geotechnical and environmental consultants

ground&water

Phase I Desk Study

1a Polygon Rd, London NW1 1QB

Origin Housing Limited

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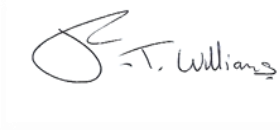
v.1.02			
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EXECUTIVE SUMMARY	
PROPOSED DEVELOPMENT	At the time of reporting, September 2023, the proposed development was understood to comprise the conversion of the existing ground floor, first floor and second floor area, from offices into residential housing. The proposed development plan can be seen within Figure 2.
GEOLOGY AND HYDROGEOLOGY	The British Geological Survey Solid and Drift Geology Map (north London Sheet No. 256) revealed that the site was underlain bedrock deposits of the London Clay Formation. An area of Worked Ground was noted 36m south-east of the site, associated with the London Underground Northern Line. No superficial deposits, outcrops of other bedrock deposits or other areas of Made/Worked Ground were noted within a 250m radius of the site. A study of the aquifer maps on the DEFRA website revealed the site was underlain by an **Unproductive Bedrock Strata** comprising bedrock deposits of the London Clay Formation. No classification was provided for superficial aquifers given the likely absence of superficial geological formations. Examination of the Environment Agency records showed that the site **did not** fall within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater. No surface water features were present within a 250m radius of the site. The nearest surface water feature was the Regent's Canal located ~650m north-east of the site. The easterly flowing River Thames was noted ~2.60km south-east of the site.
POTENTIAL SOURCES OF CONTAMINATION	• Made Ground • Asbestos • UXO
RECOMMENDATIONS / PHASE II OBJECTIVES	It is recommended that an intrusive ground investigation is undertaken at the site to evaluate the risk that contaminants of concern within the soils and groundwater may affect end-users. This should determine the underlying ground and groundwater conditions and include an assessment of the level of contamination to enable the quantification of the ground-related risks associated with the proposed redevelopment. Consideration should be given to the testing of soil samples recovered from exploratory holes for chemical laboratory testing. The testing should be for a broad range of contaminants in accordance with DEFRA/CLEA methodologies and include the contaminants of concern identified within the Conceptual Site Model.

1. INTRODUCTION

1.1. General

Ground and Water Limited were instructed by Origin Housing Limited on 18/08/2023 to conduct a Phase I Desk Study on the site at 1a Polygon Rd, London NW1 1QB. The scope of the investigation was detailed within the fee proposal GW-2230, dated 08/08/2023.

1.2. Aims of the Investigation

This Phase 1 Desk Study was undertaken to advise the client on risk factors pertaining to the site with special reference to former and present day potential contaminative uses and their impact on sensitive receptors, these being human health, controlled waters, buildings, building materials and services.

1.3. Conditions and Limitations

This report has been prepared based on the terms, conditions and limitations outlined within Appendix A.

1.4. Technical Glossary

Generic technical terms and their description can be viewed within the glossary provided within Appendix B.

2. SITE SETTING

2.1. Site Location

The site comprised a ~100m^2 rectangular-shaped plot of land, orientated in a north-west to south-east direction, along the south-eastern side of Polygon Road. The site was located in the southern portion of the London Borough of Camden, north London. The national grid reference for the centre of the site was approximately TQ 29514 82985. A site location plan is given within Figure 1.

2.2. Site Description

A Site Walkover was undertaken on 21/08/2023. A description of the site, as noted during the Site Walkover, is tabulated below.

Site Description Sheet	
Use of site	At the time of the site walkover, 21/08/2023, the site was predominantly comprised of a three-story building, connected to adjacent buildings, however very overgrown.
Site topography	The site was generally flat.
Area topography	The general area was relatively flat.
Structures onsite	A 3-storey structure was noted across the site entirety.
Structures off-site	The other buildings surround the site, with a railway station located ~40m south-west.
Use of surrounding ground	Residential buildings, businesses and also a train station
Site covering	In external areas where the building was not noted, tarmac hardstanding was present.
Contamination sources onsite	None noted.
Contamination sources off-site	Contamination associated with possible Made Ground near train station.
Vegetation onsite	Scattered shrubbery and bushes
Vegetation off-site	Larger trees to the west of the site, along Eversholt Street.
Services	The existing buildings were thought to have gas, power, water supply, sewage water and telecoms.

2.3. Proposed Development

At the time of reporting, September 2023, the proposed development was understood to comprise the conversion of the existing ground floor, first floor and second floor area, from offices into residential housing. The proposed development plan can be seen within Figure 2.

2.4. Geology

The British Geological Survey Solid and Drift Geology Map (north London Sheet No. 256) revealed that the site was underlain bedrock deposits of the London Clay Formation. An area of Worked Ground was noted 36m south-east of the site, associated with the London Underground Northern Line. No superficial deposits, outcrops of other bedrock deposits or other areas of Made/Worked Ground were noted within a 250m radius of the site.

A BGS borehole (TQ28SE2052) located ~15m south-west of the site revealed a capping of Paving stone/brick and rubble fill over Made Ground to 1.40m bgl, followed by Brown/Grey London Clay 18.90m bgl. Perched groundwater was noted at 5.70m bgl.

2.5. Hydrogeology and Hydrology

A study of the aquifer maps on the DEFRA website revealed the site was underlain by an **Unproductive Bedrock Strata** comprising bedrock deposits of the London Clay Formation. No classification was provided for superficial aquifers given the likely absence of superficial geological formations.

Examination of the Environment Agency records showed that the site **did not** fall within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

No surface water features were present within a 250m radius of the site. The nearest surface water feature was the Regent's Canal located ~650m north-east of the site. The easterly flowing River Thames was noted ~2.60km south-east of the site.

From analysis of hydrogeological and topographical maps, the groundwater table was anticipated to be encountered at depth below the London Clay Formation; however, perched water may cap the London Clay Formation and be found within the shallow surface soils (i.e. Topsoil or Made Ground), especially after periods of prolonged or intense rainfall. It was considered that groundwater was flowing in a south-easterly direction toward the Regents Canal in line with local topography.

Examination of the Environment Agency records showed that the site was located within a Flood Zone 1, i.e. an area with a very low probability of flooding.

The Groundsure Datasheets revealed the site was at a low risk of flooding from rivers and the sea. The datasheets also revealed the site had a low risk of groundwater flooding and also a negligible risk for surface water flooding.

2.6. Radon

A review of the freely available UK Health Security Agency radon database, UK Radon, indicated that the site was located within a 1km grid square, where the maximum radon potential of 1 – 3% was recorded. The neighbouring 1km grid square was noted to have a maximum radon potential of 1 – 3%. Basic radon protection measures are required in areas where more than 3% of houses are at or above the Action Level. The site was in an area where a risk assessment was not required.

2.7. Available Unexploded Ordnance (UXO) Map Review

A review of the data available on www.zeticauxo.com/ revealed the site was located within the London high-risk area associated with unexploded ordnance (UXO). The London area is further separated into 25No. categories based on bombing densities, where green is indicated for areas having <10 bombs dropped per km^2 and red is indicated for areas having >150 bombs dropped per km^2. The site is situated within the red area, ~three quarters through the spectrum. A total of 1No. known UXO Find was located 1.00km south of the site. Before site works are undertaken, a preliminary UXO report must be purchased.

2.8. Historical Landfill Tool Review

A review of the data available on www.groundsure.io/ revealed no areas of historical or authorised landfills within a 500m radius of the site.

3. HISTORICAL REVIEW

3.1. Historical Map Review

The object of this search was to report on the history of the site and its environs from available County Series and Ordnance Survey Maps dating from the mid to late 19th Century to the present day and downloaded from Groundsure. In the following sections dealing with individual maps, only features considered to have a potential contaminative impact on the site and usually within a notional 250 metre radius of the site boundaries are discussed. Any distances quoted for features remote from the site have been scaled from the maps and are only approximate. The north point and approximate extent of the site are indicated on each figure. The historical maps referred to are given within Appendix C. The implications of the map search are discussed later within this report.

