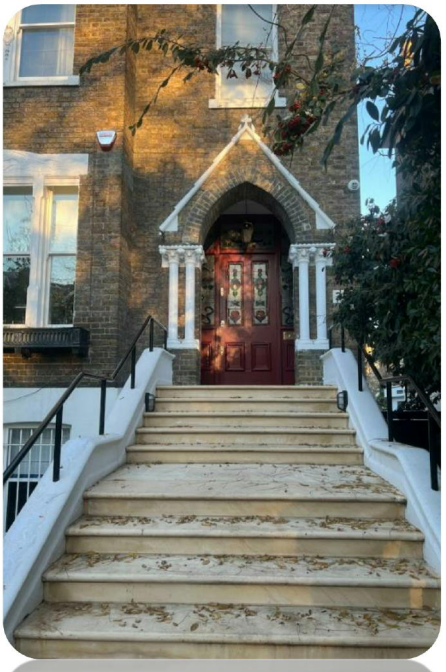
APPENDIX 4

17884 – GEO REPORT
30 ELSWORTHY ROAD, LONDON
NW3 3DL

HESI
Herts & Essex Site Investigations
Unit J8 | Peek Business Park | Woodside | Bishops Stortford | CM23 5RG
[redacted]
Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

GEOTECHNICAL REPORT

Site Address:	30 Elsworthy Road, London, NW3 3DL
Report Date:	6th January 2023
Project No.:	17884
Prepared for:	David Carr Consulting Engineers Ltd The Orchards, 8 Sauncey Avenue, Harpenden, Hertfordshire, AL5 4QF



Contents

REPORT

APPENDICES

SUMMARY

ADDRESS: 30 Elsworthy Road, London, NW3 3DL

FOUNDATION OVERVIEW:

TP1	Formation level of foundation exceeds 0.58m bgl
TP2 (A)	Two brick steps over crushed red brick footing founded at 1.10m bgl
TP2 (B)	Three brick steps over a concrete footing founded at 1.10m bgl

SOIL OVERVIEW:

TP1	GL – 0.50m bgl	MADE GROUND (Paving over base layer)
	0.0m – 1.83m bgl	MADE GROUND (Clay Fill)
TP2 (A&B)	GL to 0.30m bgl	MADE GROUND (Paving over Hardcore)
	0.30m bgl to 1.00m bgl	MADE GROUND (Clay Fill)
	1.00m bgl – 3.00m bgl	Firm – stiff slightly silty CLAY
WS1	GL – 1.50m bgl	MADE GROUND (Clay Fill)
	1.50m bgl – 4.70m bgl	Firm – stiff slightly sandy slightly silty CLAY
	4.70m bgl – 8.00m bgl	Stiff fissure slightly silty CLAY

ROOT OVERVIEW:

TP1	Roots to Close (1.83m bgl)	*Ailanthus spp.* – Tree of Heaven *Leguminosae spp.* – Laburnum & Robinia *Euonymus spp.* – Evergreen garden shrubs
TP2	Roots to Close (3.00m bgl)	*Ailanthus spp.* – Tree of Heaven
WS1	Roots to 2.50m bgl	-

GROUNDWATER OVERVIEW:

TP1	DRY	-
TP2	DRY	-
WS1	Struck at 5.00m bgl	'Seepage' Flow rate

SOIL ANALYSIS:

Fine Soils

Plasticity:	Very High
Plasticity Index:	46 – 50%
Significant Desiccation:	Present TP2 at FL (Deeper desiccation may be due to consolidation)
Sulphate Content:	DS-2AC-1s

Granular Soils

No Granular soils were encountered in excavations undertaken upon this site.

1. Introduction

1.1 In accordance with your instructions, we visited the above site on the 15th and 28th of December in order to instal a deep datum and excavate two trial pits respectively.

1.2 The purpose of our visit was to undertake two hand excavated trial pits, with associated hand augured boreholes and to instal a deep datum across the above site, in order to identify the existing footing details and the underlying subsoil conditions.

1.3 The comments and opinions expressed are based purely on the conditions encountered and the subsequent laboratory.

1.4 Therefore, it is possible that some special conditions prevailing on site have not been encountered or taken into account.

1.5 All groundwater recordings or their absence relate to short term observations and do not allow for fluctuations due to seasonal or other effects.

2. Description of Site

2.1 At the time of our visit the site consisted of a four storey residential structure surrounded by both soft and hard landscapes.

