconstruction unloading + basement excavation unloading + new superstructure loading	Undrained

Considered key stages	Changes in loading	Soil conditions
End of construction (long term)	Partial deconstruction unloading + basement excavation unloading + new superstructure loading	Drained

An assessment has been carried out to estimate changes in loading as mentioned above, to determine the net unloading/ loading applied to the ground. Figure 22 and Figure 23 illustrate the net unloading/ loading applied at different areas and levels. Unloading due to partial deconstruction of existing superstructure and loading due to new superstructure are assumed to be transferred down the piles within London Clay and applied onto an equivalent raft area empirically determined at 2/3 of the pile depth using a 1H:4V spread.

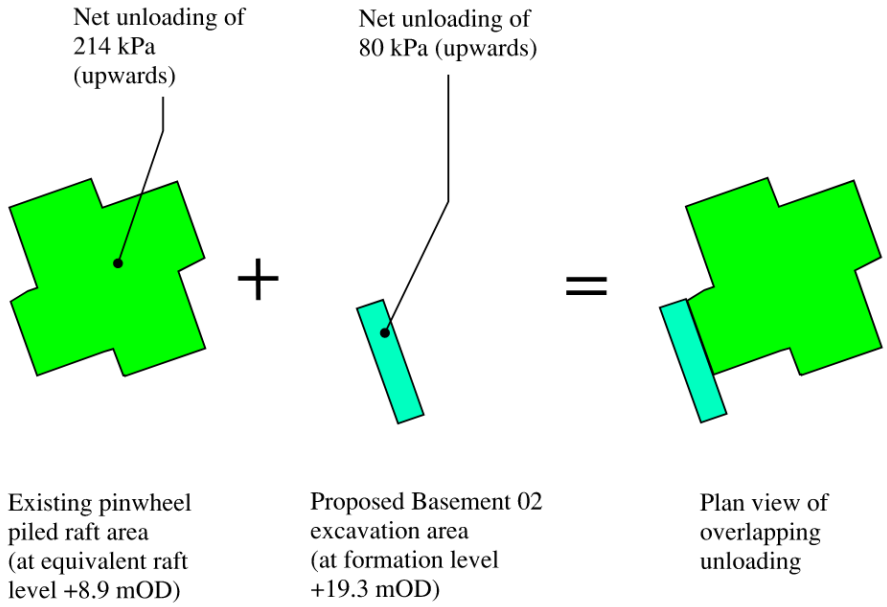


Figure 22: Net unloading applied in Oasys PDISP model, resulting from partial superstructure deconstruction and proposed Basement 02 excavation.

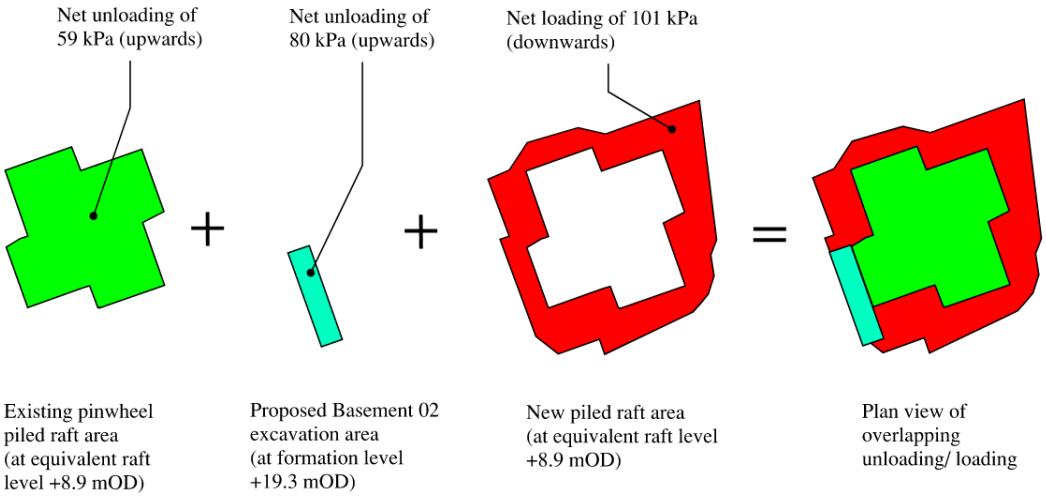


Figure 23: Net unloading/ loading applied in Oasys PDISP model, resulting from partial superstructure deconstruction, proposed Basement 02 excavation and new superstructure loading.

6.2.3 Ground movement results

Short and long term vertical ground movements associated with the considered key stages (see Table 7) are presented in Figure 24 to Figure 26. Zone of influence for ground movements refers to area with calculated vertical ground movements greater than +/-1mm. Downward movements are presented as +ve.

1 Triton Square and 2 Triton Square do not fall within the zone of influence for ground movements associated with the proposed redevelopment.

The calculated ground movements indicate that in the long term, the southern façade of Northeast Quadrant (10-30 Brock Street) would experience settlements between 2mm and 10mm.

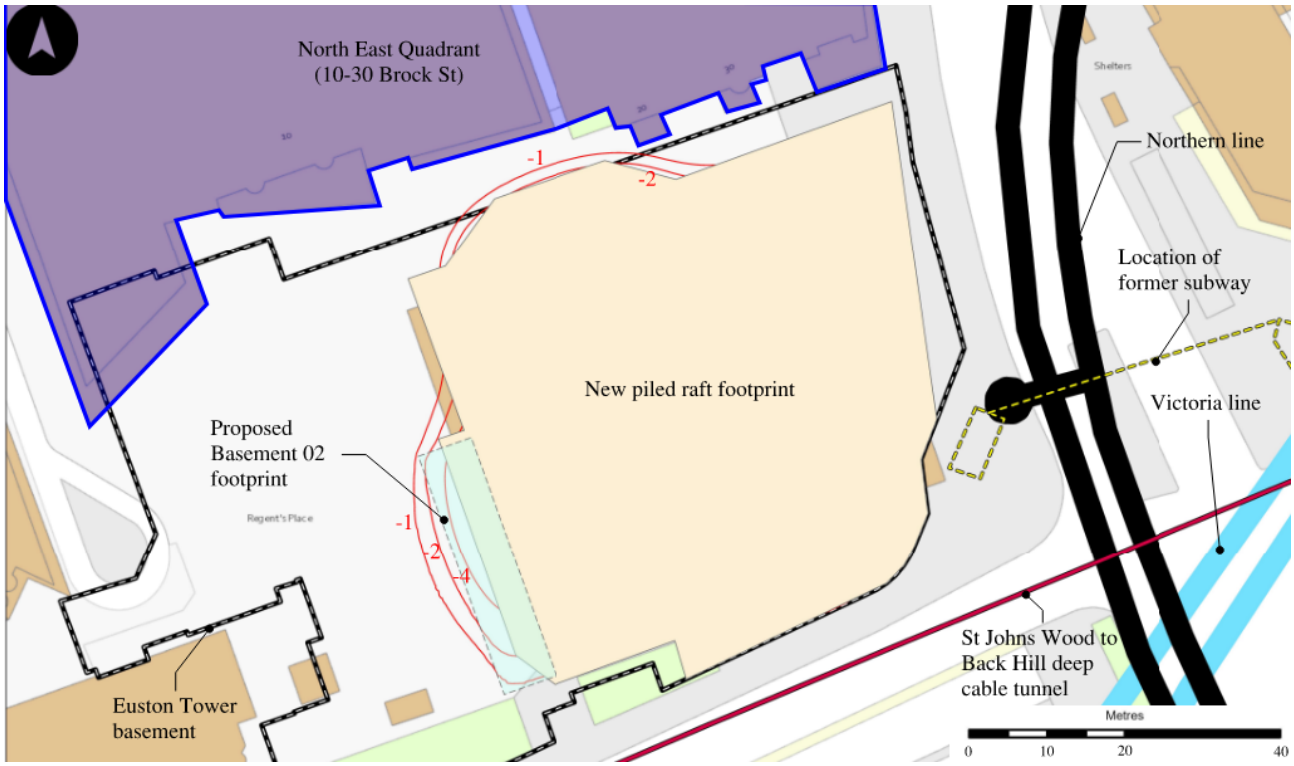


Figure 24: Calculated short term heave (mm) at basement level +21.6mOD resulting from partial superstructure deconstruction and proposed Basement 02 excavation.

Figure 25: Calculated short term settlement (mm) at basement level +21.6mOD resulting from partial superstructure deconstruction, proposed Basement 02 excavation, and new superstructure loading.

Figure 26: Calculated long term settlement (mm) at basement level +21.6mOD resulting from partial superstructure deconstruction, proposed Basement 02 excavation, and new superstructure loading.

6.2.4 Impact on Northeast Quadrant (10-30 Brock Street)

The potential impact of the calculated ground movements on Northeast Quadrant (10-30 Brock Street) is anticipated to be negligible due to the following:

- the calculated greenfield long-term settlements of the NEQ southern façade is less than 10mm.
- the calculated greenfield deflection ratio for the NEQ southern facade is less than 1:500.
- presence of 2-level basement under 10-30 Brook Street will reduce the anticipated settlements experienced by the building; and
- NEQ buildings are expected to be framed buildings, which are considered more flexible in shear than masonry structures therefore and less susceptible to damage (Mair, Taylor and Burland, 1996).

Following guidance presented in CIRIA Report C796, if ground movement are calculated as less than 10mm or imposed deflection ratio is less than 1:500 no further assessment is required, and the impacts of ground movement are deemed to be negligible. The potential impact on Northeast Quadrant (10-30 Brock Street) is therefore not anticipated to exceed category 1 ‘very slight’ on the Burland scale and is compliant with Camden Planning Guidance (CPG) on Basements (Camden, 2021). Accordingly, no further building damage assessment for neighbouring buildings is carried out at this stage.

7. Basement impact assessment conclusions

7.1 Summary

The assessment presented in this BIA report is based on guidance provided in the following documents (listed in top-down hierarchy order):

- Camden Local Plan - Policy A5 'Basements' (Camden 2017).
- Camden Planning Guidance (CPG) on Basements (Camden, 2021); and
- Camden geological, hydrogeological and hydrological study. Guidance for subterranean development (Camden, 2010).

A screening assessment has been carried out on the proposed redevelopment at Euston Tower in accordance with Camden geological, hydrogeological and hydrological study. Guidance for subterranean development (Camden, 2010). The proposed local B02 basement is expected have an impact on groundwater flow and levels locally to the new basement area due to the introduction of a full local cut-off of the shallow aquifer to the London Clay aquiclude through the river terrace deposits (upper aquifer). However, due to the size and location of the local B02 basement proposal this is expected to be negligible and not present a heightened risk to adjacent structures. The proposed B02 waterproof basement also excludes the ground mass within its enclosed area from groundwater. This will tend to reduce field capacity for water retention/storage and may result in locally higher local groundwater level during or following rainfall events, however due to the small size of the basement and location within the site the effect is expected to be negligible.

Based on the screening assessment presented in this report and findings from Flood Risk Assessment report (Arup, 2023, Report ref.: 281835-ARP-XX-XX-RP-CD-0001), it is concluded that the proposed basement development is unlikely to result in groundwater or surface water issues and is therefore compliant with the Camden Planning Guidance (CPG) on Basements (Camden, 2021).

The relative depth of the proposed Basement 02 level is deeper than the existing single level basement. Preliminary ground movement assessment carried out in this report indicated that the neighbouring 1 Triton Square and 2 Triton Square do not fall within the zone of influence for ground movements associated with the proposed redevelopment, defined as greater than 1mm. The southern façade of neighbouring Northeast Quadrant (10-30 Brock Street) falls within the zone of influence and is calculated to experience long term settlements between 2mm and 10mm. However, the potential impact of the long-term settlements on 10-30 Brock Street is anticipated to be negligible and not to exceed category 1 'very slight' on the Burland scale. The proposed redevelopment is therefore considered to be compliant with Camden Planning Guidance (CPG) on Basements (Camden, 2021).

The site falls within the 2015 Crossrail 2 Safeguarding Directions and is located to the west of Northern and Victoria line tunnels, to the north of St Johns Wood to Back Hill deep cable tunnel and Hammersmith & City, Circle and Metropolitan line tunnel). Third party consultation and engagement with the respective asset owners is in progress. Ground movement assessments and construction method statements will be carried out in separate technical submissions for review by the respective third parties ahead of proposed redevelopment.

7.2 Monitoring strategy

A monitoring regime is recommended to be scoped and specified to measure the ground and asset movements during partial superstructure deconstruction, localised excavation, and construction of the new superstructure, in order to verify that they are within the assessed range. The required monitoring will be confirmed at later design stages following development of the construction methodology and agreement with third party building owners.

In addition to monitoring of buildings, monitoring of existing LUL underground assets, and other third-party assets would be scoped and specified based on ground movement assessments of these assets and development of the basement design and construction sequence.

References

Arup (2023), Euston Tower Flood Risk Assessment & Drainage Strategy (Report ref.: 281835-ARP-XX-XX-RP-CD-0001)

Arup (2023), Euston Tower, 286 Euston Road Structural Report

Barton N (1992), Lost Rivers of London

Boussinesq, J. (1885), Applications des potentials a l'etude de l'equilibre et de movement des solides elastiques. (Gouthier-Villars, Paris)

CIRIA Report C796 (2021), Assessing the impacts of construction-induced ground movement on framed buildings.

Groundwise (2019), Desktop Utility Search, Euston Tower, Euston Road, London NW1 3DP (Report ref. URO6731.1DM)

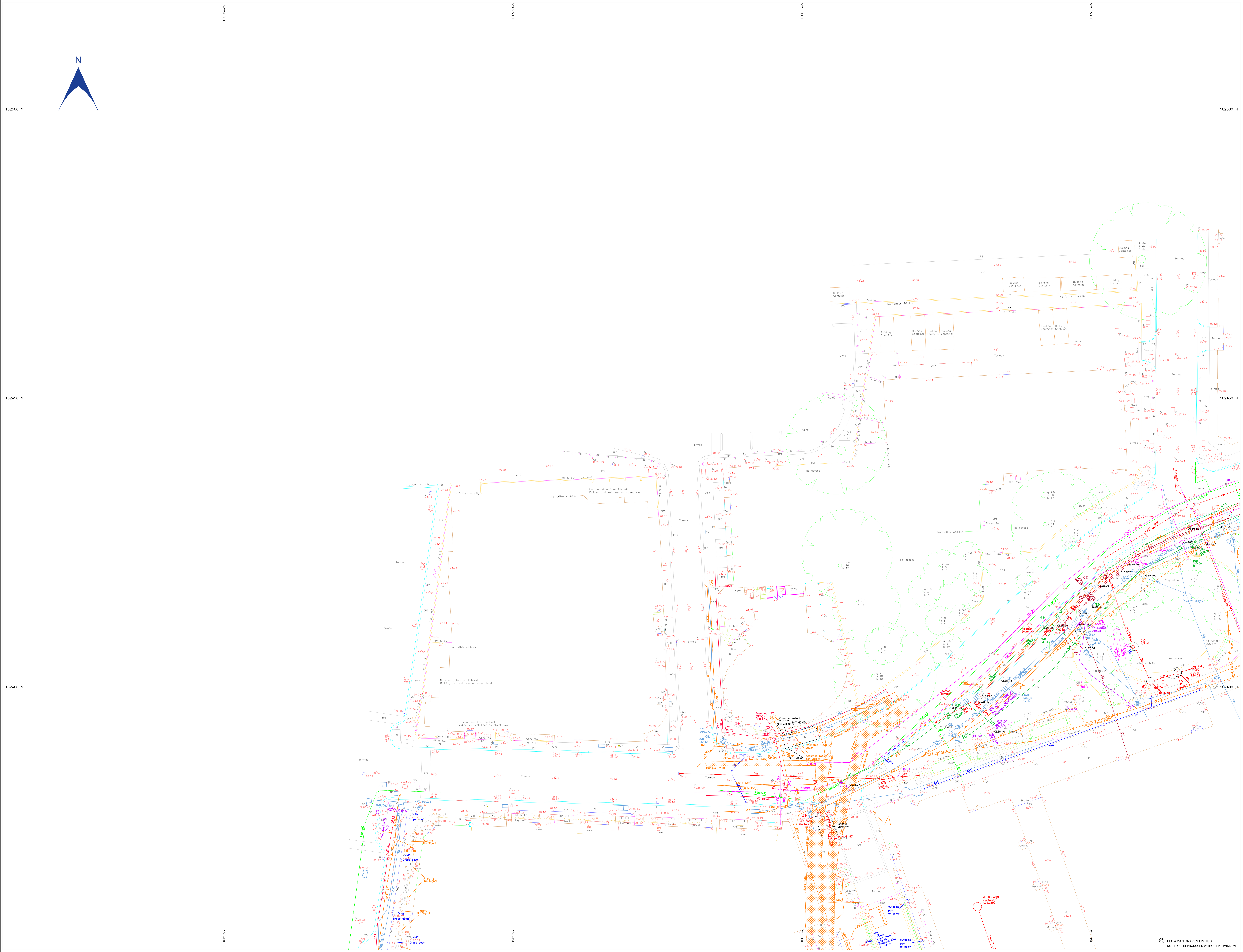
London Borough of Camden (2010), Camden geological, hydrogeological and hydrological study – Guidance for Subterranean Development

London Borough of Camden (2017), Camden Local Plan

London Borough of Camden (2021), Camden Planning Guidance – Basements

Mair, R. J., Taylor, R.N. and Burland, J. B. (1996), Prediction of ground movements and assessment of risk of building damage due to bored tunnelling.