Environmental Significance of Data from Historical Maps		
Maps Dated Between	**Site**	**Environs**
1873 – 1882	The site comprised two residential terraced properties with associated rear gardens.	The site environs generally comprised residential terraced houses. Euston railway station was recorded 100m south-west of the site. Goods offices were noted 50-100m west of the site and a good shed was noted 100-150m west of the site. A carriage shed and smithy were noted the other side of Euston train station approximately 220-250m west of the site.
1896 – 1920	No significant change recorded.	Euston station had been expanded eastwards towards the site, and is now as close as 70m south-west. The goods offices were now referenced as "Railway Clearing Houses". The carriage shed and smithy was not recorded on the plans and appeared to be part of Euston Station. A number of new flats had been constructed 50m east of the site where terraced houses had been demolished. Remainder as previous map.
1951 – 1957	The existing residential houses on site and directly to the west of the site had been demolished. The site remained undeveloped.	The land to the south-east of the site was now undeveloped land, having previously been residential houses. The Railway Clearing Houses to the west of the site were again referenced as Goods Sheds. A large garage site was noted approximately 150m south-east of the site located along Drummond Crescent. A number of buildings had been demolished/potential destroyed and were marked as ruins (60m north-east and 110m north-west of the site). Remainder as previous map.
1964 – 1978	By 1972 a new residential flat building had been constructed across the majority of the site.	The land to the south-east of the site had been redeveloped with new residential flat buildings. The garage to the south-east of the site was now referenced as a vehicle depot. Part of Euston station to the west of the site was now referenced a parcel depot. Remainder as previous map.
1986 – 1994	No significant change recorded.	By 1991 the vehicle depot to the south-east of the site was now referenced just as a depot. Remainder as previous map.
2003-2023	No significant change recorded.	No significant change recorded.

3.2. Historical Aerial Photography Review

The object of this search was to report on the history of the site and its immediate environs from available Aerial Photography dating from the mid-20th Century to the present day and downloaded from Google Earth and Groundsure. Any distances quoted for features remote from the site have been scaled from the photography and are only approximate.

At the time of the earliest aerial photography, 1945, the site appears to be occupied by a terraced residential house. The surrounding area generally comprised residential houses. Euston station was noted 100m west of the site. Due to the quality of the photograph specific details of the site are not readily visible.

The 1999 aerial photography indicates that the site was now occupied by residential flats, with the surrounding land also comprising flats and offices. The garage/depot mentioned within the historical map review had been demolished in 2016 and by 2018 was a new school. No significant changes on site or the site environs were recorded between 1999 and 2023.

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4. ENVIRONMENTAL AND GEOLOGICAL INSIGHT

4.1. Groundsure Datasheets

Groundsure Environmental and Geological Datasheets were obtained for the site. Unless the data indicates a significant risk, only information within a 250m buffer zone has been included. The GroundSure Datasheets are also presented in Appendix D and a summary is given below and overleaf(s).

Environmental Insight	
Source	Nearest Distance from Site/Dated/Type
Past Land Use	
Historical industrial land uses	20x off-site records within a 250m radius: 6x records of railway buildings 41m south-west, 202m west, 203m west, 211m west, 216m west and 245m south (1882 – 1968). 5x records of railway stations 42m south-west, 65m south-west, 66m south-west, 72m south and 98m south-west (1882 – 1989). 7x records of railway sidings 64m south, 114m south-west, 118m south-west, 127m south-west, 130m south-west, 135m south-west and 135m south-west (1882 – 1989). 2x records of terminus station 65m west and 65m west (1948 – 1957).
Historical Tank Database	2x records within a 250m radius: 2x records of unspecified tanks 240m south-west and 240m south-west (1952).
Historical Energy Features Database	8x off-side records within a 250m radius: 8x records of electricity substations 81m north-west, 82m north-west, 166m west, 166m west, 193m north-east, 193m north-east, 211m north-west and 250m south-east (1952 – 1997).
Historical Garages Database	8x records within a 250m radius: 6x records of garages 70m south-east, 70m south-east, 70m south-east, 71m south-east, 128m south-east and 129m south-east (1952 – 1997). 2x records of carriage sheds 91m west and 180m south-west (1876).
Waste and Landfill	
Waste exemptions	2x records within a 250m radius: 1x record of treating waste exemption 96m west – treatment of waste aerosol cans. 1x record of using waste exemption 173m east– use of waste in construction.
Current Industrial Land Use	
Recent Industrial Land Uses	7x records within a 250m radius: 3x records of hire services 83m south-east, 83m south-east and 226m north-west. 4x records of infrastructure and facilities 106m west, 108m north-west, 180m west and 196m north-east. 1x record of engineering services 153m north-west. 1x record of industrial products 221m south-east.
Licensed pollutant release (Part A(2)/B)	5x records within a 250m radius: 4x records of dry cleaning 11m south-west, 11m south-west, 226m east and 226m east. 1x record of unloading petrol into storage at service station 83m south-east.
Pollution inventory substances	All below reporting threshold.
Pollution inventory waste transfers	Hazardous waste – 3.9 tonnes – route: R13
Pollution inventory radioactive waste	Route: Wastewater: Technetium 99m 499.78GBq - Indium 111 0GBq - Iodine 123 37.24GBq - Other Beta/Gamma 50.1GBq -

	Iodine 131 435.08GBq - Total Alpha 0.09472GBq - Total Beta/Gamma (Excl Tritium) 2079.79GBq - Fluorine 18 758.46GBq - Lutetium-177 198.93GBq - Radium-223 0.09472GBq - Yttrium 90 0GBq – Phosphorus 32 8.25MBq - Phosphorus 33 0.203MBq - Total Beta/Gamma (Excl Tritium) 8.4MBq -
Hydrogeology	
Bedrock Aquifer	1 record onsite: 1x Unproductive.
Groundwater Vulnerability	1 record onsite: 1x Unproductive Aquifer – vulnerability: n/a, leaching class: low.
Hydrology	
WFD Surface Water Body Catchments	1x on-site record: 1x Coastal Catchment (Not part of a river WB catchment – London).
Agricultural Designations	
Agricultural Land Classification	**1x on-site record:** **1x Urban on-site.**

Geological Insight	
Source	Nearest Distance from Site/ Type
Artificial and Made Ground (1:10,000 Scale)	1x on-site record: 1x on-site worked ground (undivided)
Bedrock Geology (1:10,000 Scale)	1x on-site record: 1x London Clay Formation - Clay
Artificial ground and permeability (1:50,000 scale)	1x on-site record: 1x on-site worked ground (undivided)
Bedrock Geology and Permeability (1:50,000 scale)	1x record on-site: 1x London Clay formation – Clay, Silt and Sand. Flow Type – Mixed, Maximum Permeability – Moderate, Minimum Permeability – Very Low.
Boreholes	
BGS recorded boreholes	17x records within a 250m radius: 40m west (23.47m depth) 48m south-west (4.51 m depth) 59m west (18.29 m depth) 61m south-west (19.96 m depth) 62m west (24.08 m depth) 70m south-west (18.29 m depth) 84m south-west (23.77 m depth) 89m west (confidential) 91m south (43.05 m depth) 99m west (46.79 m depth) 105m south (21.64 m depth) 110m west (18.29 m depth) 134m north-west (confidential) 134m south (19.35 m depth) 163m south (24.38 m depth) 167m south-west (19.81 m depth) 180m south (6.09 m depth) 185m south (21.34 m depth) 207m east (2.59 m depth) 220m north-west (confidential) 239m south-east (42.37 m depth) 241m south-west (21.64 m depth) 242m south (41.60 m depth)

	244m south-west (20.42 m depth) 245m east (2.44 m depth) 245m south-west (18.92 m depth) 249m west (6.09 m depth)
Natural Hazard Findings	
Shrink-Swell Clay	Moderate hazard onsite.
Running Sands	Very Low hazard onsite.
Compressible Deposits	Negligible hazard onsite.
Collapsible Deposits	Very Low hazard onsite.
Landslides	Very Low hazard onsite.
Ground Dissolution of Soluble Rocks	Negligible hazard onsite.
Mining, Ground Working and Natural Cavities	
Researched mining	1x record within a 250m radius: 1x record of stone 23m south-east.
Radon	
Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.
Estimated Background Soil Chemistry	
Records of BGS estimated background soil chemistry	4 records within a 50m radius: On-site, 8m north, 9m west and 14m north-west: No data.
Records of BGS Estimated Urban Soils Chemistry	4 records within a 50m radius: On-site, 8m north, 9m west and 14m north-west: Arsenic: 22 - 24mg/kg Bioaccessible Arsenic: 3.8 – 4.2mg/kg Lead: 485 - 568mg/kg Bioaccessible Lead 333 - 390mg/kg Cadmium: 0.6 – 0.7mg/kg Chromium: 73 - 78mg/kg Nickel: 33 - 37mg/kg Tin: 37 - 42mg/kg
Railway Infrastructure and Projects	
Records of Underground railways (London)	1x record within a 250m radius: 1x record of the Northern line 26m south-west at 19.91m bgl.
Records of Railway Tunnels	2x records within a 250m radius: 2x records of railway tunnels 31m south-west and 154m south.
Records of Historical Railway and Tunnel Features	34x records within a 250m radius: 9x records of railway between 36m south-west and 205m west (1874 – 1930). 24x records of railway sidings between 64m south and 247m west (1876 – 1989). 1x record of a tunnel 238m south (1930).
Records of Railways	64 x records within a 250m radius: 33x records of London Euston to Crewe Line between 84m south-west and 248m west. 31x records which are note given, between 90m south-west and 248m west.