2.2 The site is shown within the British Geological Survey Online Geology Viewer (Scale 1:50 000, Solid & Drift), which shows that the site is situated within an area of The London Clay Formation – Clay.

3. Fieldwork

3.1 The hand excavated trial pits were undertaken to expose the foundations on the existing structures across the site, with the boreholes undertaken in order to detail the underlying geology at depth. The location of these excavations is shown on the site plan forming Appendix 1.

3.2 The various strata encountered were noted and are recorded within the trial pit logs forming Appendix 2.

3.3 Disturbed samples were recovered from the boreholes, as noted within the associated log for laboratory testing.

3.4 The location, type and height of any trees was noted, for later use with NHBC Chapter 4.20, if required. We are not Arboriculturists, and a tree identification report should be used, with regard any foundation design.

4. Laboratory Testing

4.1 All samples were tested in accordance with BS: 1377:1990 Methods of Test for Soils for Civil Engineering purposes.

4.2 Selected samples were tested to determine their, Moisture Content, Atterberg Limits, Soluble sulphate content and pH value.

4.3 The results of all laboratory testing are summarised in Appendix 3.

5. Fieldwork Results

5.1 Trial Pit Results

a) Trial pit One, found a stepped brick construction below ground level. Due to the presence of services in the trial pit the formation level of the foundation could not be attained. MADE GROUND in the form of Clay Fill was encountered to a minimum depth of 1.83m bgl at which depth a dense obstruction was encountered. Whilst we cannot provide any evidence, this dense obstruction may be related to the deep drainage system in the inspection chamber.

b) Trial pit Two (A), encountered two brick steps over a crushed brick foundation founded at 1.10m bgl within a firm – stiff orange brown mottled light grey slightly silty CLAY. This was present to the close of the borehole at 3.00m bgl.

c) Trial pit Two (B), encountered three brick steps over a concrete foundation founded at 1.10m bgl within a firm – stiff orange brown mottled light grey slightly silty CLAY. This was present to the close of the borehole at 3.00m bgl.

5.2 Window Sampler Results

a) Window sampler One, recorded MADE GROUND to a maximum depth of 1.50m at which depth a firm – stiff brown slightly sandy slightly silty CLAY is recorded and present to 4.70m bgl, between 4.70m bgl and the close of the borehole at 8.00m bgl a stiff brown fissured slightly silty CLAY is present. A deep datum was installed in this excavation to 8.00m bgl.

5.3 All boreholes were bored until no further penetration of the geology could be undertaken. As detailed within the associated logs forming Appendix 2.

5.4 The trial pit logs can be found forming Appendix 2.

6. Other Observations from Site Works

6.1 Groundwater was struck at 5.00m bgl within window sampler one and recorded a 'seepage' flow rate.

6.2 From the in-situ shear vane testing it can be seen that the shear vane values found within the CLAY geology range between 75 - 115 kN/m^2. This value converts to a minimum allowable bearing pressure of 120 kN/m^2.

6.3 Roots were encountered within the boreholes based on examination of the soil samples across the site as shown below and recorded within the attached appendices.

Location No.	Depth of Roots
TP1	Roots to close (1.83m bgl)
TP2	Roots to close (3.00m bgl)
WS1	2.50m bgl

6.4 A selection of roots were recovered and were sent for independent identification, the results of this testing can be found below and within Appendix 4.

Location No.	Root Identification
TP1	*Ailanthus spp.* – Tree of Heaven *Leguminosae spp.* – Laburnum & Robinia *Euonymus spp.* – Evergreen garden shrubs
TP2	*Ailanthus spp.* – Tree of Heaven

7. Laboratory Testing Results

7.1 The laboratory testing confirmed the CLAY to be of Very High plasticity (PI = 46 - 50%) which indicates a High susceptibility of movement associated with moisture content change.

7.2 A measurement of the potential desiccation has been completed using Driscoll's Method of Desiccation Analysis. This method uses a comparison of moisture content profile against the liquid limit measured in the Atterberg limit test. Driscoll makes an assumption of the state of the natural moisture content against the state of the soil in its liquid state to assess desiccation. Driscoll makes a comparison that the soils would likely be in a state of slight desiccation, if the moisture content of the soil was less than 0.5 multiplied by the liquid limit of the soil, (slight desiccation being a level of desiccation at which overburden pressure may influence). Significant desiccation if the moisture content of the soil was less than 0.4 multiplied by the liquid limit, (significant desiccation being a level where the soils natural moisture content has been reduced to such an extent, possibly by surrounding trees or vegetation).