Appendix A – Plowman Craven topographic survey



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Assumed detail

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SURFACE WATER DRAINAGE
WATER
GAS
ELECTRIC
TFL
VERIZON
COLT
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Dd	Depth to top of duct	Pe	Polyethylene
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(e)	Empty Duct	(s)	Service cable
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42746T-01-1	42746T-01-2
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CLIENT

British Land

York House
45 Seymour Street
London
W1H 7LX

PROJECT TITLE

Regents Place

London, NW1

3D Topographic Survey

PRESENTATION SCALE 1:200 @ A0

DATE OF ORIGINAL SURVEY June 2018

PC PROJECT No. 42746 CHECKED GH

DRAWING No. 42746T-01-1 ISSUE I

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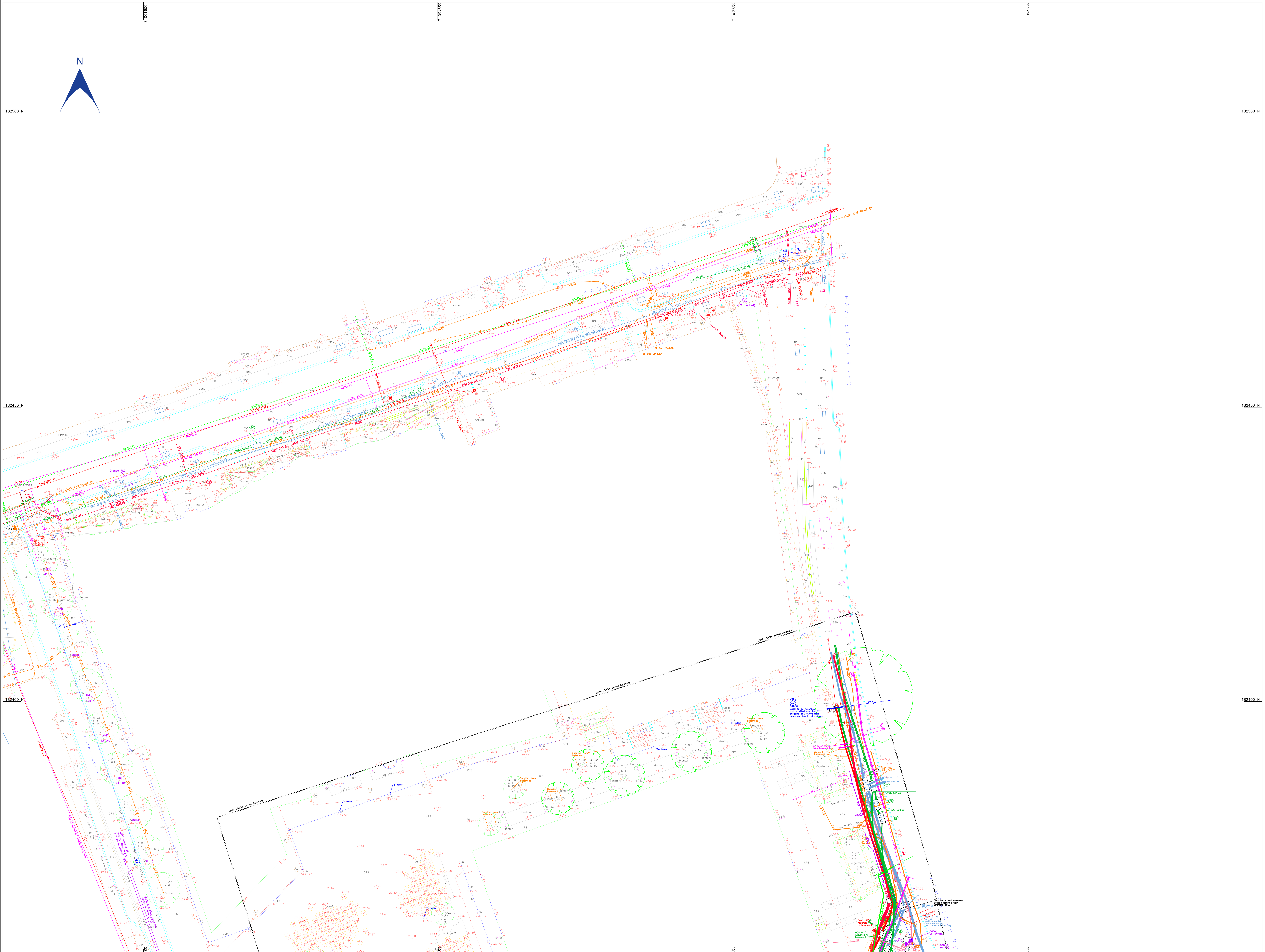

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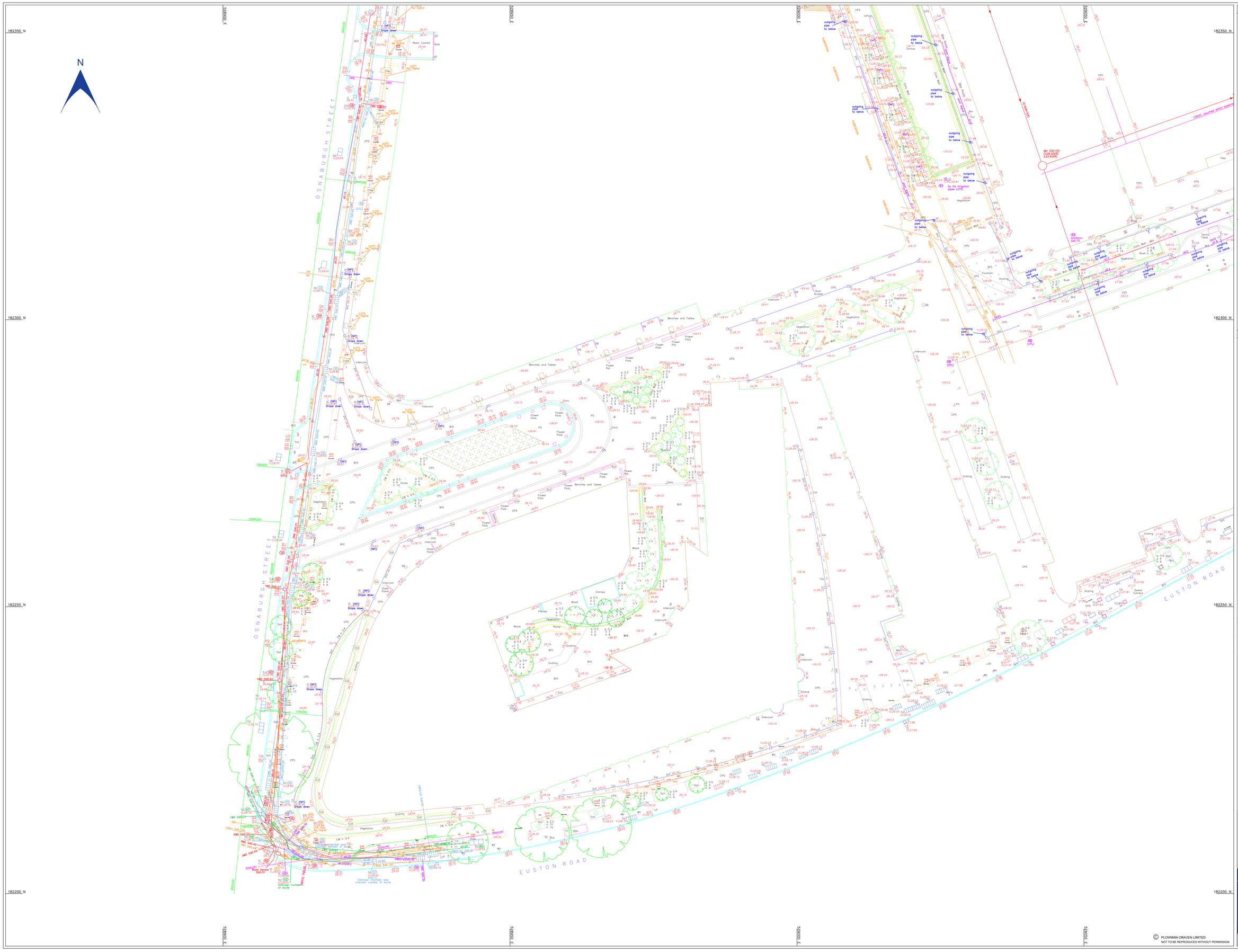

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PRESENTATION SCALE 1:200 @ A0

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DRAWING No. ISSUE

42746T-01-3 I

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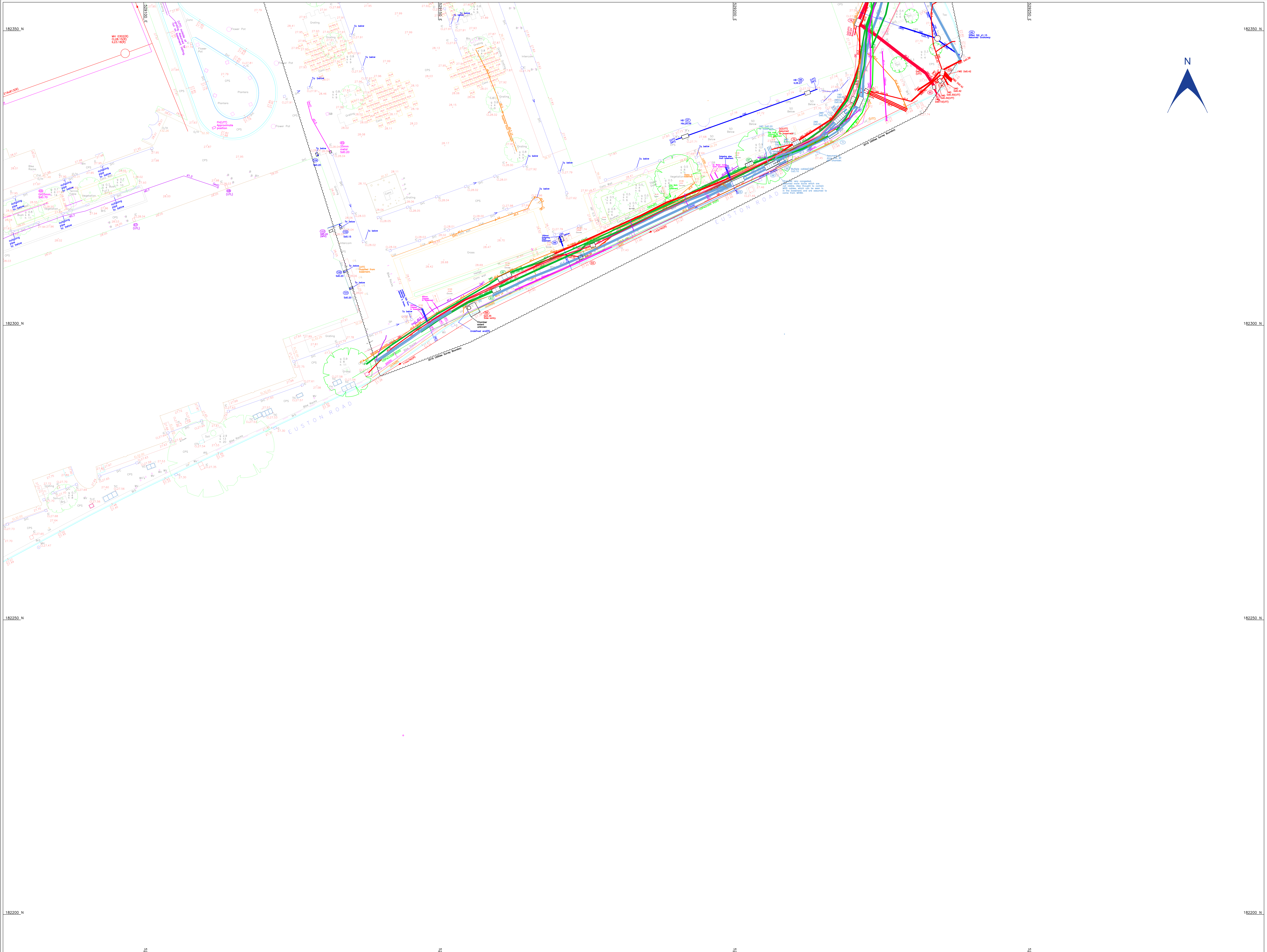

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ESG	Electrical Switchgear	SL	Sump Level
FB	Flower Bed	SO	Smoke Outlet
FH	Fire Hydrant	SP	Sign Post
FL	Floor Level	SV	Stop Valve
Flt	Floodlight	T	Telephone
g	girth	Tac	Tactile Paving
G	Gully	TBM	Temporary Bench Mark
GC	Gas Cock	TCB	Telephone Call Box
GM	Gas Meter	TCP	Traffic Control Post
GP	Gate Post	TIC	Telephone Inspection Cover
GV	Gas Valve	TJB	Telephone Junction Box
h	height	TL	Traffic Light
HR	Handrail	TLCB	Traffic Light Control Box
IB	Illuminated Bollard	TLIC	Traffic Light Inspection Cover
IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	Typ	Typical
IRF	Iron Railing Fence	V	Vent
IRS	Illuminated Road Sign	VP	Vent Pipe
JB	Junction Box	W	Window
KO	Kerb Outlet	WM	Water Meter
L	Light	WV	Water Valve

LEGEND

Stair/step arrows point up

Assumed detail

SERVICE LEGEND

FOUL DRAINAGE
SURFACE WATER DRAINAGE
WATER
GAS
ELECTRIC
TFL
VERIZON
COLT
CENTURY LINK
ZAYO GROUP
VODAFONE
BRITISH TELECOM
VIRGIN MEDIA
UNKNOWN SERVICE
UNDERGROUND CHAMBER

SERVICE ABBREVIATIONS

(AC)	Assumed Connection	IL	Invert Level
(AR)	Assumed Route	LV	Low Voltage
CI	Cast Iron	(NFI)	No Further Information
Cd	Depth to top of cable	(NPV)	No Pipes Visible
d	Depth of service (approx)	Pd	Depth to top of pipe
Dd	Depth to top of duct	Pe	Polyethylene
DI	Ductile Iron	(R)	From Records
(e)	Empty Duct	(s)	Service cable
EHV	Extra High Voltage	Sd	Sump Depth
HB	Hatch Box	(UTL)	Unable to Lift without damage
HbD	Hatch Box Depth	(UTT)	Unable to Trace
HV	High Volatge	WD	Way Duct
		WL	Water Level

Electro-detection techniques have been used in the location of underground services in some areas. The results are not infallible and trial excavations must be carried out to confirm service identification, position and particularly depths.
Although all reasonable effort has been made in searching available record drawings the completeness of the underground services information cannot be guaranteed.