5. ONLINE REVIEW AND HISTORICAL INVESTIGATIONS

5.1. Online Council Planning Database

A review of the London Borough of Camden Council Planning Database revealed that no planning applications had been filed for 1a Polygon Rd, London NW1 1QB. 4no. applications were available for the surrounding houses, as shown below:

18/02/1999 - 39 St Richards House, 110 Eversholt Street, NW1 - Change of use of 1 x 1 bed flat at first floor level (Class C3) to additional office floorspace (Class B1) for St. Pancras Housing Association.

23/04/2998 - St.Richards House & Hillwood House, 110 Eversholt Street, NW1 - The Installation of pipework to the rear elevations to both properties in order to facilitate the renewal of existing common heating services.

16/04/1998 - St.Richards House, 110 Eversholt Street, NW1 - The installation of a base transceiver station on the roof.

25/03/1998 - St.Richards House, 110 Eversholt Street, NW1 - Installation of base transceiver station on roof.

5.2. Internet Search

An internet search did not identify any other information pertinent to this report.

6. PRELIMINARY RISK ASSESSMENT

6.1. Contaminant Source-Pathway-Receptor Model

In the UK, the assessment of risk from contamination follows the source-pathway-receptor (SPR) approach. For a risk to be present there must be a source of contamination, a receptor or receptors, and a pathway for contaminants to migrate or be absorbed. If one of these three elements are absent, it is considered that there is no risk of harm. If, however, there is a linkage between any given source and any given receptor, then a risk-based approach is used to assess the significance or impact of the pollutant linkage.

This Phase 1 Desk Study has been used to identify potential on-site and off-site sources of contamination, which are summarised in this section of the report. Additional potential sources of contamination identified within the Desk Study have been discounted based on the absence of a realistic SPR linkage (i.e. the distance from the site or the nature or age of any potential contamination sources).

In line with the requirements of BS 21365:2020, *Soil Quality – Conceptual site models for potentially contaminated sites*, the Conceptual Site Model (CSM) can be described in text, tabulated or presented as a figure. A tabulated CSM is provided in Section 6.6 of this report, where each component is discussed in the following sections. A diagrammatic CSM is provided within Figure 3.

6.2. Potential On-site Sources of Contaminants

This Desk Study revealed that at the time of the earliest historical mapping (1873) the site comprised two residential terraced properties with associated rear gardens. The next change occurred in the 1951 maps where the existing residential houses on site and directly to the west of the site were demolished. The site remained undeveloped. However, by 1972 a new residential flat building had been constructed across the majority of the site. No other significant changes were recorded up to the most recent historical maps in 2023.

The Phase 1 Desk Study revealed the following on-site sources of contamination:

- The site has undergone various phases of construction/demolition and as a result various thicknesses of Made Ground resulting from these activities are likely to be encountered. Contaminants of concern associated with Made Ground deposits include; metals, Petroleum Hydrocarbons (TPHs), Polycyclic aromatic hydrocarbons (PAHs), asbestos, sulphates, volatile organic compounds (VOCs) and ground gases.
- Given the age of the existing building, there is a potential for asbestos or asbestos containing materials being present on-site or within the existing building makeup.
- Made Ground has the potential to cause aggressive ground conditions. It is determined aggressive ground conditions pose a risk to on-site foundations and services. Therefore, any Made Ground encountered on-site should be tested for sulphates, pH, PAHs, TPHs, phenols and BTEX compounds within a ground investigation, to determine the risk of aggressive ground.
- The site was within an area which was bombed during the London Blitz. Unexploded ordinance, if disturbed, may explode.

6.3. Potential Off-site Sources of Contaminants

The Phase 1 Desk Study revealed the following potential off-site sources of contamination:

Off-site Made Ground

- The site environs have undergone various phases of construction/demolition and as a result various thicknesses of Made Ground. Particularly deep Made Ground was noted ~35m south-east of the site, associated with the London Underground Northern Line. Contaminants of concern include; metals, Petroleum Hydrocarbons (TPHs), Polycyclic aromatic hydrocarbons (PAHs), asbestos, sulphates and ground gases.

Railway Land >75m south-west of the site:

- Contaminants associated with railway land include metals such as cadmium, chromium, nickel and lead, Polycyclic Aromatic Hydrocarbons (PAHs) and Total Petroleum Hydrocarbons (TPH).

Garage Services ~70m and 130m south-east of the site:

- Potential sources of contamination associated with a garage include: lubricant oils; brake fluids (constitute mainly of polymerised glycols and ethers. Waste fluid is generated during repair work on brake systems); solvents (chlorinated hydrocarbons, carbon tetrachloride, paraffin and proprietary degreasing compounds); paints (lead-based paints, zinc-rich epoxy primers, polyurethanes as decorative finishes); gasoline, diesel, paraffin *(Department of the Environment Industry Profile, Road vehicle fuelling, service and repair: garages and filling stations 1996).*

Tanks ~240m south-west of the site:

- Any potential leakages of the underground tanks would be a likely source of contamination to the sub-surface soils on-site. Contaminants associated with a petrol filling station/garage could include heavy metals, semi-metals, PAH's, asbestos, petroleum hydrocarbons and volatile organic compounds (incl. solvents). Given their distance from the site, and location down the hydraulic gradient, it is unlikely this source of contamination would affect soils at the site and therefore the potential risk is considered negligible.

Electrical Sub-Stations within the site environs:

- PCB oils and other cable/transformer oils, together with a series of waxes are commonly used in mainly high voltage applications. PCBs are generally toxic; however, newer forms of non-toxic oils and waxes have replaced the use of PCBs. All cable oils are extremely viscous and adhere strongly to soil particles and do not tend to migrate far from the point of leakage or spillage. All electrical sub-stations were noted >50m away from the site and therefore, the potential risk of encountering PCBs on the site was negligible.

6.4. Potential Receptors

At the time of reporting, September 2023, the proposed development was understood to comprise the development of the existing ground floor, first floor and second floor area, from offices into residential housing. The proposed development plan can be seen within Figure 2.

Based on the proposed development, the potential receptors are presented below and comprise:

- **Human Health**
- End users of the site (Residents/Future site visitors);
- Construction workers during redevelopment;

- Site operatives during maintenance works; and
- Neighbours and members of the public.

Flora and Fauna

- Vegetation within soft landscaped areas;

Building Materials and Services

- Buildings;
- Buried concrete;
- Confined spaces; and
- Underground services (Water Pipes).

Controlled Waters

- River Thames (~2.6km south-east).

6.5. Contaminant Absorption Pathways

The potential pathways for contaminant absorption between the identified sources and the identified receptors are as follows:

Human Health:

- Direct ingestion of soil and soil derived dust;
- Dermal contact of soil and soil derived dust;
- Inhalation of dust (indoors and outdoors) with elevated concentration of determinands;
- Ingestion of home-grown produce, and soil attached;
- Direct ingestion of groundwater;
- Inhalation of volatile vapour (indoors and outdoors);
- Inhalation of ground gases.; and
- Explosion.

Flora and Fauna

- Direct uptake of groundwater; and
- Direct uptake of contaminants in the soil.

Building Materials and Services

- Direct contact;
- Explosion.

Controlled Waters

- Vertical and lateral migration in permeable strata horizons;
- Via anthropogenic pathways (infilled ground and service runs);
- Surface water Runoff.