7.3 The above analysis can be found within the attached appendices and show that 'significant' desiccation is present in TP2 at FL.

7.4 As the site contains more than 0.50g/l of soluble sulphate it can be categorised as a class 2 site, in accordance with ACEC, and as such any concrete in contact with the subsoil needs special precautions (DS-2 / AC-1s).

8. Conclusions

8.1 In conclusion we would suggest that the surrounding vegetation is having an effect upon the underlying highly susceptible CLAY, which is confirmed by the presence of roots, high shear vane values & 'Significant' desiccation found within the samples recovered.

8.2 We would therefore suggest that either the required trees be reduced / removed, with further monitoring to see if the building stabilises, or that a underpinning scheme be undertaken.

8.3 If a underpinning scheme is to be considered, then with the information available we are of the opinion that a deep conventional concrete strip / pad footing seated upon the underlying CLAY geology and designed in conjunction with NHBC Chapter 4.2 - Building Near Trees taking in to account the existing & proposed / removed trees.

8.4 Any new foundations will need to be deeper than softened zones, significant desiccation, old foundations or roots. This requirement may make the footing deep depending on the proposed layout of the scheme, engineer design or NHBC requirements.

8.5 Heave precautions should be incorporated within the foundation and substructure design, in accordance with NHBC Chapter 4.2 – Building Near Trees, Clause 10.

8.6 If the proposed footing exceeds 1.50m, then a suspended ground floor should be included within the design, incorporating the correct void dimension from NHBC Chapter 4.2 – Building Near Trees, Table 7.

8.7 The final decision regarding the foundation / substructure design, should be undertaken by a suitable qualified engineer, with a full working knowledge of the existing site conditions and the proposed works.

We hope that this is of satisfactory, however if you should require any further information, please do not hesitate to contact us.

Yours faithfully,

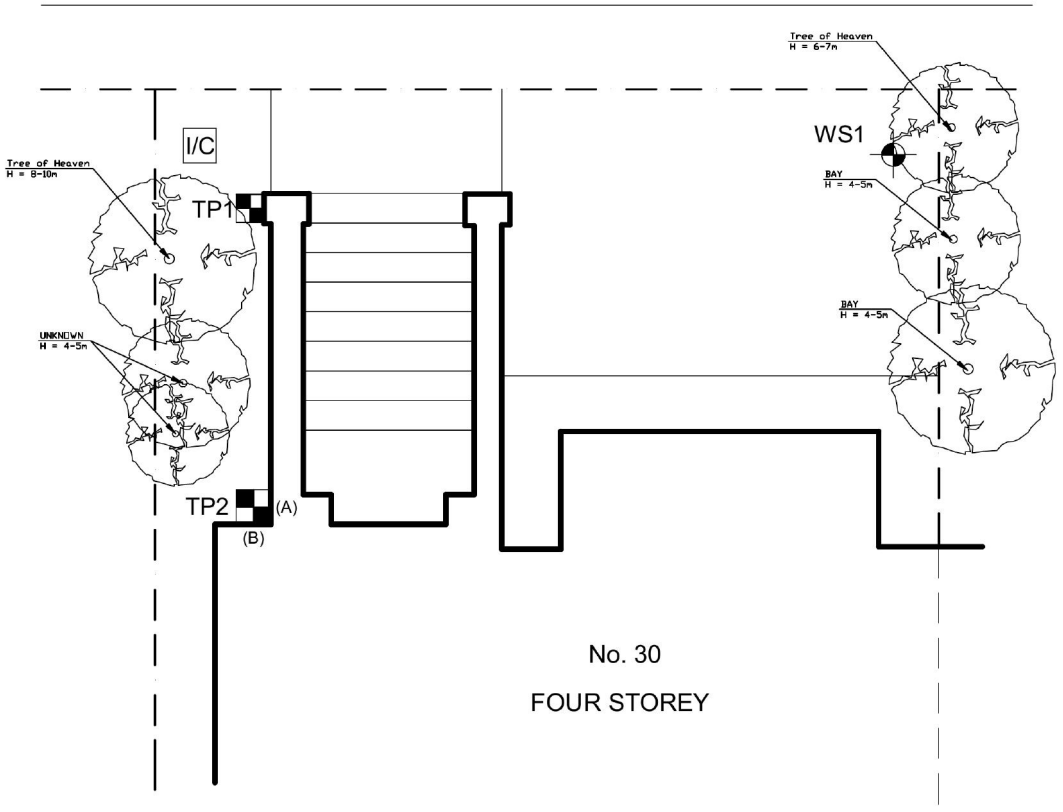
[redacted]