Unless otherwise stated, drainage pipes are 100mm diameter.

The identification of service covers in some locations has been made by a surface inspection only - critical identifications should be verified by the lifting of covers or a full utilities survey

Due to the inherent instability of paper materials, drawings plotted on paper may be stretched and distorted - dimensions scaled from paper plots should therefore be treated with caution

SHEET LAYOUT

42746T-01-1	42746T-01-2
42746T-01-3	42746T-01-4

ISSUES & REVISIONS

Issue	Details	By	Date
A	Original Issue	PCL	04/04/2016
B	Underground Services Added	PCL	12/05/2016
C	St. Anne's Church Details Updated	PCL	10/07/2017
D	Triton Sq Underground services added	PCL	30/08/2017
E	Topo extended and layout amended	PCL	11/07/2018
F	Topo extended and additional levels added	PCL	18/07/2018
G	Additional Underground Services Added	PCL	21/02/2018
H	Basement Extents Added	PCL	04/03/2018
I	Underground services (Hampstead Road and Euston Road) added.	PCL	18/11/2019

This survey is commensurate with band F accuracy, as outlined in the RICS survey detail accuracy banding table

All levels are in metres and are above Ordnance Survey Newlyn Datum derived by multiple network RTK GPS observations

The survey grid shown on this drawing is positioned on Ordnance Survey (OS) National Grid, obtained by multiple network RTK GPS observations

Unless otherwise stated, levels have been taken to finished floor surface

All quoted dimensions are in metres

Drawing units are metres

CLIENT
British Land

York House
45 Seymour Street
London
W1H 7LX

PROJECT TITLE

Regents Place
London, NW1

3D Topographic Survey

PRESENTATION SCALE 1:200 @ A0

DATE OF ORIGINAL SURVEY June 2018

PC PROJECT No. 42746 CHECKED GH

DRAWING No. 42746T-01-4 ISSUE I

Plowman Craven

Plowman Craven House
2 Lea Business Park
Lower Luton Road
Harpenden
Hertfordshire
AL5 5EQ

115 Southwark Bridge Road
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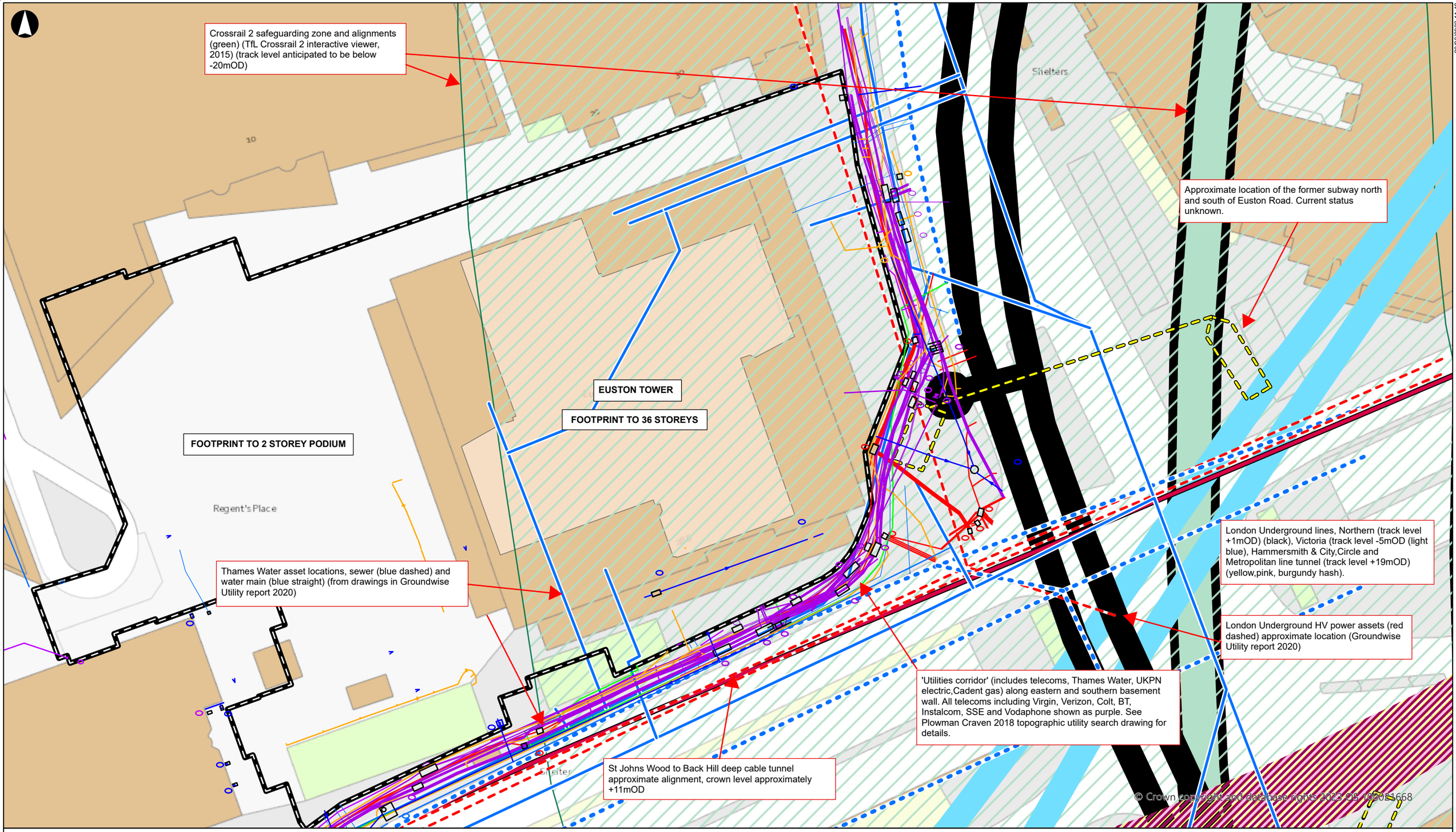
Web: www.plowmancraven.co.uk

Tel: +44 (0)207 490 7700

Appendix B – Site constraints plans.

A3



- Power tunnel (CL ~+11.0mOD, 3m diameter)
- LU HV Track cables
- TW sewer
- LU HV Road&Track
- Victoria line (TL -5.0mOD, ~4.0m diameter)
- Northern line (TL +0.7mOD, ~4.0m diameter)
- CR2 Safeguarding (2015)
- TW Water main
- Crossrail 2 safeguarded alignment (2015)
- Service Route - Storm
- Service Route - Foul
- Service Route - Chamber
- Service Route - Water
- Service Route - Telecom
- Service Route - Electric
- Service Route - Verizon
- Service Route - Unknown
- Service Route - Vodafone
- Service Route - COLT
- Service Route - Gas
- Service Route - Virgin Media
- Service Route - TFL
- Service Route - Century Link
- Euston Tower basement
- Location of former subway
- H&C, Circle line

Metres: 0 5 10 20

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd
00	20/06/2023	ST	HT	ME

ARUP
8 Fitzroy Street
London W1T 4BJ
Tel +44 20 7755 4026
www.arup.com

Client
British Land PLC

Project Title
286 Euston Tower, London NW1 3DP

Drawing Title
Euston Tower - Site constraints plan

Scale at A3
1:500

Role
Geotechnics-Structures

Suitability
S0 - Initial Status

Arup Job No
281835-00

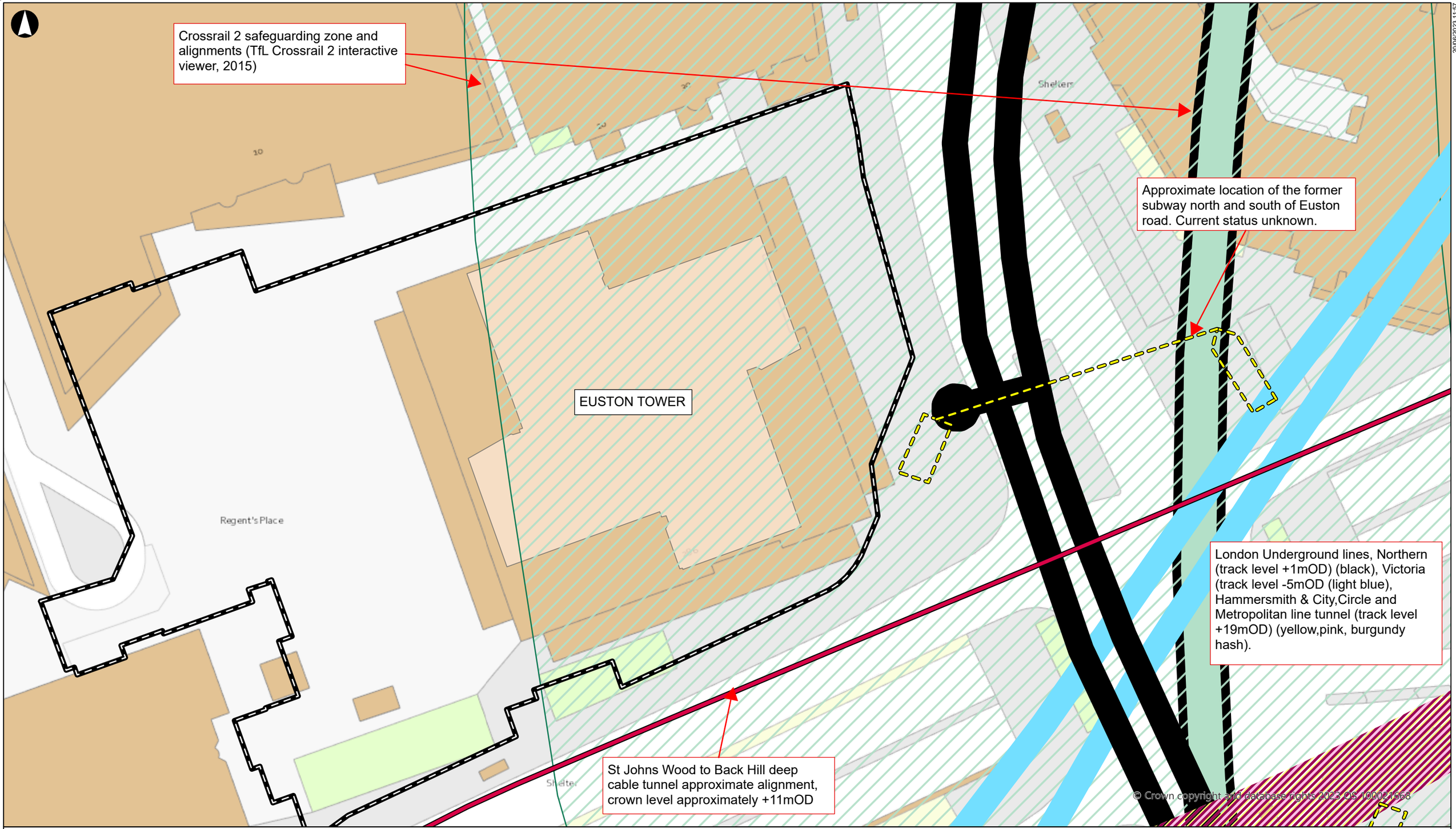
Rev
00

Name
281835-ARP-GE-SK-00001

20/06/2023 11:48

C:\Users\sam.taylor\Arup\281835-00 EUSTON TOWER NEW BUILD - Internal Data\07 Arup Specialists\05 Geotechnics\03_GIS\Euston Tower GIS\Euston Tower.aprx

A3



- Location of former subway
- Power tunnel (CL ~+11.0mOD, 3m diameter)
- H&C, Circle line
- Northern line (TL +0.7mOD, ~4.0m diameter)
- Victoria line (TL -5.0mOD, ~4.0m diameter)
- CR2 Safeguarding (2015)
- Crossrail 2 safeguarded alignment (2015)

Metres
0 5 10 20

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd
00	20/06/2023	ST	HT	ME

ARUP
8 Fitzroy Street
London W1T 4BJ
Tel +44 20 7755 4026
www.arup.com

Client
British Land PLC

Project Title
Euston Tower

Drawing Title
Euston Tower - Site constraints plan (tunnels only)

Scale at A3
1:500

Role
Geotechnics-Structures

Suitability
S0

Arup Job No
281835-00

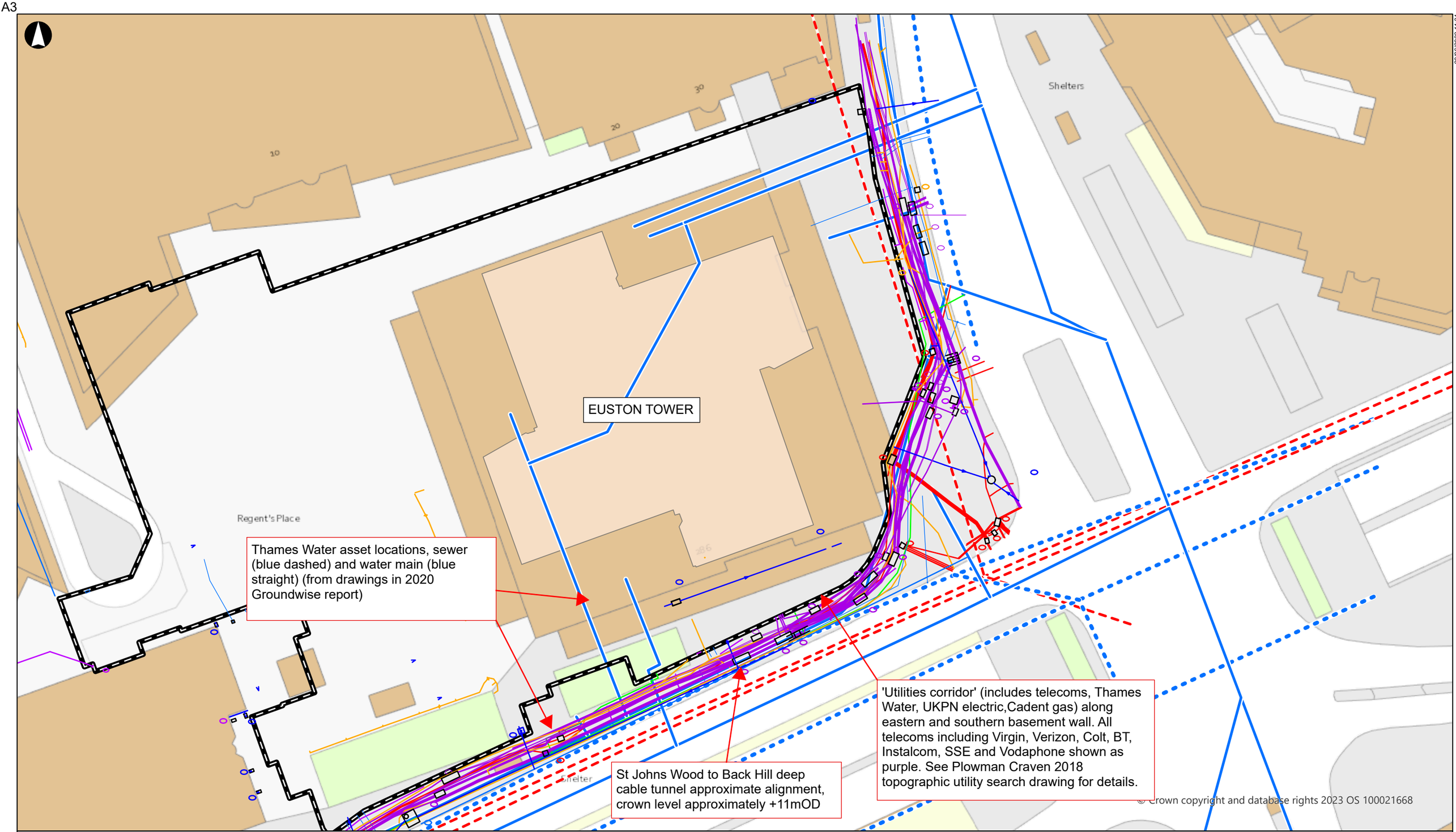
Rev
00

Name
#####

20/06/2023 11:57

C:\Users\sam.taylor\Arup\281835-00 EUSTON TOWER NEW BUILD - Internal Data\07 Arup Specialists\05 Geotechnics\03_GIS\Euston Tower GIS\Euston Tower.aprx