6.6. Tabulated Conceptual Site Model

The tabulated Conceptual Site Model developed as part of this Desk Study is outlined overleaf. For ease of reference and understanding, the risks have been classified within this risk assessment against four possible levels / categories, summarised in the table below.

Risk Categories used in the Tabulated CSM	
Negligible	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is no plausible risk. Therefore, there is no need to further assess this potential source of contamination.
Low Risk	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is not considered to be an unacceptable risk to receptors. However, it is considered that further investigation to confirm this is recommended.
Moderate Risk	Regarding this potential SPR linkage, the site may not be suitable for the proposed end-use in its current condition and there may be an unacceptable risk to receptors. Further investigation is required to confirm this.
High Risk	Regarding this potential SPR linkage, the site is probably or certainly not suitable for proposed end-use and there is likely to be an unacceptable risk to receptors. Contaminants probably or certainly present and urgent action required in the short term.

Figure 3: Tabulated Conceptual Site Model – Pollutant Linkage Summary (On-Site Sources)			
Potential Sources	**Potential Absorption Pathways**	**Potential Receptors**	**Risk Classification**
Made Ground from construction/ demolition activities: • Asbestos, • PAHs, • TPHs, • VOCs, • Sulphates, and • Metals.	• Direct ingestion of soil and soil derived dust • Dermal contact of soil and soil derived dust • Inhalation of dust (indoors and outdoors) with elevated concentration of determinands • Ingestion of home-grown produce, and soils attached • Direct ingestion of groundwater • Inhalation of volatile vapour (indoors and outdoors)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development • Site operatives during maintenance works • Neighbours and public	**Moderate**
	• Direct uptake of groundwater • Direct uptake of determinands in the soil	**Flora and Fauna** • Vegetation within soft landscaped areas	**Moderate**
	• Anthropogenic (man-made) pathways • Vertical and lateral migration in permeable strata • Surface water runoff	**Controlled Waters** • Regents Canal • River Thames	**Low**
Asbestos within the makeup of the buildings on-site • Asbestos and ACMs,	• Inhalation of dust (indoors and outdoors) with elevated concentration of determinands • Inhalation of volatile vapour (indoors and outdoors)	**Human Health** • End Users (Residents /Future site visitors) • Construction workers during development • Site operatives during maintenance works • Neighbours and public	**Moderate**
Aggressive ground conditions with Made Ground and natural ground on-site, including groundwater: • Sulphates, • pH	• Direct contact of with aggressive ground conditions	**Building Materials and Services** • Buried Concrete	**Moderate**
Aggressive ground conditions within Made Ground and natural ground on-site, including groundwater: PAH/TPH.	• Direct contact of with aggressive ground conditions	**Building Materials and Services** • Underground services (water pipes)	**Moderate**
Ground gases generated by Made Ground: • Methane, • Carbon Dioxide,	• Migration through anthropogenic & natural pathways • Inhalation of Asphyxiating gases • Explosion (methane only)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development (especially in confined spaces)	**Moderate**

Figure 3: Tabulated Conceptual Site Model – Pollutant Linkage Summary			(On-Site Sources)
Potential Sources	**Potential Absorption Pathways**	**Potential Receptors**	**Risk Classification**
• Hydrogen Sulphide, and • Carbon Monoxide.		• Site operatives during maintenance works in confined spaces • Neighbours and public	
	• Migration through anthropogenic & natural pathways • Explosion (methane only)	**Building Materials and Services** • Buildings • Confined spaces • Underground services	**Moderate**
UXO Risk	• Explosion	**Human Health** • Construction workers during development	**Moderate**
		Building Materials and Services • Buildings	**Moderate**

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(Off-Site Sources)
Potential Sources	**Potential Absorption Pathways**	**Potential Receptors**	**Risk Classification**
Nearby Made Ground, nearby railway land and garages: • Asbestos, • PAHs, • TPHs, • Sulphates, and • Metals.	• Direct ingestion of soil and soil derived dust • Dermal contact of soil and soil derived dust • Inhalation of dust (indoors and outdoors) with elevated concentration of determinands • Direct ingestion of groundwater • Inhalation of volatile vapour (indoors and outdoors)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development • Site operatives during maintenance works	**Low**
	• Direct uptake of groundwater	**Flora and Fauna** • Vegetation within soft landscaped areas	**Low**
Ground gases generated by Made Ground: • Methane, • Carbon Dioxide, • Hydrogen Sulphide, and • Carbon Monoxide.	• Migration through anthropogenic & natural pathways • Inhalation of Asphyxiating gases • Explosion (methane only)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development (especially in confined spaces) • Site operatives during maintenance works in confined spaces	**Low**
	• Migration through anthropogenic & natural pathways • Explosion (methane only)	**Building Materials and Services** • Buildings • Confined spaces	**Low**

Tabulated Conceptual Site Model – Pollutant Linkage Summary (Off-Site Sources)			
Potential Sources	**Potential Absorption Pathways**	**Potential Receptors**	**Risk Classification**
		• Underground services	
Tanks ~240m south-west of the site: • Metals; • PAHs; • Asbestos; • TPHs; and, • VOCs	• Direct ingestion of soil and soil derived dust • Dermal contact of soil and soil derived dust • Inhalation of dust (indoors and outdoors) with elevated concentration of determinands • Direct ingestion of groundwater • Inhalation of volatile vapour (indoors and outdoors)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development • Site operatives during maintenance works	**Negligible**
	• Direct uptake of groundwater	**Flora and Fauna** • Vegetation within soft landscaped areas	**Negligible**
Electricity substations >50m of the site: • PCBs	• Direct ingestion of soil and soil derived dust • Dermal contact of soil and soil derived dust • Inhalation of dust (indoors and outdoors) with elevated concentration of determinands • Direct ingestion of groundwater • Inhalation of volatile vapour (indoors and outdoors)	**Human Health** • End Users (Residents/Future site visitors) • Construction workers during development • Site operatives during maintenance works • Neighbours and public	**Negligible**
	• Direct uptake of groundwater	**Flora and Fauna** • Vegetation within soft landscaped areas	**Negligible**

7. RECOMMENDATIONS AND PHASE II OBJECTIVES

This section of the report will present recommendations for the further investigation of each plausible pollutant linkage identified by the Conceptual Site Model.

It is recommended that an intrusive ground investigation is undertaken at the site to evaluate the risk that contaminants of concern within the soils and groundwater may affect end-users. This should determine the underlying ground and groundwater conditions and include an assessment of the level of contamination to enable the quantification of the ground-related risks associated with the proposed redevelopment.

Consideration should be given to the testing of soil samples recovered from exploratory holes for chemical laboratory testing. The testing should be for a broad range of contaminants in accordance with DEFRA/CLEA methodologies and include the contaminants of concern identified within the Conceptual Site Model.

7.1. Soils

It is possible that asbestos and asbestos containing materials will be incorporated within any Made Ground. An asbestos management strategy should be implemented to ensure that any asbestos uncovered during the investigation does not pose a risk to members of the public that use the site.

On the basis of the Phase 1 Site Assessment the following contaminants of concern have been identified and should be included in the chemical analysis suite for the ground investigation:

- Asbestos.
- Semi-metals and heavy metals;
- Poly-cyclic aromatic hydrocarbons (PAHs);
- Speciated TPH including full aliphatic/aromatic split;
- Volatile/semi-volatile organic compounds – BTEX Used as marker compounds;
- Sulphates.

The list above does not imply that these determinands are present on-site or that they are likely to cause contamination issues at the site. The ground investigation will be used to prove the presence or absence of these contaminants. The sampling and testing strategy must be in line with current standards. Given the site has undergone various phases of building and demolition, random sampling should be adopted across the site. Targeted sampling of proposed soft landscaped areas may be deemed appropriate. Results should be assessed against suitable assessment criteria to be protective of human health as well as vegetation.

Sub-surface concrete may be damaged due to being in contact with aggressive ground conditions. Sampling should be undertaken where the proposed foundations will be in contact with Made Ground and/or natural ground and tested for aggressive ground conditions (sulphates/pH). Classification should then be undertaken of the ground conditions in accordance with Building Research Establishment Special Digest 1, 2005, ‘Concrete in Aggressive Ground’.