B.E.J.McCullock BSc
Contract Engineer

D A Hudd
Senior Contract Engineer

30 Elsworthy Road, London, NW3 3DL

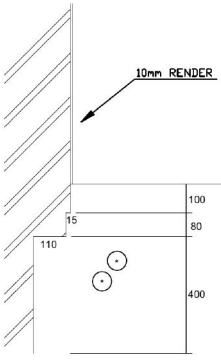
Site Plan



Not to Scale

30 Elsworthy Road, London, NW3 3DL

Trial Pit No. One



FL (>580mm)

D1 @ 1.05m
V = 100

D2 @ 1.50m
V = 96

Roots to Close

Paving slab over lean mix - MADE GROUND

0.23m

Loose brown sandy FILL with brick and ash fragments - MADE GROUND

0.50m

Firm dark brown slightly silty slightly sandy CLAY FILL with much brick, gravel and ash fragments - MADE GROUND

1.05m

Firm - stiff orange brown mottled light grey slightly silty CLAY FILL with some clinker ash and brick fragments - MADE GROUND

Trial pit closed at 1.83m bgl

No Progress

Closed upon dense obstruction

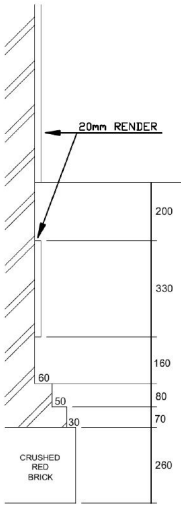
Potentially Service

Remarks: * Services in Trial pit - preventing formation level being attained

Scale 1 : 20

30 Elsworthy Road, London, NW3 3DL

Trial Pit No. Two (A)



Roots to Close

Paving slab over lean mix - MADE GROUND

0.18m

Loose brick and clinker ash HARDCORE - MADE GROUND

0.30m

Firm - orange brown mottled brown slightly sandy CLAY FILL with some brick, gravel and ash fragments

1.00m

Firm - stiff orange brown mottled light grey slightly silty CLAY

D1 @ FL (1100mm)
V = 75

D2 @ 1.50m
V = 82

With Gypsum from 1.80m bgl

D3 @ 2.00m
V = 86

D4 @ 2.50m
V = 110

With wet Orange Silt Partings from 2.80m bgl

D5 @ 3.00m
V = 115

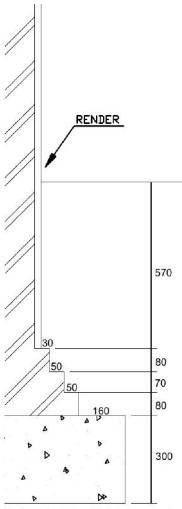
Trial pit closed at 3.00m bgl

Remarks

Scale 1 : 20

30 Elsworthy Road, London, NW3 3DL

Trial Pit No. Two (B)



Roots to Close

Paving slab over lean mix - MADE GROUND

0.18m

Loose brick and clinker ash HARDCORE - MADE GROUND

0.30m

Firm - orange brown mottled brown slightly sandy CLAY FILL with some brick, gravel and ash fragments

1.00m

Firm - stiff orange brown mottled light grey slightly silty CLAY

D1 @ FL (1100mm)
V = 75

D2 @ 1.50m
V = 82

With Gypsum from 1.80m bgl

D3 @ 2.00m
V = 86

D4 @ 2.50m
V = 110

With wet Orange Silt Partings from 2.80m bgl

D5 @ 3.00m
V = 115

Trial pit closed at 3.00m bgl

Remarks

Scale 1 : 20

HESI
Herts & Essex Site Investigations
Unit J8 | Peek Business Park | Woodside | Bishops Stortford | CM23 5RG
[redacted]
Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