A3



- Service Route - Storm
- Service Route - Foul
- Service Route - Chamber
- Service Route - Water
- Service Route - Telecom
- Service Route - Electric
- Service Route - Verizon
- Service Route - Unknown
- Service Route - Vodafone
- Service Route - COLT
- Service Route - Gas
- Service Route - Virgin Media
- Service Route - TFL
- Service Route - Century Link
- TW Water main
- LU HV Track cables
- TW sewer
- LU HV Road&Track

Metres
0 5 10 20

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd
00	20/06/2023	ST	HT	ME

ARUP
8 Fitzroy Street
London W1T 4BJ
Tel +44 20 7755 4026
www.arup.com

Client
British Land PLC

Project Title
Euston Tower

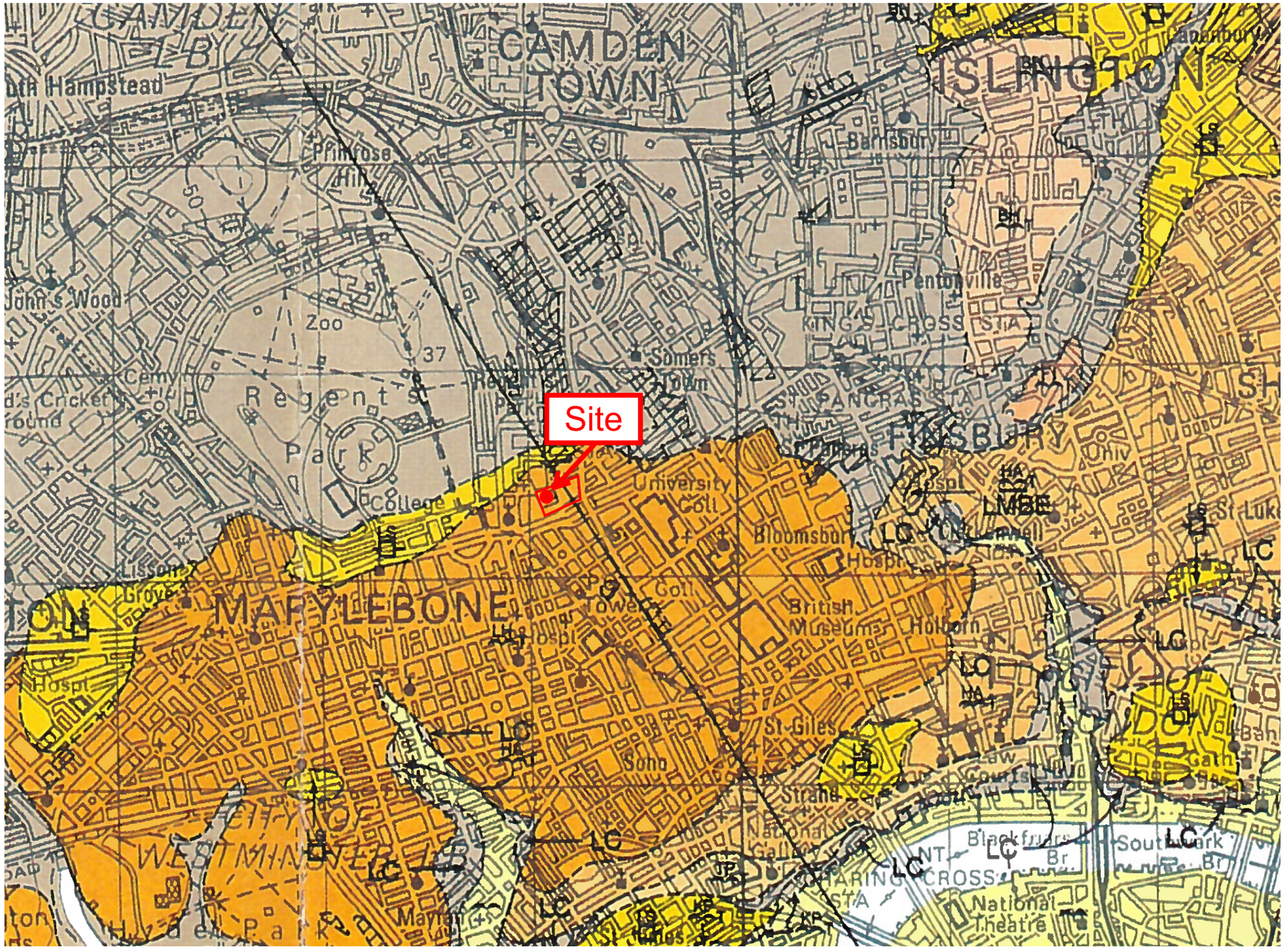
Drawing Title
Euston Tower - Site constraints plan (buried utilities only)

Scale at A3
1:500
Role
Geotechnics-Structures
Suitability
S0
Arup Job No
281835-00
Rev
00
Name
#####

20/06/2023 11:34

C:\Users\sam.taylor\Arup\281835-00 EUSTON TOWER NEW BUILD - Internal Data\07 Arup Specialists\05 Geotechnics\03_GIS\Euston Tower GIS\Euston Tower.aprx

Appendix C – Regional geology

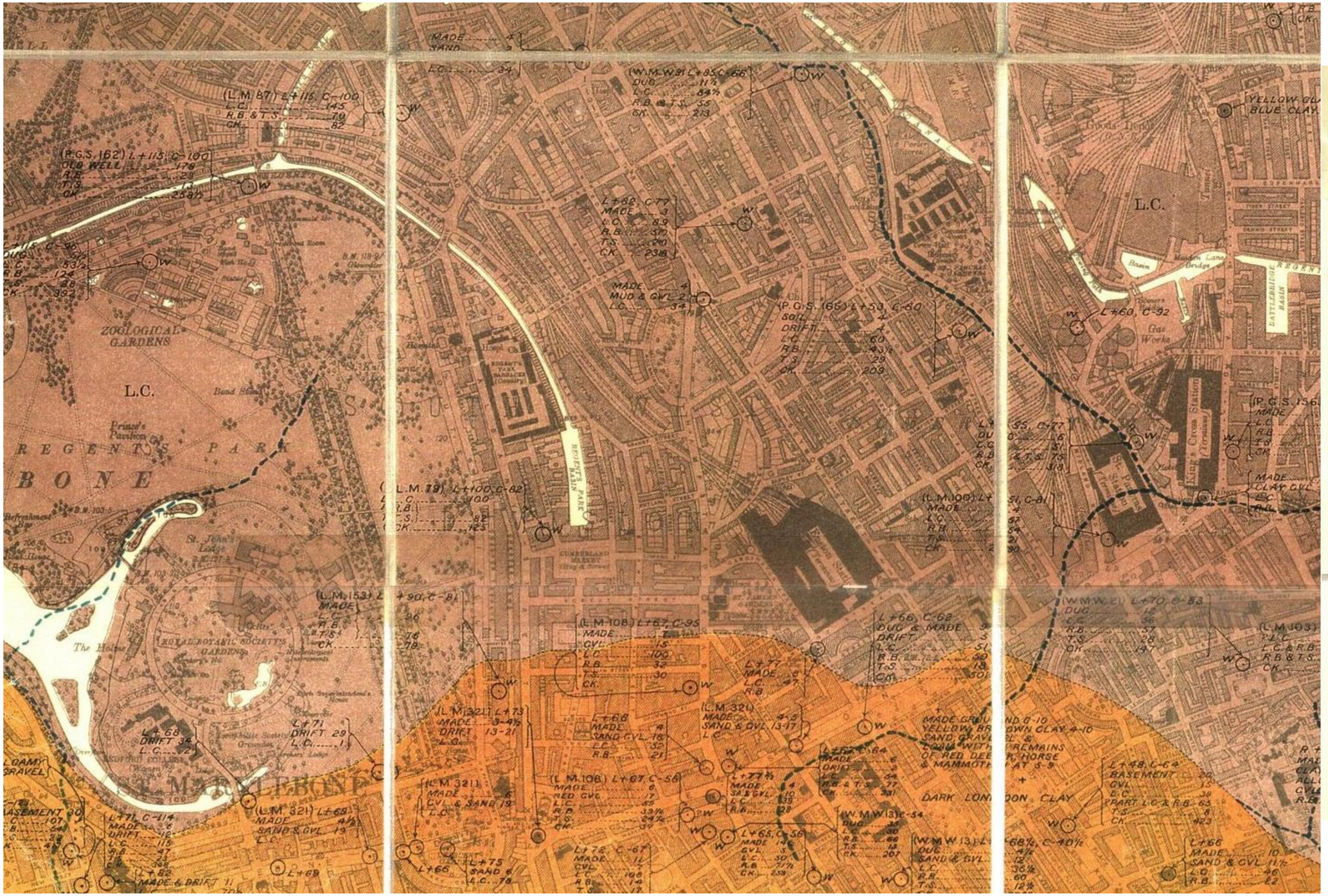


KEY TO GEOLOGICAL SYMBOLS AND COLOURS

N

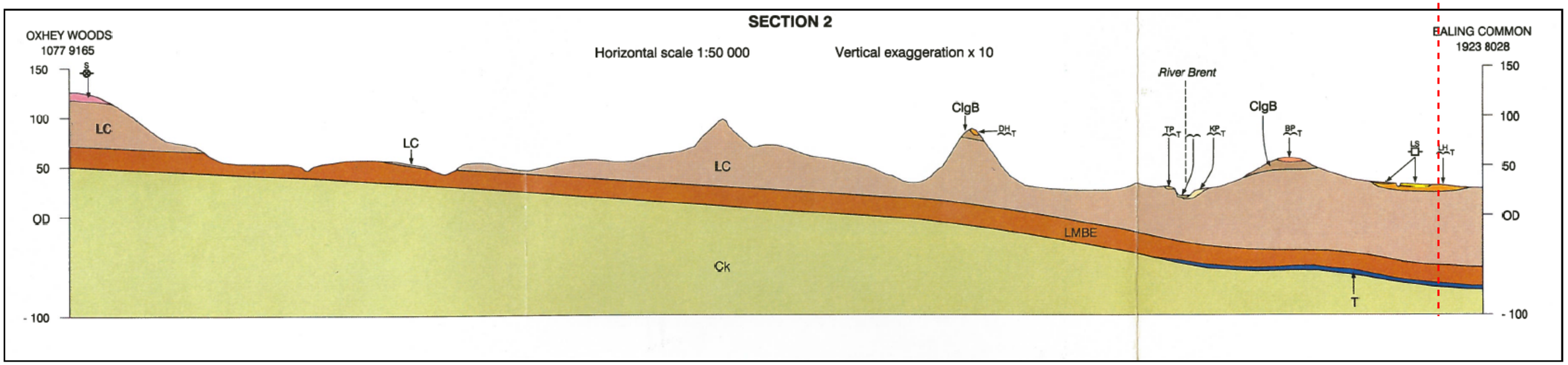
Euston Tower
1994 BGS Geological Map
Sheet 256 (1:50,000)