7.2. Services

The CSM has identified a moderate risk for aggressive ground conditions that may affect water supply pipes as part of the development. Consideration should be given to the targeted sampling (0.75 – 1.50m bgl) and scheduling for contaminants of concern: TPH, Naphthalene, Phenols, BTEX, VOCs and SVOCs.

7.3. Groundwater

If analytical results show elevated concentrations of contaminants of concern in the soil samples then there might be a requirement to assess the potential risks of leachability of contaminants migrating to the groundwater underlying the site. This might mean leachate testing on soils samples is required or groundwater sampling and testing.

Analysis should be compared to suitable assessment criteria for both Controlled Waters and Human Health, where appropriate.

7.4. Ground-gas

The CSM has identified a moderate risk from ground-gases at the site as a result of the Made Ground on-site, worked ground and possible migration of gas from the nearby railway land. Analysis of soil samples should include Total Organic Carbon (TOC) testing in order to provide an indication of risk from on-site sources. In addition, ground gas monitoring should be undertaken within monitoring wells installed as part of the investigation. At this stage of investigation, in accordance with CIRIA C665, it is anticipated that a minimum of four spot monitoring visits will be required within the ground gas risk assessment.

7.5. Vapours

The CSM has identified sources and associated contaminants that may pose a risk through the vapour pathway. The investigation should comprise a multiple line of evidence approach, comprising the analysis of soil samples taken from appropriate horizons. During the monitoring of the standpipes, a PID should be used in order to identify whether a total VOC concentration is present. Should the PID identify anything over 10ppm, analysis by canister should be undertaken.

7.6. UXO

Given the risk noted from unexploded ordinance, it is recommended that further risk assessment is undertaken. A preliminary UXO report should be purchased to further assess the site. Protection measures may be required during drilling/excavation of all stages of the investigation and development of the site, based on the results of the reporting.

7.7. Geotechnical Review

The BGS have identified the following natural hazards on-site and within a 50m buffer.

Natural Hazards	
Shrink-Swell Clay	Moderate hazard on-site.
Running Sands	Very Low hazard on-site.
Compressible Deposits	Negligible hazard on-site.
Collapsible Deposits	Very Low hazard on-site.
Landslides	Very Low hazard on-site.
Ground Dissolution of Soluble Rocks	Negligible hazard on-site.

When designing foundations, the potential presence of aggressive ground conditions should be taken into consideration. Further investigation may be required in accordance with the guidance established in BRE Special Digest 1 (SD1) (2005) 'Concrete in aggressive ground'. The BGS do not record any details regarding the potential for aggressive ground conditions within shallow units identified at the site.

It is recommended that as part of the site-specific ground investigation on-site, geotechnical testing is undertaken to determine the underlying ground conditions and to evaluate any geotechnical related risks associated with the proposed redevelopment of the site.

The Groundsure datasheets have indicated that the bedrock London Clay Formation is likely to have a very low to moderate permeability and may not be suitable for surface water disposal. These will be subject to on-site testing.

FIGURES

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
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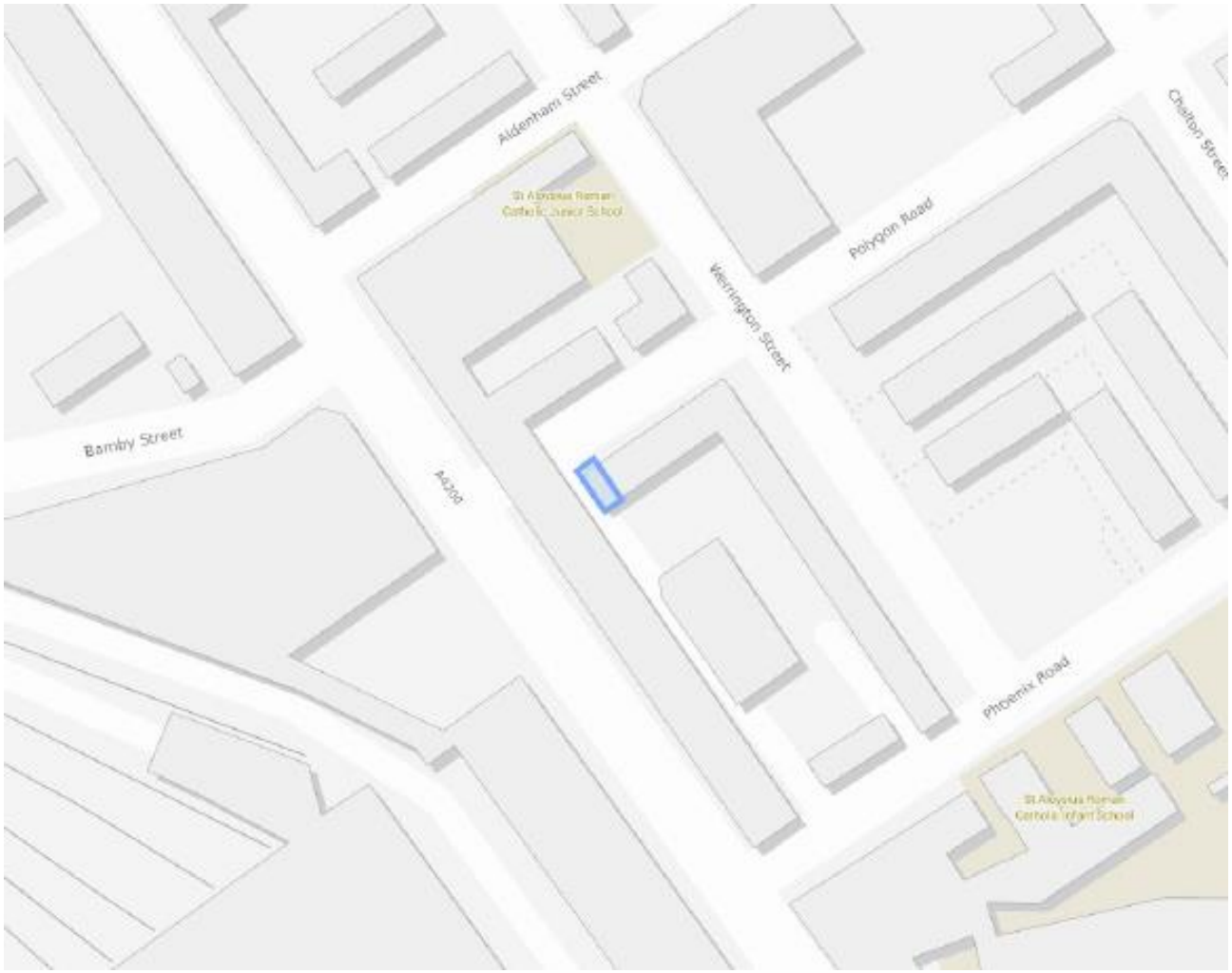
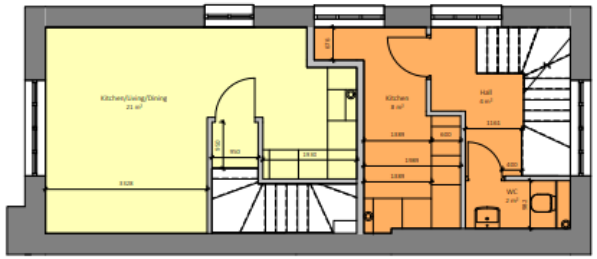


Site Boundary

Not To Scale

1a Polygon Rd, London NW1 1QB	
Origin Housing Limited	**December 2023**
Figure 1 – Site Location Plan	**GWPR5556**

ground&water



FIRST FLOOR PLAN - PROPOSED OPTION 1A
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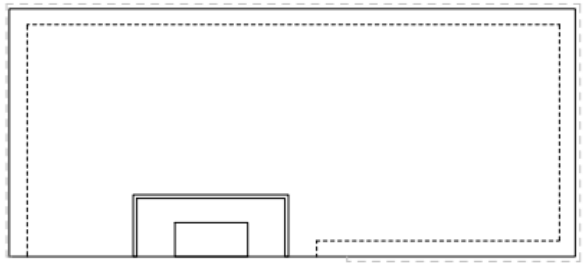