Appendix No 2
Sheet No 4
Job No [redacted]
Date Dec 2023

30 Elsworthy Road, London, NW3 3DL

Window Sampler One

Description of Stratum	Legend	Depth (m bgl)	Strata Thickness (m)	Water Level (m bgl)	Samples No.	Samples Type	Samples Depth (m bgl)	S.P.T N-Value or Vane Strength	Installations	Casing Depth, (m)
Loose - compact brown sandy CLAY FILL with brick and clinker ash fragments - MADE GROUND		1.50	1.50		1	U	GL - 1.00		DEEP DATUM INSTALLED TO 8.00m bgl	1.00
					2	U	1.00 - 2.00			
Firm - stiff brown slightly sandy slightly silty CLAY					3	U	2.00 - 3.00			
			3.20		4	U	3.00 - 4.00			
					5	U	4.00 - 5.00			
Claystone lense from 4.50m bgl - 4.70m bgl		4.70								
Stiff brown slightly fissued slightly silty CLAY				SEEPAGE 5.00	6	U	5.00 - 6.00			
					7	U	6.00 - 7.00			
					8	U	7.00 - 8.00			
		8.00								
Borehole closed at 8.00m bgl Roots to 2.40m bgl										

Remarks : Datum Installed to 8.00m bgl

Scale 1 : 50

Key : U - Undisturbed Sample (100mm diameter) B - Bulk Sample ▼ - Water Struck D - Disturbed Sample ▽ - Water Standing W - Water Sample T - Chemical Tub N - SPT N-Value V - Shear Vane Test (kN/m²)

HESI
Herts & Essex Site Investigations
Unit J8 | Peek Business Park | Woodside
Bishops Stortford | CM23 5RG
[redacted]
Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

APPENDIX 3
SHEET 1
JOB NUMBER [redacted]
DATE Dec-22

LOCATION 30 Elsworthy Road, London, NW3 3DL

ATTERBERG LIMITS TEST DATA

Excavation Location Number	Depth (m)	Sample	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Group Symbol	Ammended Plasticity Index (%)	Desiccation Profile	Percentage Retained on 425 Micron Sieve (%)
TP1	1.05	D1	28							0
TP1	1.50	D2	30							
TP2	FL	D1	31	83	30	53	CV	50	Significant	5
TP2	1.50	D2	32							
TP2	2.00	D3	32	75	29	46	CV	46	Slight	0
TP2	2.50	D4	32							
TP2	3.00	D5	33	78	29	49	CV	49	Slight	0

HESI
Herts & Essex Site Investigations
Unit J8 | Peek Business Park | Woodside
Bishops Stortford | CM23 5RG
[redacted]
Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

APPENDIX 3
SHEET 2
JOB NUMBER [redacted]
DATE Dec-22

LOCATION 30 Elsworthy Road, London, NW3 3DL

SULPHATE ANALYSIS

Excavation Location Number	Depth (m)	Sample	Concentrations of Soluble Sulphate			Classification	pH
			Soil		Groundwater		
			Total SO4 (%)	SO4 in 2:1 Water:soil (g/l)			
TP2	1.50	D2		0.74		DS-2 / AC-1s	8.21
TP2	2.50	D4		0.36		DS-1 / AC-1s	7.99

EPSL
Independent Scientific Analysis

European Plant Science Laboratory

Herts & Essex Site Investigations
[redacted]

Intec
[redacted]

ROOT IDENTIFICATION

30 Elsworthy Road, London, NW3 3DL

Client Reference: [redacted]
Report Date: 4 January 2023
Our Ref: [redacted]

Sub Sample	Species Identified		Root Diameter	Starch
TP1:				
1.83m	*Ailanthus* spp.	1	1 mm	Abundant
1.83m	Leguminosae spp.		<1 mm	Moderate
1.83m	*Euonymus* spp.		1 mm	Absent
TP2:				
3m	*Ailanthus* spp.	2	3 mm	Abundant
3m	broadleaved species, too decayed for positive identification	3	4 mm	Absent

Comments:

1 - Plus 1 other also identified as *Ailanthus* spp.
2 - Plus 2 others also identified as *Ailanthus* spp.
3 - Plus 1 other the same. Possibly Pomoideae gp.

Ailanthus spp. include the Tree of heaven.
Leguminosae spp. include laburnum, *Robinia* (false acacia or locust), broom, the pagoda tree and the climber wisteria.
Euonymus spp. are deciduous or evergreen garden shrubs, including spindleberries.

Signed: [redacted]

Unless we are otherwise instructed in writing, the above sample material will normally be disposed of 6 years after the date of this report.