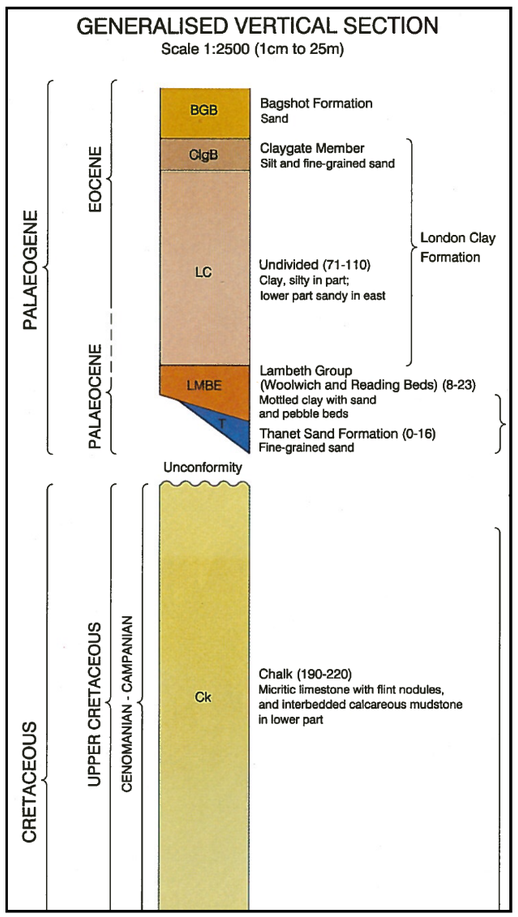
FIGURE 1



Euston Tower
BGS GEOLOGICAL MAP 1920
FIGURE 2

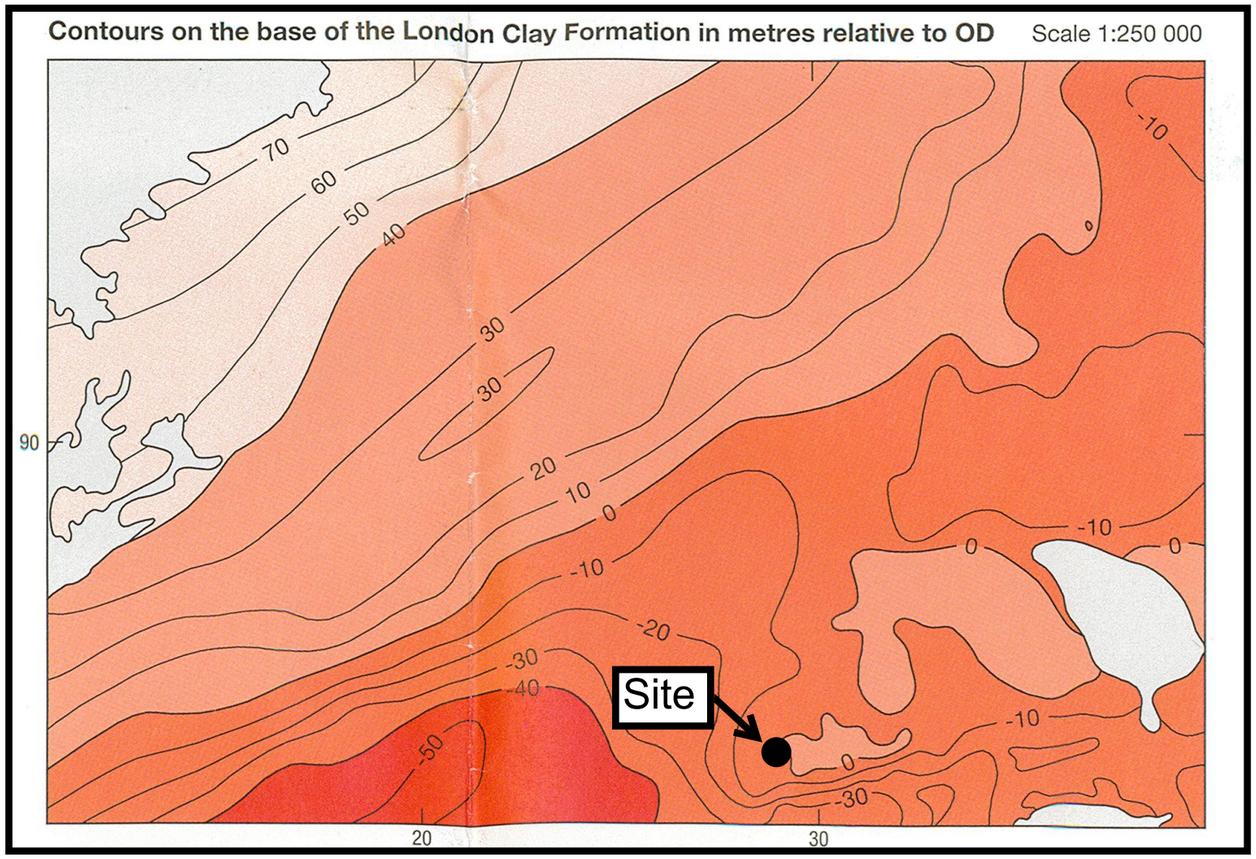
Approximate site location

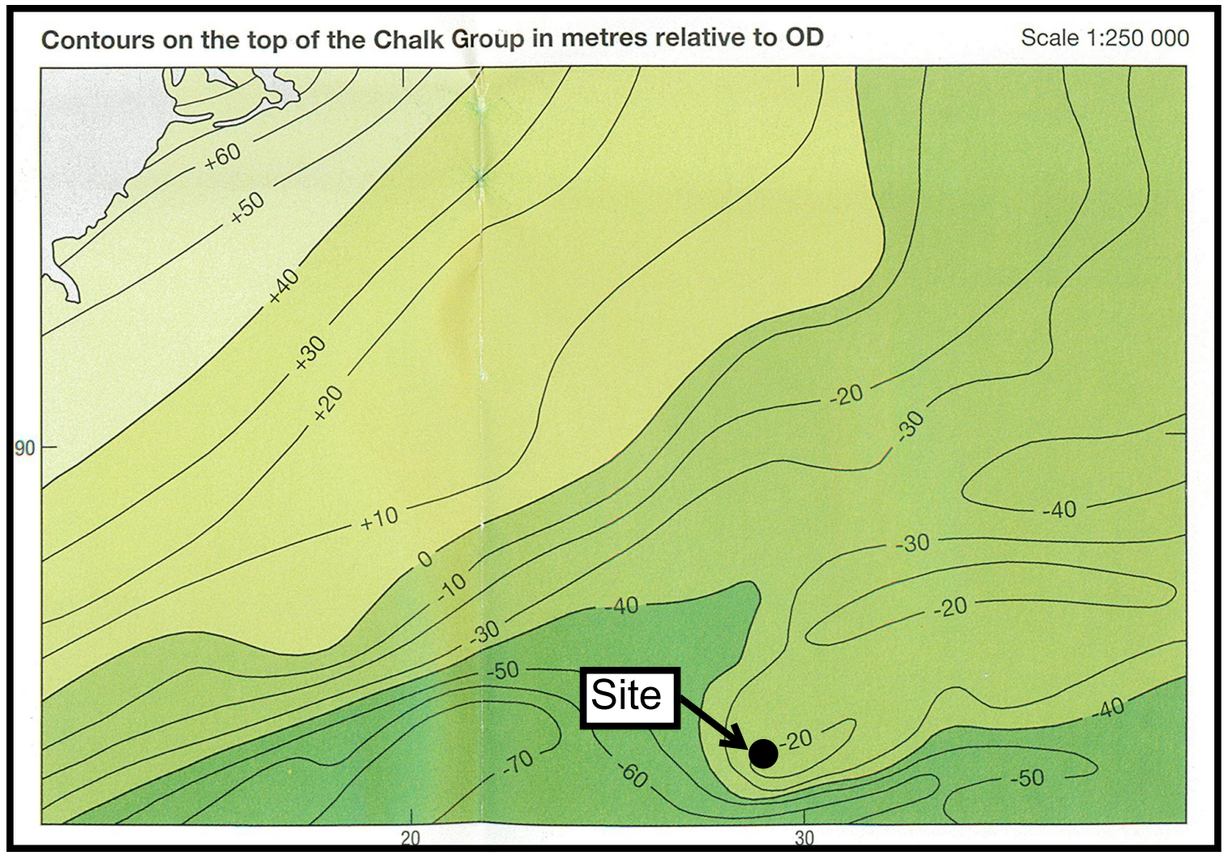




Euston Tower
1994 BGS Geological Map
Sheet 256 (1:50,000)

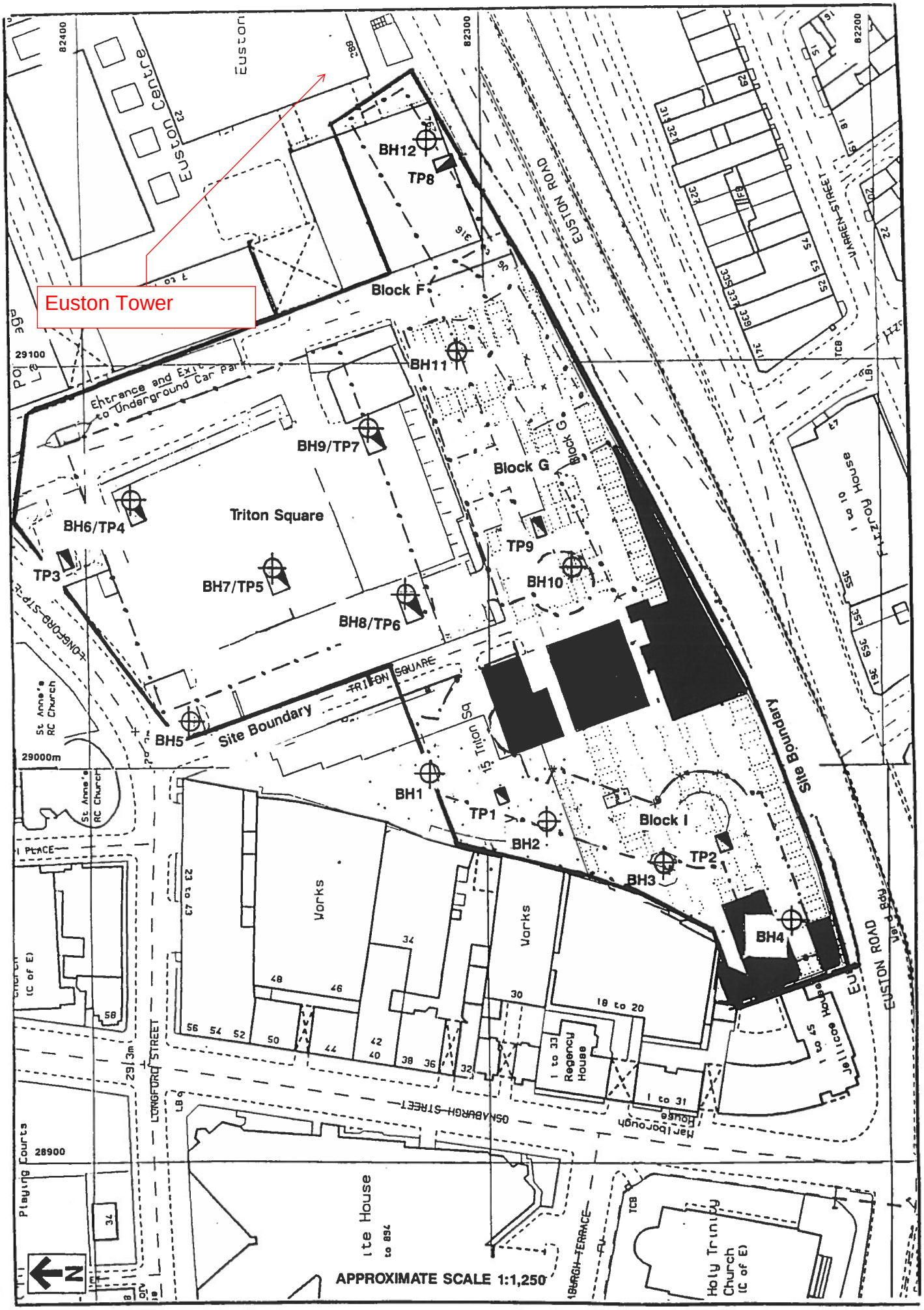
FIGURE 3





Euston Tower
BGS CONTOUR MAPS FOR LONDON CLAY AND CHALK
FIGURE 4

Appendix D – Existing ground investigation information



CROWN COPYRIGHT RESERVED

SITE PLAN SHOWING BASEMENT

Borehole

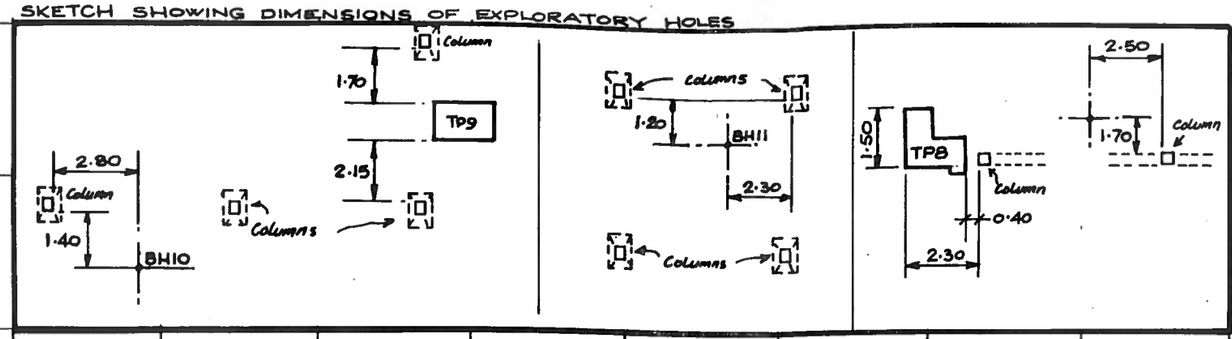
Trial Pit

Proposed Development

TRITON SQUARE / REGENTS PLACE

94484

SKETCH SHOWING DIMENSIONS OF EXPLORATORY HOLES



KEY

- BOREHOLE LOCATIONS
- TRIAL PIT LOCATIONS

Euston Tower

TP9

BH10

BH11

TP8

BH12

0 10 20 30

SCALE (m)

LTG SERVICES

EXPLORATORY HOLE LOCATION PLAN

Project Name:	Record of Borehole No:
TRITON SQUARE/REGENTS PLACE	BH 12
Project No: 9 4 4 8 4 — Client: THE BRITISH LAND CORPORATION	

Co-ordinates (National):	Ground level (mAOD):	Method:		
29153.0E 82311.0N	23.87	CABLE PERCUSSION		
Date:	**Depth of Hole:**	**Hole diameter:**	**Casing diameter:**	**Sheet:**
24/01/95 to 31/01/95	40.90	200/150mm	200/150mm	1 of 6

Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo/Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
				0						
0.25-0.70	1	B		(0.25) 0.25	23.62	MADE GROUND(concrete floor)				
0.60-0.85	2	B		(0.35) 0.60	23.27	MADE GROUND(yellow brown medium to coarse sand and subangular to rounded fine to coarse gravel predominantly of flint).				
0.85	3	D		(0.25) 0.85	23.02	MADE GROUND(red brown subrounded brick and mortar cobbles.				
1.00-1.45	4	BC	37	1		Medium dense yellow brown fine to coarse SAND and subangular to rounded fine to coarse flint GRAVEL. (TERRACE GRAVEL)				
1.60	6	W								
2.00-2.45	5	BC	24	2 (2.00)						
				2.85	21.02					
2.90	7	D		3		Firm brown and yellow brown mottled poorly fissured silty CLAY with occasional communited shell, (fissures degraded by weathering). (WEATHERED LONDON CLAY)				
3.00-3.45	8	U		(0.35) 3.20	20.67					
3.45	9	D	19			Stiff to very stiff dark grey brown very to extremely closely fissured silty CLAY with occasional light blue grey or green grey silt veins and communited shell debris, fissure planes generally inclined, smooth and planar - curviplanar, commonly and communited shell debris with black mottling along fissure planes. From 3.20 - 3.45m slight bluish alteration along fissure planes. @3.45m occasional 5mm diameter orange brown clay pockets; (oxidised pyrite?). From 3.50 - 5.00m brown silt or fine sand lining to some fissure planes. (LONDON CLAY)				
3.50-3.95	10	DS		4						
4.50-4.95	11	U	(45)							
4.95	12	D	19	5						
5.00-5.45	13	DS								
6.00-6.45	14	U	(45)	6						
6.45	15	D	24			...@6.50m occasional light grey silt pockets up to 2 - 3mm in diameter.				
6.50-6.95	16	DS		7						
7.50-7.95	17	U	(45)							
				8						

Boring Progress & Water Obs.							Chiselling			Remarks:
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins	Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101 Produced by J.M.Davidson on gINT, 1992

LTG

Scale: 1:50 All dimensions in metres	Processed in accordance with BS5930, BS5750 and AGS standards	Processed by: DC	Logged by: SR

Project Name:		Record of Borehole No:
TRITON SQUARE/REGENTS PLACE		BH 12
Project No: 9 4 4 8 4	Client: THE BRITISH LAND CORPORATION	

Co-ordinates (National):	Ground level (mAOD):	Method:		
29153.0E 82311.0N	23.87	CABLE PERCUSSION		
Date:	**Depth of Hole:**	**Hole diameter:**	**Casing diameter:**	**Sheet:**
24/01/95 to 31/01/95	40.90	200/150mm	200/150mm	2 of 6

Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
7.95	18	D	25			Stiff to very stiff dark grey brown very to extremely closely fissured silty CLAY with occasional light blue grey or green grey silt veins and communited shell debris, fissure planes generally inclined, smooth and planar - curviplanar, commonly and communited shell debris with black mottling along fissure planes.				
8.00-8.45	19	DS		(10.35)						
9.00-9.45	20	U	(65)							
9.45	21	D	29							
9.50-9.95	22	DS								
10.50-10.95	23	U	(65)							
10.95	24	D	28							
11.00-11.45	25	DS								
12.00-12.45	26	U	(55)							
12.45	27	D	28							
12.50-12.95	28	DS								
13.50-13.65	29	U	(100)	13.55	10.32					
13.65-14.10	30	B				Grey fresh CLAYSTONE, strong.				
14.00-14.30	31	B		(0.45) 14.00	9.87					
14.50-14.95	32	U	(70)			Very stiff dark grey brown locally grey brown extremely closely fissured silty CLAY with occasional communited shell debris, fissure planes generally inclined smooth planar and mottled black.				
14.95	33	D	30							
15.00-15.45	34	DS								

Boring Progress & Water Obs.							Chiselling			Remarks:
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins	Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101

LTG

Scale: 1:50	Processed in accordance with	Processed by:	Logged by:
All dimensions in metres	BS5930, BS5750 and AGS standards	DC	SR

Project Name:		Record of Borehole No:
TRITON SQUARE/REGENTS PLACE		BH 12
Project No: 9 4 4 8 4	Client: THE BRITISH LAND CORPORATION	

Co-ordinates (National):	Ground level (mAOD):	Method:		
29153.0E 82311.0N	23.87	CABLE PERCUSSION		
Date:	**Depth of Hole:**	**Hole diameter:**	**Casing diameter:**	**Sheet:**
24/01/95 to 31/01/95	40.90	200/150mm	200/150mm	3 of 6

Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
16.00-16.45	35	U	(70)			Very stiff dark grey brown locally grey brown extremely closely fissured silty CLAY with occasional communited shell debris, fissure planes generally inclined smooth planar and mottled black.				
16.45	36	D	29			...@16.45m silty to very silty with occasional light brown silt/fine sand partings.				
16.50-16.95	37	DS								
17.50-17.95	38	U	(65)							
17.95	39	D	32							
18.00-18.45	40	DS								
18.80-19.00	41	B		18.80	5.07					
19.00-19.45	42	U	(80)	19.00	4.87	Grey fresh CLAYSTONE, strong.				
19.45	43	D	33			Very stiff dark grey brown silty to very silty CLAY with occasional communited shell debris, grey green silt veins and pyritised wood fragments.				
19.50-19.95	44	DS								
						...@20.00m becoming silty and extremely closely fissured; fissure planes generally inclined smooth planar and mottled black.				
20.50-20.95	45	U	(60)							
20.95	46	D	31							
21.00-21.45	47	DS								
22.00-22.45	48	U	(60)							
22.45	49	D	34							
22.50-22.95	50	DS				...@22.50m with occasional fine brown sand/silt partings; fissure planes show polishing and striated.				
23.50-23.95	51	U	(70)			...@23.50m small 3mm diameter pockets of silt/fine sand partings; fissure planes show polishing in part.				