ROOF PLAN - NO CHANGE
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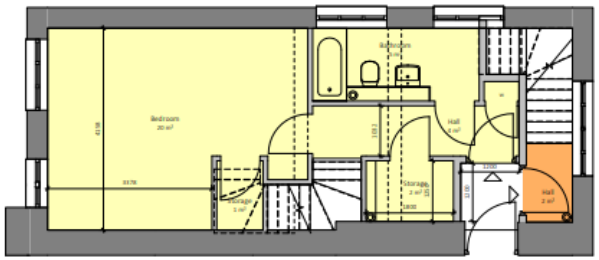

GROUND FLOOR PLAN - PROPOSED OPTION 1A
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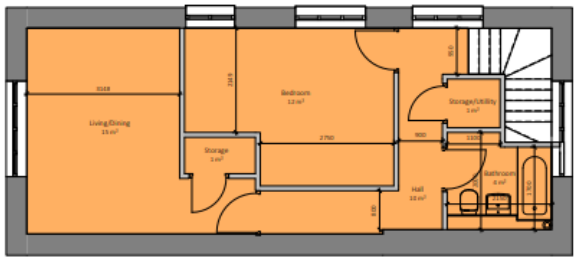

SECOND FLOOR PLAN - PROPOSED
1 : 50

NOT TO SCALE

1a Polygon Rd, London NW1 1QB	
Origin Housing Limited	**December 2023**
Figure 2 – Proposed Development	**GWPR5556**

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APPENDIX A: Conditions and Limitations

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The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly, any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report ("you" or "the Recipient") are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground

conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist.

The conclusions and recommendations relate to 1a Polygon Rd, London NW1 1QB.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

APPENDIX B: Technical Glossary

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
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TECHNICAL GLOSSARY

The list of possible definitions within the report may be seen below. Please note that some definitions may not be relevant to this report.

HYDROGEOLOGY:

A **Principal Aquifer** is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary (A) Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

Secondary (B) Aquifers consist of deposits with predominantly lower permeability layers with may stoke and yield limited amounts of groundwater due to localised features such as fissures, think permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Aquifers (Undifferentiated) are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both a minor aquifer and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata are rock layers with low permeability that have negligible significance for water supply or river base flow. These were formerly classified as non-aquifers.

FLOOD ZONES:

Environment Agency Flood Zone 2, defined as; land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.

Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1%0 or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

Environment Agency Flood Zone 3 area that benefits from flood defences, defined as; land and property in this flood zone would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

GROUNDWATER SOURCE PROTECTION ZONES (SPZS):

Inner Zone (SPZ1): This zone is 50 day travel time of pollutant to source with a 50 metres default minimum radius.

Outer Zone (SPZ2): This zone is 400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.

Total Catchment (SPZ3): This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Zone of Special Interest (SPZ4): This zone is where local conditions require additional protection.

IN-SITU STRENGTH GEOTECHNICAL TESTING:

Windowless Sample and/or Cable Percussion and/or Rotary Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50mm and an inside diameter of 35mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. The sample tube is driven 150mm into the ground and then the number of blows needed for the tube to penetrate each 75mm up to a depth of 450mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (The Dynamic Probe 'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).

APPENDIX C:
Historical Maps

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Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: 1056 Scale Town Plan

Map date: **1871-1873**

Scale: 1:1,056

Printed at: 1:1,056

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Surveyed 1870
Revised N/A
Edition 1873
Copyright N/A
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Surveyed 1871
Revised N/A
Edition 1874
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Production date: 18 August 2023

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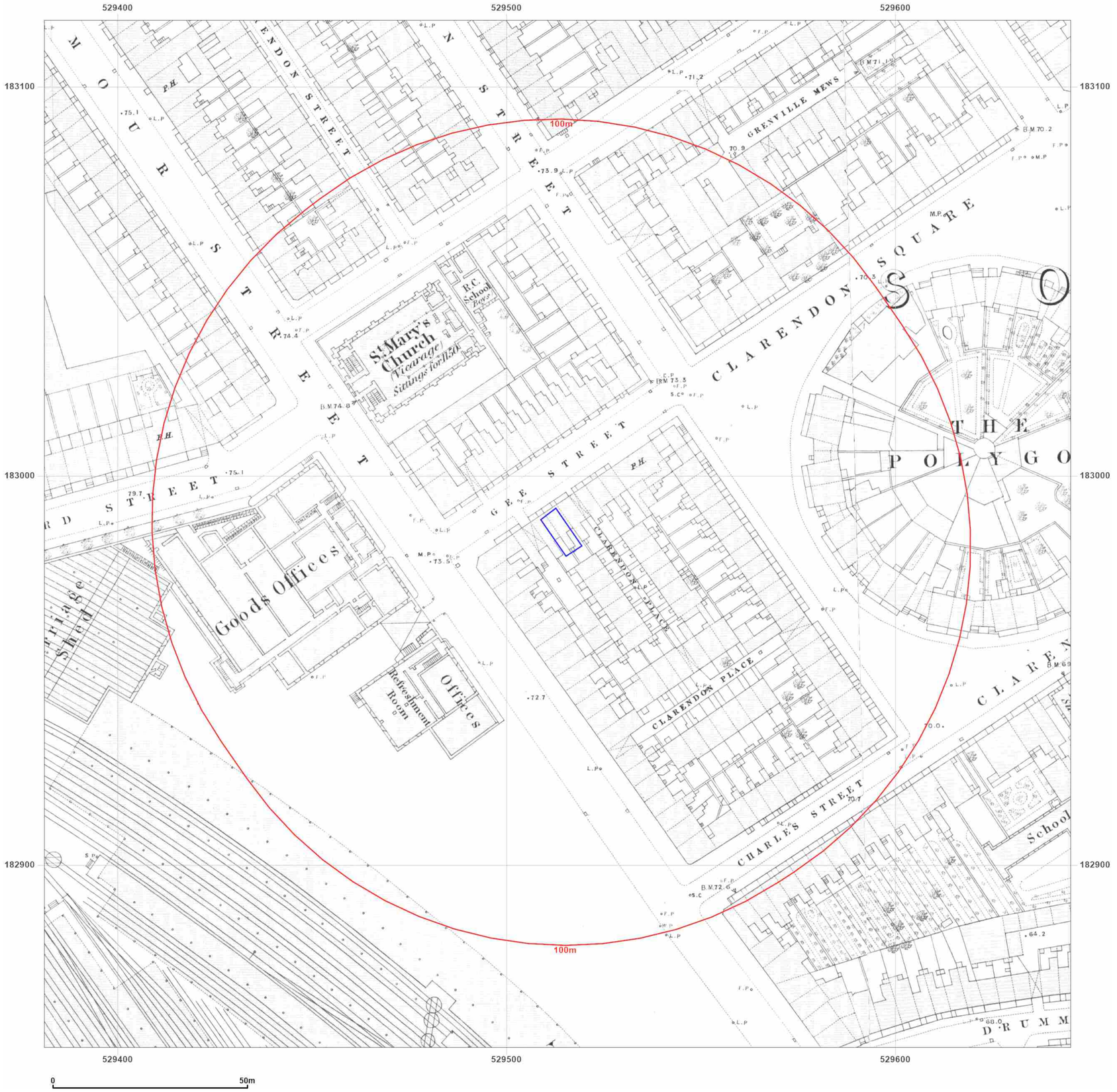

Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: 1056 Scale Town Plan

Map date: **1870-1874**

Scale: 1:1,056

Printed at: 1:1,056

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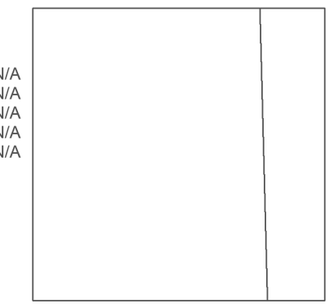