Boring Progress & Water Obs.							Chiselling		
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins

Remarks:
Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101

LTG

Scale: 1:50 All dimensions in metres	Processed in accordance with BS5930, BS5750 and AGS standards	Processed by: DC	Logged by: SR

Project Name:		Record of Borehole No:
TRITON SQUARE/REGENTS PLACE		BH 12
Project No: 9 4 4 8 4	Client: THE BRITISH LAND CORPORATION	

Co-ordinates (National):	Ground level (mAOD):	Method:		
29153.0E 82311.0N	23.87	CABLE PERCUSSION		
Date:	**Depth of Hole:**	**Hole diameter:**	**Casing diameter:**	**Sheet:**
24/01/95 to 31/01/95	40.90	200/150mm	200/150mm	4 of 6

Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo/Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
23.95	52	D	35							
24.00-24.45	53	DS				Very stiff dark grey brown silty to very silty CLAY with occasional communited shell debris, grey green silt veins and pyritised wood fragments.				
24.70-24.80	54	B				...@24.70m grey fresh CLAYSTONE, strong.				
25.00-25.45	55	U	(70)							
25.45	56	D	37							
25.50-25.95	57	DS				...@25.50m becoming very silty/sandy.				
26.50-26.95	58/59	D/U	(80)	26.50	-2.63					
				(0.40) 26.90	-3.03	Very stiff grey mottled red and brown silty to very silty CLAY; fissure planes generally inclined, polished and curviplanar.				
26.95	60	D	75			(WOOLWICH AND READING BEDS)				
27.00-27.35	61	DS		27.10	-3.23	Firm, probably stiff in-situ, light brown and light blue mottled silty sandy CLAY with occasional small 5mm diameter pockets of fine to medium grey sand.				
				(0.90)						
						Very stiff brown and blue grey banded and mottled silty CLAY with occasional pockets (up to 5mm) of fine to medium grey sand.				
28.00-28.45	62	U	(100)	28.00	-4.13					
28.45	63	D	86			Very stiff hard blue grey yellow and purple mottled extremely closely fissured silty CLAY locally with a little sand. Fissure planes generally inclined smooth and planar.				
28.50-28.83	64	DS								
				(1.70)						
29.50-29.95	65	U	(120)							
				29.70	-5.83					
29.85	66	D	55			Very stiff to hard red or red brown mottled brown spotted blue very to extremely closely fissured silty CLAY; fissure planes generally inclined smooth polished or striated and planar - curviplanar; locally lined with blue grey clay and undulatory				
29.90-30.35	67	DS								
31.00-31.35	68	U	(120)							
31.35	69	D	61							
31.40-31.80	70	DS								
				(3.70)						

Boring Progress & Water Obs.							Chiselling		
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins

Remarks:
Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101

LTG

Scale: 1:50	Processed in accordance with	Processed by:	Logged by:
All dimensions in metres	BS5930, BS5750 and AGS standards	DC	SR

Project Name: TRITON SQUARE/REGENTS PLACE							Record of Borehole No: BH 12
Project No: 9 4 4 8 4	Client: THE BRITISH LAND CORPORATION						
Co-ordinates (National): 29153.0E 82311.0N	Ground level (mAOD): 23.87	Method: CABLE PERCUSSION					
Date: 24/01/95 to 31/01/95	Depth of Hole: 40.90	Hole diameter: 200/150mm	Casing diameter: 200/150mm	Sheet: 5 of 6			Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
						Very stiff to hard red or red brown mottled brown spotted blue extremely to very closely fissured silty CLAY; fissure planes generally inclined planar and silt/fine sand lined.				
32.50-32.95	71	U	(120)							
32.95	72	D								
33.30	73	D		33.40	-9.53					
33.50-33.95	74	DS	61			Hard blue grey, yellow, brown and orange brown mottled very to extremely closely fissured silty sandy locally very sandy CLAY with occasional rounded medium flint gravel; fissure planes generally inclined planar and silt/fine sand lined.				
34.50-34.85	75	U	(120)							
34.85	76	D	64							
34.90-35.21	77	DS		(2.90)						
36.00-36.25	78	U	(120)							
36.25	79	D	103	36.30	-12.43	...@36.25m with small pockets and lenses of fine to medium brown sand.				
36.30-36.59	80	DS				Very dense black/dark grey subrounded to rounded fine to coarse clayey sandy GRAVEL with white incrust on some gravel surfaces; probably becoming gravelly with depth.				
37.00-37.25	81	BC	143	(1.10)						
				37.40	-13.53					
37.50-37.70	82	DS	300			Very dense grey silty fine to medium SAND with occasional gravel sized lumps of soft silt/clay. (THANET SAND)				
38.50-38.78	83	DS	200							
				(3.50)						
39.50-39.77	84	DS	206			...from 39.50 - 40.00m occasional thin (3mm) bands of soft? brown silty CLAY.				

Boring Progress & Water Obs.							Chiselling			Remarks:
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins	Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101 Produced by J.M.Davidson on gINT, 1992

LTG

Scale: 1:50 All dimensions in metres	Processed in accordance with BS5930, BS5750 and AGS standards	Processed by: DC	Logged by: SR

Project Name:		Record of Borehole No:
TRITON SQUARE/REGENTS PLACE		BH 12
Project No: 9 4 4 8 4	Client: THE BRITISH LAND CORPORATION	

Co-ordinates (National):	Ground level (mAOD):	Method:		
29153.0E 82311.0N	23.87	CABLE PERCUSSION		
Date:	**Depth of Hole:**	**Hole diameter:**	**Casing diameter:**	**Sheet:**
24/01/95 to 31/01/95	40.90	200/150mm	200/150mm	6 of 6

Machine Number

Samples & Tests				Strata		Description of Strata	Geology	Legend	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' value	Depth (m)	Reduced Level (m)					
				40						
40.50-40.75	85	DS	240			Very dense grey silty fine to medium SAND.				
				40.90	-17.03					
						EXPLORATORY HOLE COMPLETED AT 40.90m.				

Boring Progress & Water Obs.							Chiselling		
Date	Time	Depth	Casing	Water	Rose	Sealed	From	To	Mins

Remarks:
Full boring progress, water observations and chiselling details are given on a separate sheet. Full SPT and U100 details are given on separate sheets. Borehole in underground car park.

For abbreviations and symbols see key sheet

GE/tech 101

Produced by J.M.Davidson on gINT, 1992

LTG

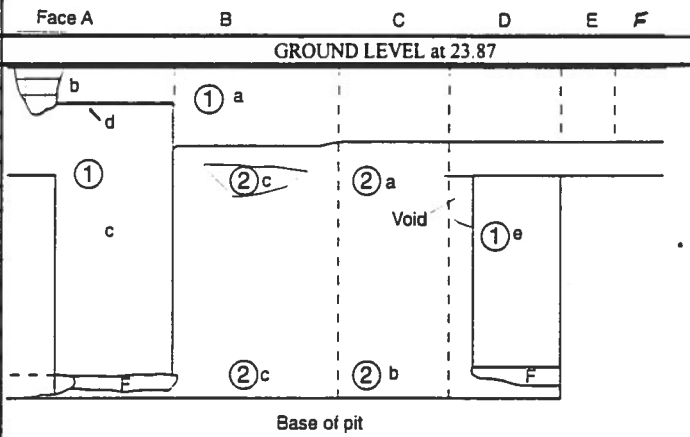
Scale: 1:50 All dimensions in metres	Processed in accordance with BS5930, BS5750 and AGS standards	Processed by: DC	Logged by: SR

OVE ARUP AND PARTNERS
REGENT'S PLACE
RECORD OF TRIAL PIT - TP 8 **Page 1 of 2**

APPENDIX	
JOB NO.	49198/77
MADE BY	JMB
DATE MADE	25/1/95

DAILY PROG-RESS	DEPTH TO WATER	SAMPLE/ IN SITU TEST DEPTH FROM	DEPTH TO	TYPE		LEG END	DEPTH	RED LEVEL
	(m)	(m)	(m)				(m)	(mOD)
23/1/95								
		0.40		3	J			
		0.40		4	J		0.45	23.42
24/1/95	1.25*	1.25		5	W		1.25	22.62
		1.30		1	B		1.35	22.52
		1.35		2	B			

DESCRIPTION OF STRATA



STRATA

1 a. Concrete floor slab with 6mm diameter mesh with 150mm spacing.
b&c. Structural concrete with spiral drawn 16mm diameter reinforcement @ 300mm centres & 10-12mm shear reinforcement @ 150mm centres
d. 150mm wide black rubber water bar
e. Concrete footing under column
f. Blinding

2 a. Medium dense orange brown medium to coarse SAND and fine to medium angular to rounded GRAVEL with occasional building rubble (concrete & wood)
b. Black sheet pile section surrounded in concrete
c. Below 0.6m (2) a becoming SAND and GRAVEL (as (2) a) with soft to firm grey CLAY

NOTES

* Water level after overnight rise.

** Void noticed underneath slab - see section 1-,1 2m long and up to 0.45m wide. Black pipe visible 1.5m into void.

METHOD OF EXCAVATION

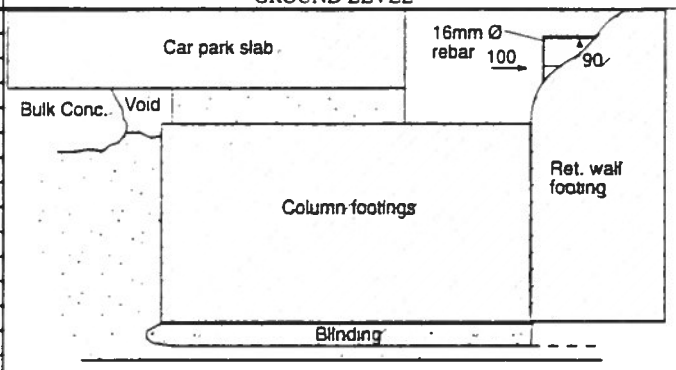
Hand Dug

TP 8

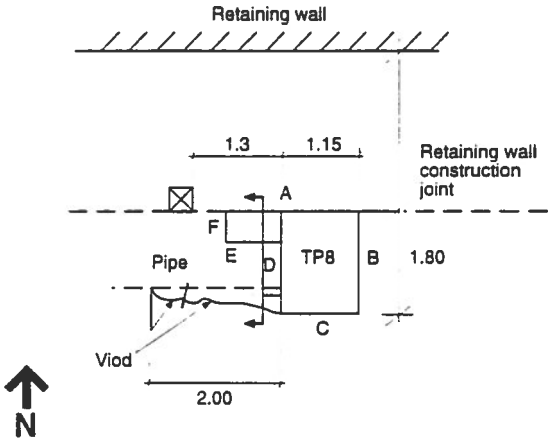
OVE ARUP AND PARTNERS
REGENT'S PLACE
RECORD OF TRIAL PIT - TP 8

APPENDIX	
JOB NO.	49198/77
MADE BY	JMB
DATE MADE	25/1/95

DAILY PROG-RESS	DEPTH TO WATER	SAMPLE/ IN SITU TEST DEPTH FROM	DEPTH TO	TYPE	LEG-END	DEPT	RED LEVEL	DESCRIPTION OF STRATA
	(m)	(m)	(m)			(m)	(mOD)	GROUND LEVEL
						0.30		
						0.45		
						1.25		
						1.35		



Section 1-1



PLAN VIEW

All dimensions in m

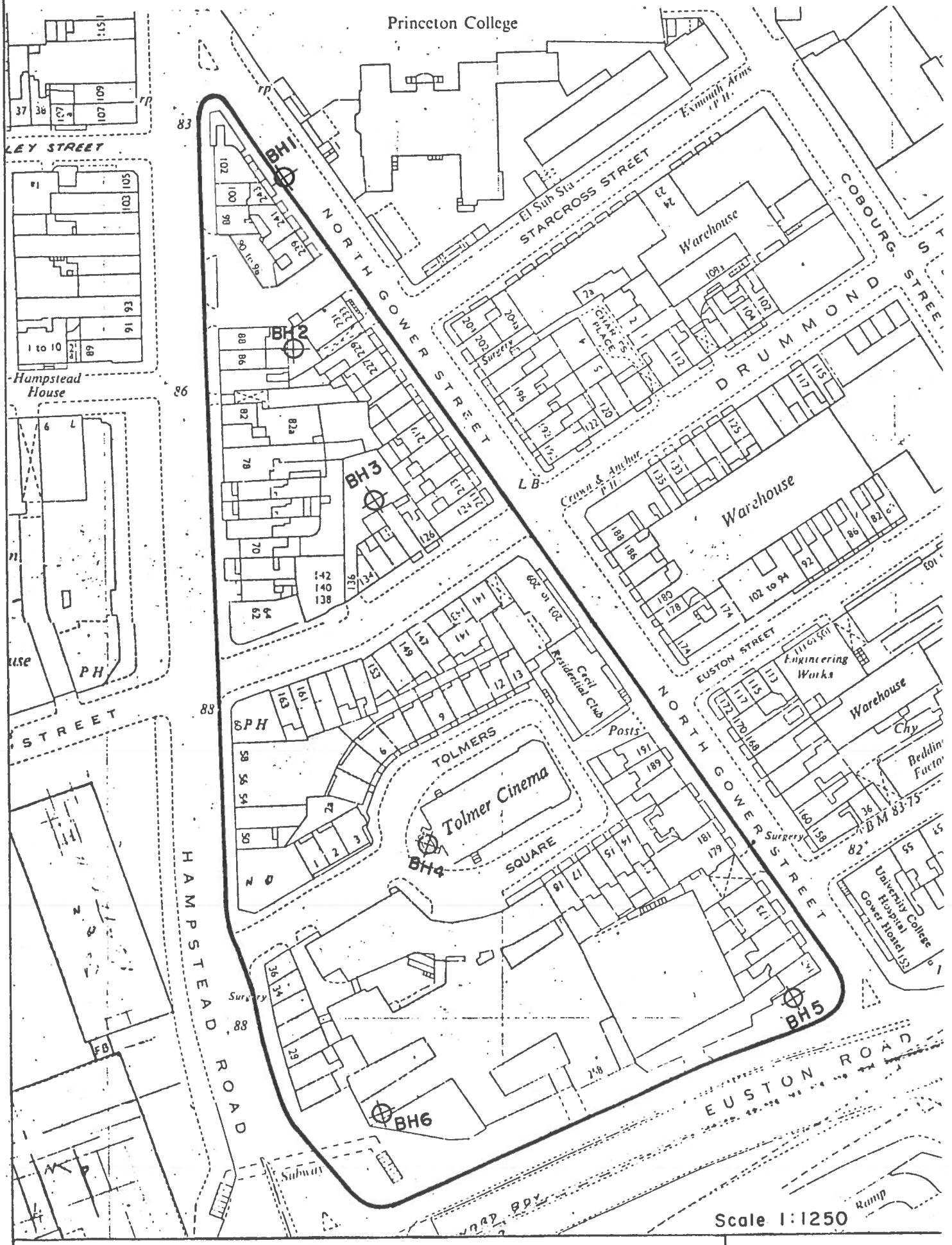
NOTES

METHOD OF EXCAVATION

Hand Dug

TP 8

TOLMERS SQUARE — BOREHOLE LOCATION PLAN



DRG.	1
Job	374

NUTTALL GEOTECHNICAL SERVICES LTD.

Site investigation at Tolmers Square. **Job** 374

LOG OF BOREHOLE No. 1

Type of equipment Shell and Auger

Diameter of hole 200mm (8") to 6.90m
150mm (6") to 20.00m

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 25.48m O.D.
	7.12/76			G.L.	2.40	1	D				Ashphalt, concrete and ballast material (Road surface foundations).
1 m											
2 m											
3 m						1			2.90	22.58	(Fill)
			3.00	3.15	3.45	2	CP(18)B				Medium dense brown sandy fine to coarse GRAVEL with occasional cobbles.
4 m				3.90		3	D		3.80	21.68	(Taplow Gravel)
			3.50	3.90	4.35	4	U4				Firm to stiff brown highly fissured, slightly silty CLAY with occasional grey fissure surfaces.
				4.35		5	D				
				4.50	4.80	6	SP(21)D				(London Clay)
5 m											
6 m				6.00		7	D				
				6.00	6.45	8	U4				---with traces of organic material
				6.45		9	D				
7 m				6.60	6.90	10	SP(25)D				
				7.50		11	D				
				7.50	7.95	12	U4				
8 m				7.95		13	D				
			7.50	8.10	8.40	14	SP(19)D				
	8.40	DRY	7.50								
	8.12/76	DRY									
9 m				9.00		15	D				
				9.00	9.45	16	U4				
				9.45		17	D				
10 m				9.60	9.90	18	SP(24)D				
11 m											
				11.40		19	D				
				11.40	11.85	20	U4				
12 m				11.85		21	D				
				12.00	12.30	22	SP(33)D				
13 m				13.00		23	D				

continued on next sheet

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
*	no recovery
▩ 80	core drilling, 80% recovery
RQD	rock quality designation

Notes

(a) Starting pit dug to 1.00m.

BOREHOLE 1

Site Investigation at Tolmers Square Job 374

LOG OF BOREHOLE No. 1
(Continuation Sheet)

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	continued from previous sheet
			7.50	13.00	13.45	24	U4				(Stiff mottled brown and grey fissured silty CLAY with traces of organic staining)
				13.45		25	D				
14m				13.60	13.90	26	SP(34)D				(London Clay)
15m											
16m				16.00		27	D				
				16.00	16.45	28	U4				---with some silt bands
				16.45		29	D				
17m				16.60	16.90	30	SP(37)D				
18m											
19m											
				19.10		31	D				
				19.10	19.55	32	U4				
				19.55		33	D				
20m	20.00	DRY	7.50	19.70	20.00	34	SP(41)D		20.00	5.48	Borehole completed.
21m											
22m											
23m											
24m											
25m											
26m											
27m											
28m											
29m											
30m											

Revised April 71

For Key to symbols and Notes, see first sheet for this borehole.

BOREHOLE 1

NUTTALL GEOTECHNICAL SERVICES LTD.

Job 374

R.2

Site Investigation at Tolmers Square **Job** 374

Type of equipment Shell and Auger

Diameter of hole 200mm (8")

LOG OF BOREHOLE No. 2

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	SAMPLING DATA: DEPTH TO	SAMPLING DATA: No.	SAMPLING DATA: TYPE	LEGEND	CHANGE OF STRATA: DEPTH	CHANGE OF STRATA: REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 25.79m O.D.
1 m	27.11.76			G.L.	1.85	1	D				Soft to firm dark brown sandy silty CLAY with some gravel of brick, concrete and flint material and occasional ash fragments. (Fill)
2 m				2.20		2	D		2.50	23.29	Soft mottled brown slightly sandy silty CLAY with some iron staining.
3 m				2.80	3.25	3	U4		3.00	22.79	
				3.25		4	D				Medium dense brown fine to coarse SAND with some fine and medium, angular to sub-rounded gravel.
4 m				3.45	3.75	5	CP(14)B				
5 m				4.05	4.35	6	CP(29)B				(Taplow Gravel)
				5.60		7	D		5.60	20.19	
6 m				5.60	6.05	8	U4				Stiff mottled grey-brown laminated (2mm) fissured slightly silty CLAY with occasional brown fissure surfaces and hard clay layers. (London Clay)
				6.05		9	D				
7 m	6.50	DRY	5.60	6.20	6.50	10	SP(27)D		6.50	19.29	Borehole completed.
8 m											
9 m											
10 m											
11 m											
12 m											
13 m											

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
•	no recovery
▨ 80	core drilling, 80% recovery
RQD	rock quality designation

Notes

(a) Starting pit dug to 0.25m.

(b) Standpipe installed with tip at 5.50m.

BOREHOLE 2

374

Site Investigation at Tolmers Square **Job** 374

Type of equipment Shell and Auger

Diameter of hole 200mm (8")

LOG OF BOREHOLE No. 3

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 25.75m O.D.
	23.11.76			0.50		1	D				Fine to coarse GRAVEL of brick rubble, ash and wood material.
1 m											
									1.45	24.30	(Fill)
				1.60		2	D				Soft brown sandy silty CLAY with some gravel of brick and ash material.
2 m	2.00	DRY	1.50								
	24.11.76	DRY	1.50	2.35	2.65	3	SP(1)D				
									2.75	23.00	(Fill)
3 m				2.95	3.25	4	CP(33)B				Dense to very dense brown medium to coarse SAND and fine to medium angular to rounded GRAVEL.
				3.65	3.95	5	CP(50)B				
4 m											
				4.35	4.65	6	CP(30)B				
5 m											
				4.95	5.25	7	CP(50)B				
											(Taplow Gravel)
				5.60		8	D		5.60	20.15	
6 m				5.80	6.25	9	U4				Stiff brown and grey laminated fissured CLAY.
				6.55	6.85	10	SP(22)D				(London Clay)
7 m	7.00	DRY	5.80								
	25.11.76	DRY	5.80	7.30	7.75	11	U4				
8 m											
				8.20	8.50	12	SP(34)D				
9 m											
				8.80	9.25	13	U4				---with some mudstone fragments
10 m				9.75	10.05	14	SP(28)D				
				10.30	10.75	15	U4				---with some organic staining
11 m											
				11.15	11.45	16	SP(24)D				
12 m				11.80	12.25	17	U4				---becoming slightly silty with occasional silt pockets
	12.70	DRY	5.80	12.40	12.70	18	SP(28)D		12.70	13.05	
13 m											Borehole completed

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
•	no recovery
▨ 80	core drilling, 80% recovery
RQD	rock quality designation

Notes

(a) Starting pit dug to 0.80m.

(b) Piezometer installed with tip at 12.00m.

BOREHOLE 3

Job 344

Site Investigation at Tolmers Square **Job** 374

LOG OF BOREHOLE No. 4

Type of equipment Shell and Auger

Diameter of hole 200mm (8")

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 28.50m O.D.
1 m	10.12.76			G.L.	2.00	1	B				Grey slightly silty fine and medium SAND with much fine to coarse, sub-angular to rounded gravel. (Fill)
2 m				2.00		2	D		2.00	26.50	
3 m											Firm to stiff mottled grey and brown slightly sandy, silty CLAY with some fine and medium gravel of flint and brick material and occasional bone material. (Fill)
				3.50		3	D		3.50	25.00	
4 m			3.00	3.50	3.95	4	U4				Firm dark grey silty CLAY.
				3.95		5	D		4.50	24.00	
5 m			4.20	4.65	4.95	6	CP(54)B				Medium dense brown medium to coarse SAND with much fine and medium, sub-angular to sub-rounded gravel. (Taplow Gravel)
6 m											
7 m			5.80	6.15	6.23	7	CP(80)‡B				
			6.40	6.65	6.95	8	CP(28)B				
8 m											
				8.20		9	D		8.10	20.40	
			8.00	8.20	8.65	10	U4				Stiff mottled brown and grey fissured CLAY with evidence of iron staining on fissure surfaces. (London Clay)
9 m	9.10	DRY		8.65		11	D				
			8.00	8.80	9.10	12	SP(31)D		9.10	19.40	
10 m											Borehole Completed
11 m											
12 m											
13 m											

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
•	no recovery
▨ 80	core drilling, 80% recovery
RQD	rock quality designation
‡	No. of blows for 0.30m penetration calculated from actual number of blows.

Notes

(a) Starting pit dug to 0.50m.

(b) Standpipe installed with tip at 8.00m.

BOREHOLE 4

Job 374

Site Investigation at Tolmers Square **Job** 374 **LOG OF BOREHOLE No. 5**

Type of equipment Shell and Auger

Diameter of hole 200mm (8") to 7.00m
150mm (6") to 22.00m

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 26.08m O.D.
	13.12'76			G.L.	3.00	1	B				Fine to coarse GRAVEL of brick, concrete and paving material with some sand and wood fragments.
1 m											
2 m											
3 m	3.00	DRY	3.00								(Fill)
	4.12'76	DRY				/					
									3.30	22.78	
4 m											
			3.70	3.95	4.25	2	CP(19)B				Medium dense grey, medium and coarse SAND with some fine to coarse gravel.
				4.60		3	W				
5 m											(Taplow Gravel)
									5.10	20.98	
				5.50		4	D				Firm to stiff brown highly fissured slightly silty CLAY with occasional grey fissure surfaces.
				5.50	5.95	5	U4				
6 m				5.95		6	D				
				6.10	6.40	7	SP(23)D				
7 m											(London Clay)
				7.50		8					
			6.00	7.50	7.95	9	U4				
8 m				7.95		10	D				
				8.10	8.40	11	SP(22)D				
9 m											
			9.00	9.65		12	D				
10 m				9.65	10.10	13	U4				
				10.10		14	D				
				10.25	10.55	15	SP(26)D				
11 m				11.00		16	D				
				11.00	11.45	17	U4				---with traces of organic material
				11.45		18	D				
12 m	12.00	DRY	9.00	11.60	11.90	19	SP(27)D				
	15.12'76	DRY									
13 m				12.80		20	D				

continued on next sheet

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
•	no recovery
▨ 80	core drilling, 80% recovery
RQD	rock quality designation

Notes

(a) Starting pit dug to 0.75m

(b) Reduced to 150mm (6") casing at 7.00m

Site Investigation at Tolmers Square Job 374

LOG OF BOREHOLE No. 5

(Continuation Sheet)

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	continued from previous sheet
			9.00	12.80	13.25	21	U4				
				13.25		22	D				(Stiff brown fissured CLAY)
				13.40	13.70	23	SP(29)D				(London Clay)
14m											
15m											
				15.50		24	D				
				15.50	15.95	25	U4				
16m				15.95		26	D				
				16.10	16.40	27	SP(34)D				
17m											
18m											
				18.50		28	D				
				18.50	18.95	29	U4				
19m				18.95		30	D				
				19.10	19.40	31	SP(38)D				
20m											
21m											
				21.55		32	D				
22m				21.55	22.00	33	U4		22.00	4.08	---with occasional grey mottling and traces of organic staining
	22.00	DRY	9.00	22.00			D				Borehole completed
23m											
24m											
25m											
26m											
27m											
28m											
29m											
30m											

For Key to symbols and Notes, see first sheet for this borehole.

BOREHOLE 5

NUTTALL GEOTECHNICAL SERVICES LTD.

Job 374

Revised April 71

R.2

Site Investigation at Tolmers Square **Job** 374 **LOG OF BOREHOLE No. 6**

Type of equipment Shell & Auger

Diameter of hole 200mm (8") to 13.40m
150mm (6") to 23.70m

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	GROUND LEVEL: 26.62m O.D.
	29.11.76			G.L.	2.00	1	B				Fine to coarse, angular to sub-rounded GRAVEL of flint and brick material, with much fine to coarse sand.
1 m											
2 m									2.00	24.62	(Fill)
				2.15	2.45	2	SP(8)D				Soft to firm mottled brown silty CLAY with some ash material.
3 m									3.00	23.62	(Fill)
			3.00	3.15	3.30	3	CP(102)B				Dense brown silty sandy GRAVEL.
4 m											(Taplow Gravel)
5 m	4.95	DRY	4.60	4.65	4.95	4	CP(15)B		4.60	22.02	Soft to firm brown silty CLAY with traces of sand and medium gravel.
	11.12.76	DRY	4.60	5.00		5	D				
				5.00	5.45	6	U4		5.40	21.22	
				5.45		7	D				Firm to stiff grey-brown laminated, fissured CLAY with some organic staining.
6 m				5.60	5.90	8	SP(15)D				
				6.50		9	D				
				6.50	6.95	10	U4				---becoming stiff
7 m				6.95		11	D				
				7.10	7.40	12	SP(24)D				
8 m											(London Clay)
				8.00		13	D				
				8.00	8.45	14	U4				
				8.45		15	D				
9 m				8.60	8.90	16	SP(31)D				
				9.50		17	D				
				9.50	9.95	18	U4				
10 m				9.95		19	D				
				10.10	10.40	20	SP(37)D				---5-10mm band of mudstone
11 m											
				11.00	11.45	21	U4*,D				---band of grey, moderately strong mudstone
12 m				11.60	11.90	22	SP(41)D				
				12.50		23	D				
				12.50	12.95	24	U4				
13 m	13.00	DRY	5.00	12.95		25	D				

continued on next sheet

Key

▨	sampling depth, soils
U4	4 in. dia. undisturbed sample (102 mm)
U3	3 in. dia. undisturbed sample (73 mm)
D	disturbed jar sample
B	disturbed bulk sample
W	water sample
SP ( )	standard penetration test
CP ( )	cone penetration test
(25)	number of blows e.g. 25
▪	no recovery
▮ 80	core drilling, 80% recovery
RQD	rock quality designation
++	No. of blows for 0.30m penetration calculated from actual number of blows.

Notes

(a) Piezometer installed with tip at 23.00m.
(b) Reduced to 150mm (6") casing at 13.40m.