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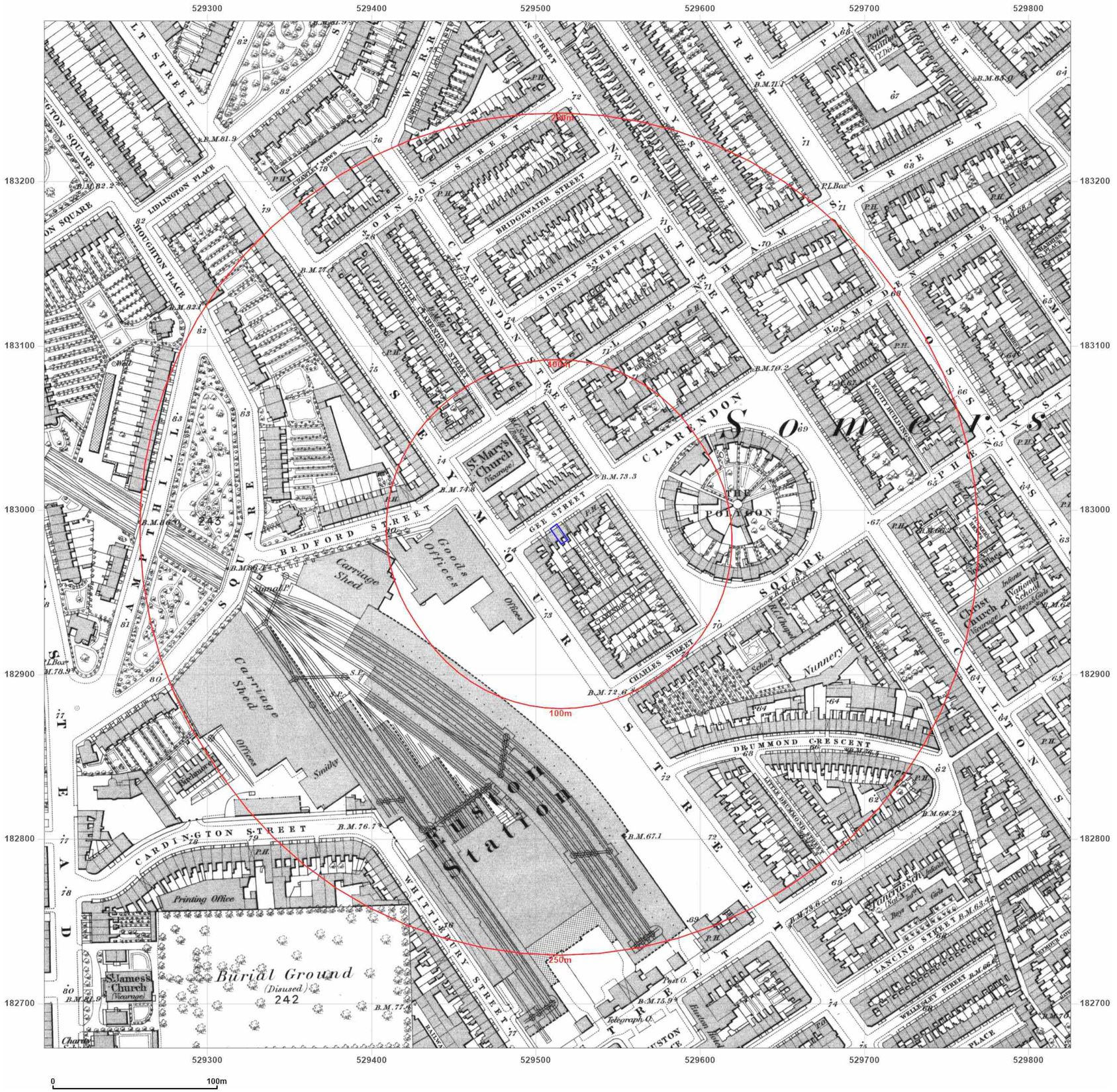

Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: County Series
Map date: **1876**
Scale: 1:2,500
Printed at: 1:2,500

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Revised N/A
Edition 1876
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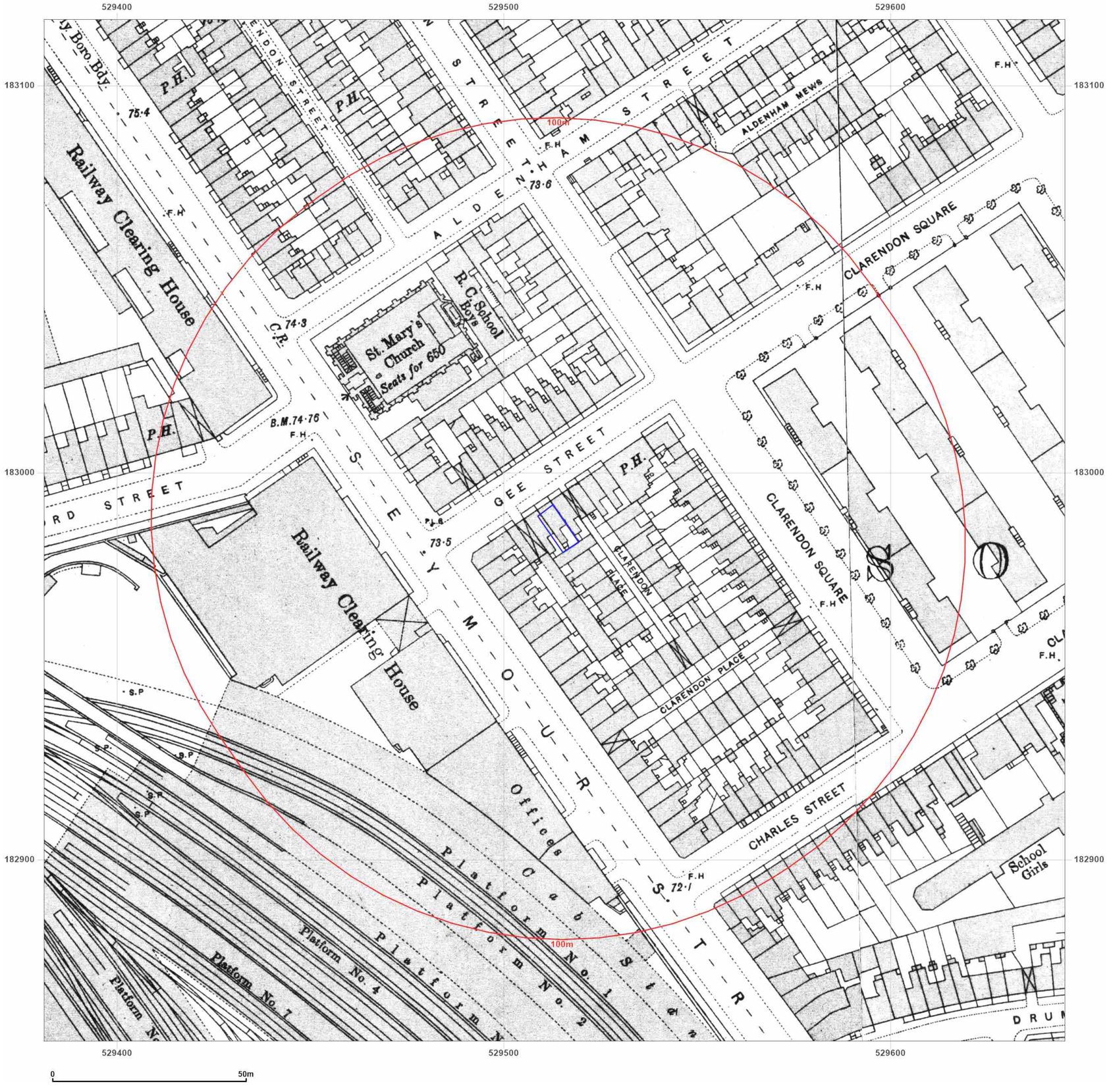

Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: 1056 Scale Town Plan

Map date: **1896**

Scale: 1:1,056

Printed at: 1:1,056

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Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: County Series

Map date: **1896**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1896
Revised 1896
Edition N/A
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: County Series

Map date: **1916**

Scale: 1:2,500

Printed at: 1:2,500

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Revised 1916
Edition N/A
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Groundsure INSIGHTS

Site Details:

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EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: National Grid
Map date: **1951-1952**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1952
Revised 1952
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Copyright N/A
Levelled 1932

Surveyed 1951
Revised 1951
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Copyright N/A
Levelled 1932

Surveyed 1952
Revised 1952
Edition N/A
Copyright N/A
Levelled 1932

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Revised 1952
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Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: National Grid

Map date: **1952-1953**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A	Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1932

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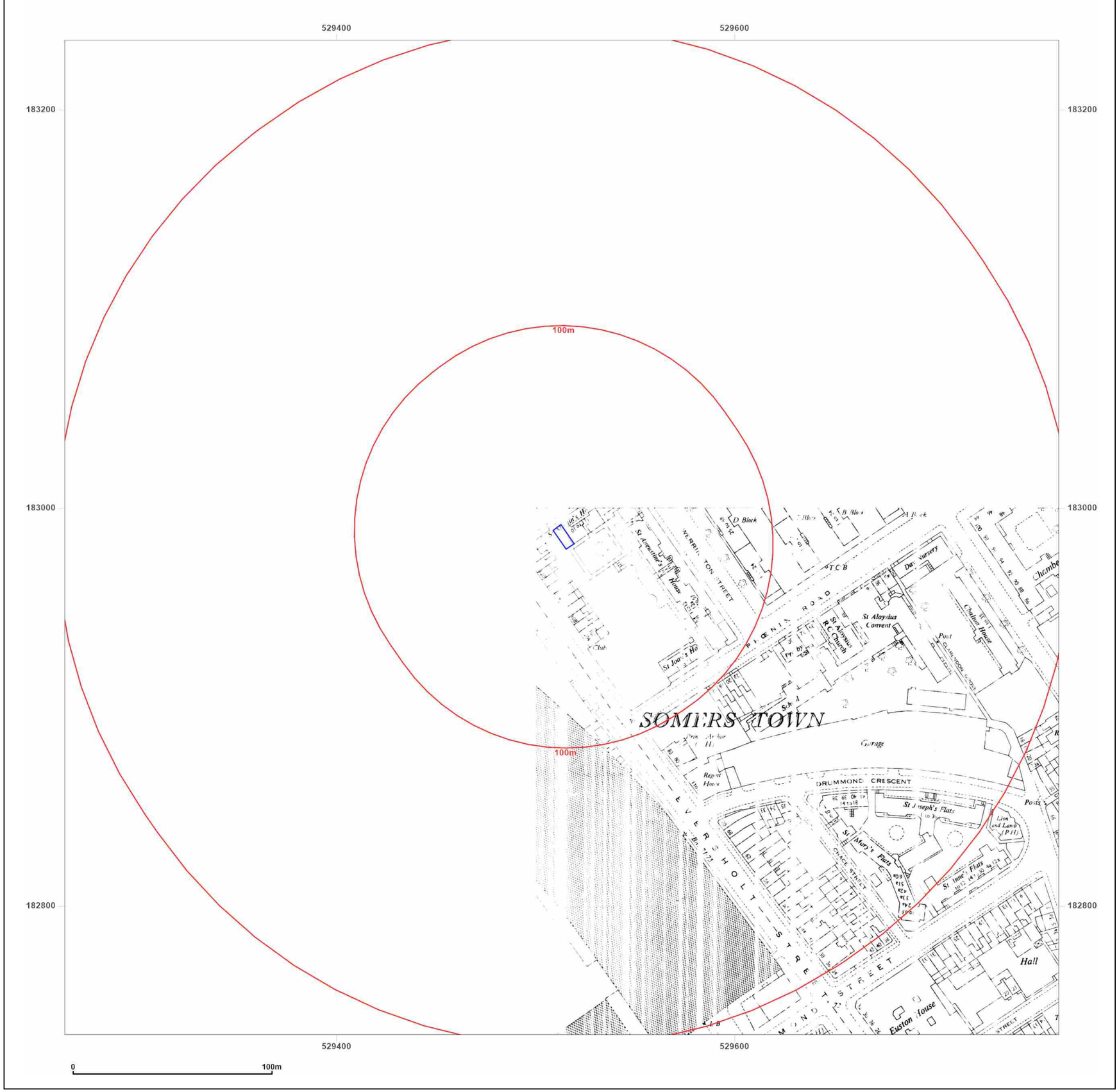
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: National Grid
Map date: **1953**
Scale: 1:1,250
Printed at: 1:2,000

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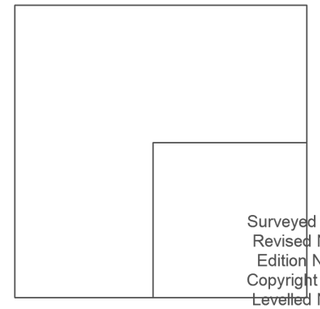

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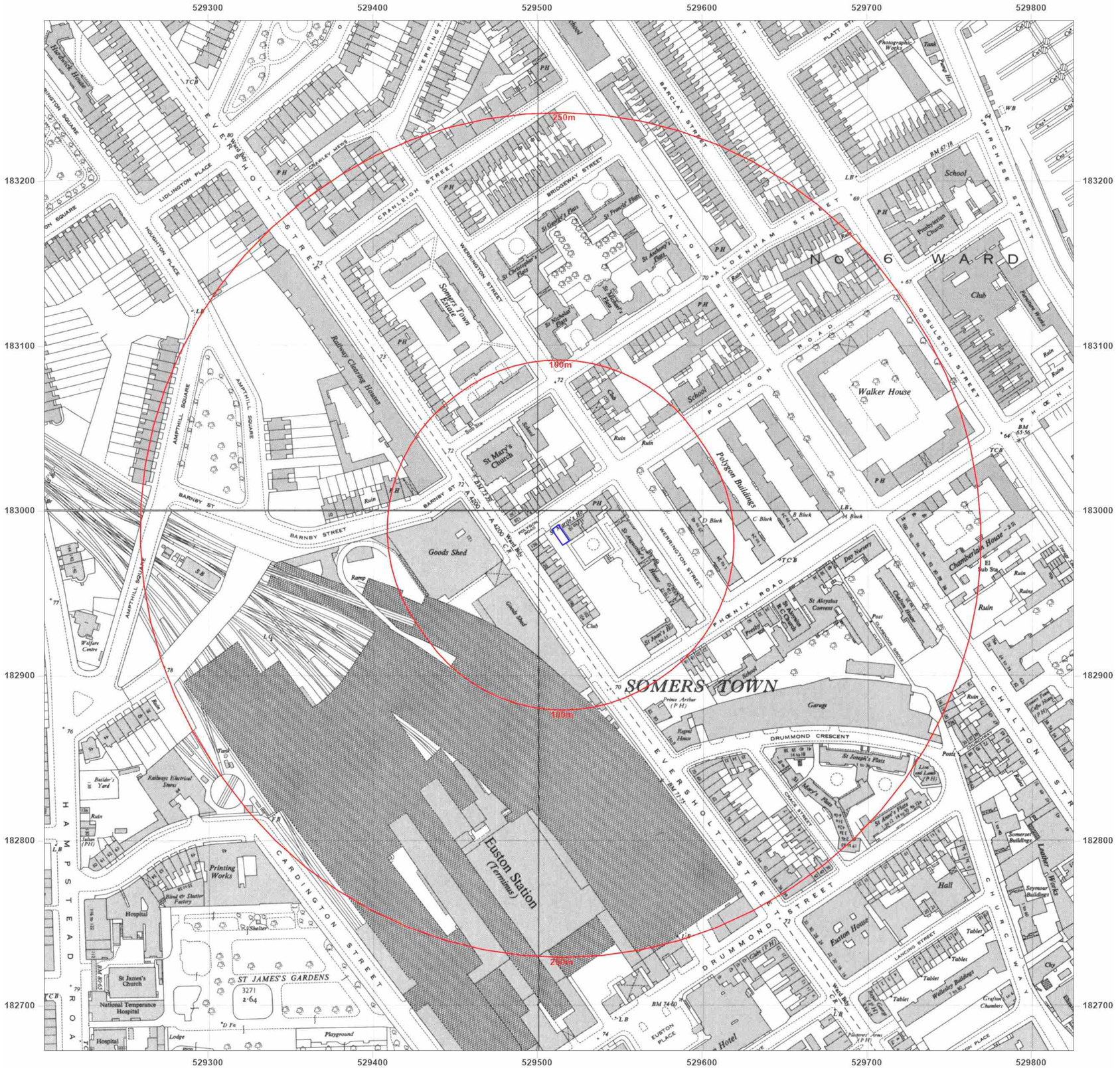

Groundsure INSIGHTS

Site Details:

FLAT 1, ST RICHARDS HOUSE,
EVERSHOLT STREET, LONDON,
NW1 1BS

Client Ref: GWPR5556
Report Ref: GS-EIG-6VW-7WF-642
Grid Ref: 529513, 182985

Map Name: National Grid

Map date: **1952-1954**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1952
Revised 1952
Edition N/A
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Levelled 1934

Surveyed 1952
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