BOREHOLE 6

RI. NUTTALL GEOTECHNICAL SERVICES LTD. **Job 374**

Site Investigation at Tolmers Square Job 374

LOG OF BOREHOLE No. 6
(Continuation Sheet)

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER	DEPTH OF CASING	SAMPLING DATA: DEPTH FROM	DEPTH TO	No.	TYPE	LEGEND	CHANGE OF STRATA: DEPTH	REDUCED LEVEL	DESCRIPTION OF STRATA
		m	m	m	m				m	m	continued from previous sheet
	2.1276	DRY	5.00	13.15	13.45	26	SP(31)D				(Stiff grey weakly laminated fissured micaceous CLAY)
14m											
											(London Clay)
				14.50		27	D				
			14.00	14.50	14.95	28	U4				
15m				14.95		29	D				
				15.10	15.40	30	SP(32)D				
16m											
17m				17.00		31	D				
				17.00	17.45	32	U4				---with some partially pyritised wood fragments
				17.45		33	D				
18m				17.60	17.90	34	SP(36)D				
19m											
20m											
				20.50		35	D				
				20.50	20.95	36	U4				
21m				20.95		37	D				
				21.10	21.40	38	SP(35)				
22m									21.90	4.72	
				22.05		39	D				Hard, light grey, mottled red, laminated and fissured silty CLAY (Woolwich and Reading Beds)
				22.05	22.50	40	U4				
23m				22.50		41	D				
				23.20		42	D				Red-brown from 22.50m.
											Light grey-green from 23.60m.
24m	23.70	DRY	14.00	23.25	23.70	43	U4		23.70	2.92	
				23.70		44	D				Borehole Completed
25m											
26m											
27m											
28m											
29m											
30m											

For Key to symbols and Notes see first sheet for this borehole

BOREHOLE 6

NUTTALL GEOTECHNICAL SERVICES LTD.

Job 374

Revised April 71

R.2

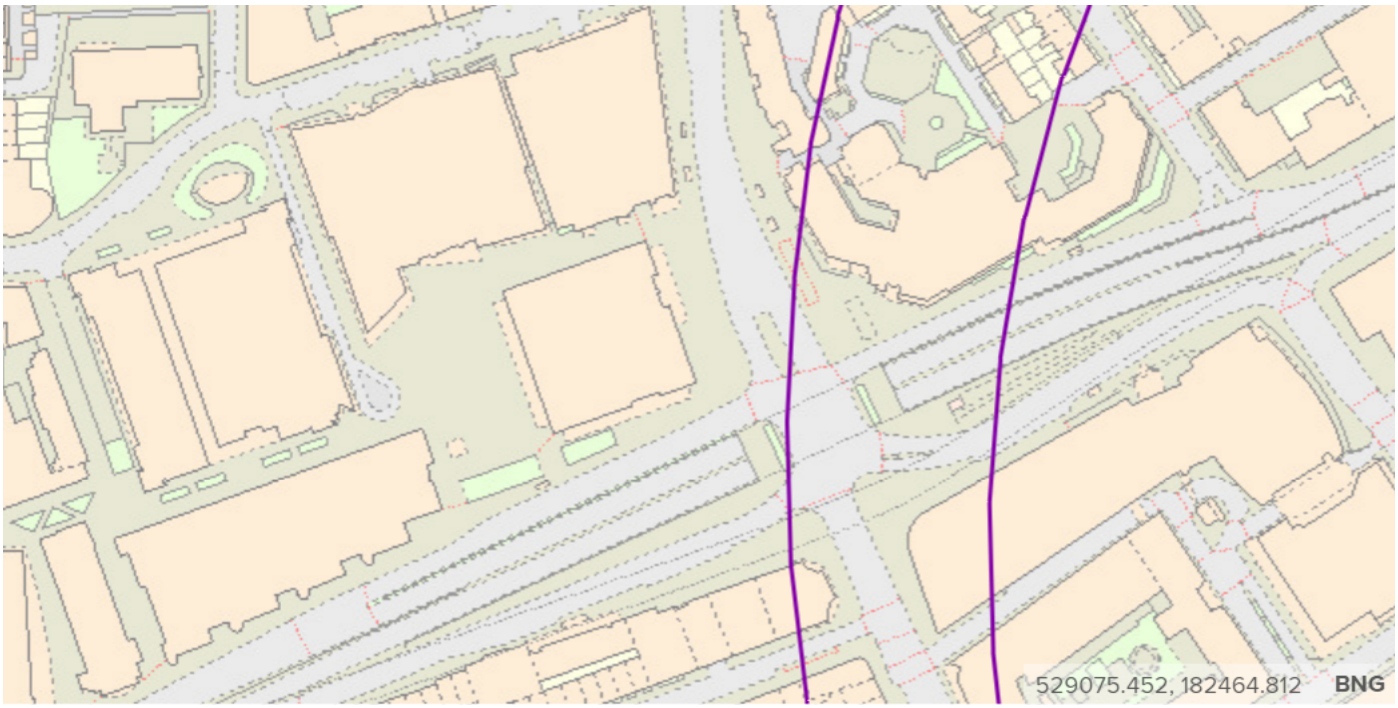
Appendix E – Crossrail 2 safeguarding correspondence

From: Crossrail2 <Crossrail2@tfl.gov.uk>
Sent: Monday, October 9, 2023 3:07 PM
To: Henry Tayler <Henry.Tayler@arup.com>; Crossrail2 <Crossrail2@tfl.gov.uk>
Cc: G.Williams@Gardiner.com; j.pennell@gardiner.com; Marc Easton <Marc.Easton@arup.com>
Subject: RE: Euston Tower, 286 Euston Road, London. Crossrail 2 Safeguarding

Henry,

Euston Tower, 286 Euston Road, does fall within the 2015 Crossrail 2 Safeguarding Directions. This means that any consultation on planning applications submitted to the Local Planning Authority in respect of this site which propose or imply works more than 3 metres below ground level, an increase in height or floor area must include TfL to prevent planning permission being granted for development that might be prejudicial to the subsequent delivery of Crossrail 2.

Since the 2015 Directions were confirmed the current alignment of Crossrail 2 has been the subject of ongoing review and the latest proposal, shown below, are for the Mk.20.1 alignment which has moved the running tunnels slightly east of the above site. The purple lines show the centrelines of each of the two running tunnels.



Given the distance between the Crossrail 2 running tunnels and the site, in the event an application for planning permission were to be submitted I would still expect TfL to be notified of the proposals. Your email speaks about modifications to the existing building and, depending on the nature of the works and whether any below ground works are proposed, TfL may recommend to the local planning authority its Crossrail 2 conditions relating to ground movement and noise and vibration be attached to a grant of planning permission. If we do recommend conditions

the Crossrail 2 information for Developers guidance document provides further advice on how these may be discharged in conjunction with the local planning authority.

I am happy to meet but don't necessarily see there being an immediate need unless you would like to share the proposals in more detail.

Regards,

Michael Johnson BSc. Hons BTP MRTPI
Safeguarding Manager Crossrail 2
Investment Delivery Planning
Transport for London

M: 0751 505 2717 E: michaeljohnson@tfl.gov.uk

TfL RESTRICTED

From: Henry Tayler <Henry.Tayler@arup.com>
Sent: 07 October 2023 10:00
To: Crossrail2 <Crossrail2@tfl.gov.uk>; Safeguardcrossrail2 <Safeguardcrossrail2@tfl.gov.uk>
Cc: G.Williams@Gardiner.com; j.pennell@gardiner.com; Marc Easton <Marc.Easton@arup.com>
Subject: Euston Tower, 286 Euston Road, London. Crossrail 2 Safeguarding

For attention of the safeguarding manager, Crossrail 2-TfL.

This correspondence is to request details of TfL Crossrail 2 safeguarding in proximity to the above site and to make initial contact with the safeguarding manager in relation to proposed feasibility studies for modifications to the existing building and development of the site.

Brief summary:
On behalf of our client, British Land, Arup are carrying out structural/geotechnical studies for the 286 Euston Road, "Euston Tower" site, Euston Road, within the London Borough of Camden.
The site is located at the corner of Euston Road and Hampstead Road and the existing 1960s constructed Euston Tower building and associated 2 storey podium structure are located within the Regents Place /former Euston Centre development. The existing 36 storey 1960s constructed Euston Tower building has a single level basement and is founded on deep piled foundations.

Existing TfL engagement.
The project team have held initial screening sessions with TfL related to the public realm and highways aspects of the proposal since April 2023.
The lead contact for engagement within TfL related to this scheme is Nahuel Mainard-Sardon.
The project team are in contact with TfL/LUL Infrastructure Protection in relation to tube assets adjacent to the site, the lead contact within TfL is Lydia Wong.

Crossrail 2 safeguarding:
An extract from the Crossrail 2 safeguarding directions is provided below, showing the location of the existing Euston Tower building in blue.
The Euston Tower and associated basement surrounding the tower is shown as located within the limited of land subject to consultation (safeguarding limits).

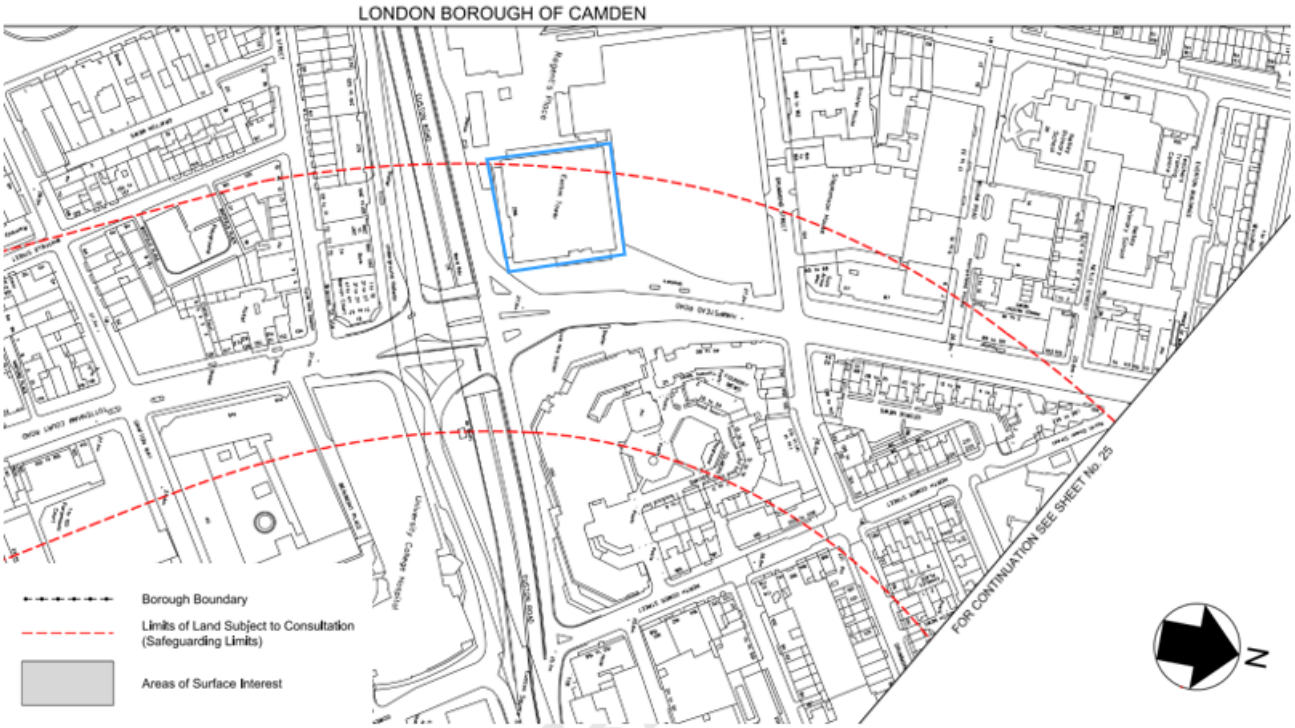


Figure 14 - Crossrail 2 safeguarding directions Sheet No24. March 2015. [MMD-307346-C-DR-SG-XX-1124]

An extract from the Crossrail2 interactive webmap is below, also showing the location of the existing Euston Tower building in blue.
https://cr2.maps.arcgis.com/apps/webappviewer/index.html?id=21a7f72dfd0c443db5733bd81a707a67
The Euston Tower site falls within the Crossrail 2 safeguarding limits, however we note that the proposed tunnel alignment, shown in brown, falls outside the safeguarding limits to the east.

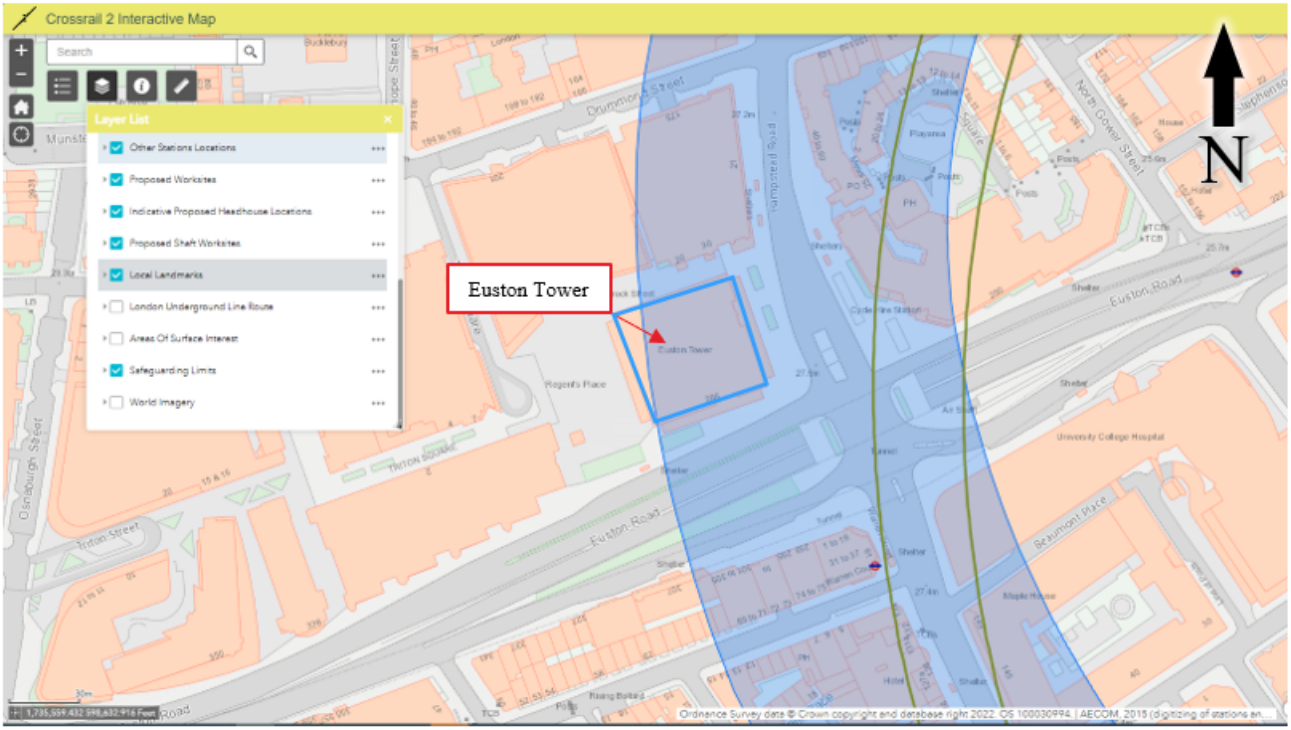


Figure 15 - Crossrail 2 safeguarding map extract – accessed 13/1/2023.

The team are aware of the guidance information available on https://crossrail2.co.uk/discover/safeguarding/ and the associated "Information for Developers" guidance - CRL2-CRL2-GEN-ROUTWID-NOT-LP-00003. The team request details of the latest safeguarding arrangements, tunnel alignment and exclusion zones to inform engineering assessment at the site and ahead of a Planning Application.

We would like to arrange an initial meeting to discuss the current feasibility proposals and establish the requirements for further studies or submissions.

Please let us know if we can provide any further information to assist in this enquiry. Our contact details are given below.

Kind regards,

Henry

Henry Tayler
Associate | Geotechnics - Transport London
MEng CEng MICE MAPM

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