Chelmer
Consultancy Services
'Groundbreaking Services'

Geo-environmental Interpretative Report

Site	36 Flask Walk London NW3 1HE
Client	Vidhur Mehra
Date	April 2015
Our Ref	GENV/5058

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APPENDICES

1.0 EXECUTIVE SUMMARY

Item	Comments	Risk
Site	**36 Flask Walk, London NW3 1HE**	
Ground Conditions	The current work encountered MADE GROUND to a maximum depth of 2.00m below existing ground floor level. The MADE GROUND was found to be underlain by REWORKED GROUND to a maximum depth of 5.50m below existing ground floor level. The REWORKED GROUND was found to be underlain by CLAY of the Claygate Member to the maximum borehole termination depth of 10.00m below existing ground floor level.	Low
Swelling/ Shrinking	The REWORKED GROUND and Claygate Member encountered beneath the site have been confirmed to possess 'medium' volume change potential in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards.	Moderate
Root Activity	No roots were observed during the current investigation.	Low
Groundwater (GW)	Groundwater 'strikes' were recorded within boreholes BH1 & BH2 at depths of 6.60m and 6.00m below existing ground floor level respectively. On completion of borehole BH1 groundwater was standing at a depth of 7.00m below existing ground floor level. Groundwater was encountered during the return gas/groundwater monitoring visits on 13th and 25th February 2015. Borehole BH1 encountered groundwater at depth of 5.03m below existing ground floor level during both visits and borehole BH2 encountered groundwater at depth 3.84m below existing ground floor level.	Moderate
Landborne Gas	During the return gas/groundwater monitoring visits, methane concentrations did not exceed 0.5%v/v. The maximum carbon dioxide concentration was recorded at 0.8%v/v. The associated flow rates reached a maximum of 0.1/hr. It should be noted that both visited were undertaken at low pressures so are considered to represent a 'worst' case. We would therefore consider that the current site would be classified as **Green** or **Characteristic Situation 1** and no further action is therefore recommended, in accordance with CIRIA Publication C665 "Assessing Risks posed by Hazardous Ground Gases to Buildings (Revised 2007) including the NHBC "Traffic Light" system.	Low
Soil Chemical Analysis	No constituents within the soil exceed the criteria set out by the ATRISK Contaminated Land Screening Values (SSVs), the CLEA Soil Guideline Values (SGVs) and the LQM/CIEH Generic Assessment Criteria (GAC) for *Residential with plant uptake* criteria. No asbestos was identified within the tested samples.	Low
WAC Tests	The results of the WAC test indicated that the sample would probably be classified as "Stable Non-reactive Hazardous waste" or suitable for disposal/treatment at a site that can accept "Non-hazardous wastes". This is considered to be representative of the MADE GROUND strata. Full details of the results are given on the appended results sheets.	Moderate
Basement Construction	It is assumed that the basement slab will be set at a depth of approximately 3.60m below existing ground floor level, with the underpins set at a depth of approximately 3.85m-3.90m below existing ground floor level. At this depth the basement slab will most likely be set within the REWORKED GROUND, which has demonstrated 'good' load-bearing characteristics, with the results of the in-situ and laboratory testing, in conjunction with research undertaken by Skempton, indicating a maximum safe (design) bearing pressure of approximately 160 kN/m^2 at a depth of 3.60m below existing ground level and approximately 170 kN/m^2 at a depth of 3.90m below existing ground floor level.	Low
Piled Foundations	As an alternative to the above, the installation of a combination of secant/contiguous piles around the perimeter of the site in order to construct the basement could be undertaken. Appropriate design parameters have been suggested, together with an indication of design capacity.	Moderate
Settlement	Settlements of such piles can be expected to be small, typically less than 5-10mm	Low
Retaining Structures	The full design of temporary and permanent retaining structures is beyond the scope of this report. However, values have been given as a guide to assist in the design of these structures at this site.	Moderate
Buried Concrete	The results of the BRE Standard Digest 1:2005 test indicates that the samples collected and tested would fall into Class AC-4 of the Building Research Establishments (BRE) classification system Special Digest Part 1:2005 "Concrete in aggressive ground". The results of the pH and Sulphate tests undertaken on samples collected and tested from boreholes BH1 & BH2 indicate that the samples would fall into Class DS-1.	Low

2.0 INTRODUCTION & SCOPE OF WORKS

2.1 This report has been prepared by Chelmer Site Investigation Laboratories Limited (CSI) to the instructions of the Consulting Structural Engineers for the project, Trigram Partnership LLP.

2.2 The Client for the project was Vidhur Mehra.

2.3 At the time of the current survey the site was found to be occupied by a three storey terraced residential building, with associated rear patio garden. A communal basement garage was also present under the rear garden of the site.

2.4 It is understood that the proposed development will comprise the construction of a single storey basement under the full footprint of the existing building, with a lightwell to the front of the building. *Existing and Proposed Development Plans* have been appended to this report.

2.5 The Phase I *Non-intrusive* investigation undertaken by CSI ref. DTS/5058 comprised a 'Desk Study' and included a Walkover Survey, an Environmental Disclosure Report and a Historical Map Search.

2.6 From the historical information, the site appears to have been occupied from 1879 to 1954 by a residential property. From 1954 to 1991 the site was indicated as a 'Hall' of unknown use, after this date to the present day the site has been a residential property. Due to the low risk identified from both on-site and off-site sources of contamination, the risk to future residents was considered to be low. The need for a full site investigation is therefore not considered necessary.

2.7 However it was understood that site intrusive works were scheduled for geotechnical characterisation of the site and it was therefore recommended that some near surface soil samples be analysed to classify the underlying soils for suitable waste disposal purposes. It was recommended that ground gas monitoring wells be installed to monitoring ground gases, should significant depths of MADE GROUND be encountered.

2.8 This *Intrusive* site investigation has now been commissioned to provide information on the sub-soil conditions of the site together with laboratory testing and reporting, in order to enable future foundations to be designed together with associated environmental reporting.

2.8 In addition, a limited gas/groundwater monitoring survey was also carried out within the boreholes which were drilled during the current intrusive investigation work, together with a ***preliminary contamination assessment***.

2.9 This report presents the work carried out and discusses the findings.

3.0 FIELDWORK & FINDINGS

3.1 All fieldwork was generally executed in accordance with the recommendations given in British Standard BS 5930:1999+A2:2010, "Code of Practice for Site Investigations". Contamination sampling was undertaken in accordance with BS 10175 : 2011, "Code of Practice for the Investigation of Potentially Contaminated Sites".

3.2 The borehole locations were chosen by the Structural Engineers and are indicated on the appended *Sketch Fieldwork Location Plan*.

3.3 Fieldwork was undertaken on 9th February 2015 and comprised the following elements:

C.f.a. Boreholes

3.4 Two c.f.a. boreholes (BH1 & BH2) were undertaken within the ground floor level of the existing property at the positions indicated on the *Sketch Fieldwork Location Plan*. Boreholes BH1 & BH2 were advanced to a depth of 10.00m below existing ground floor level.

3.5 Disturbed samples were taken from the boreholes at regular depth intervals within each stratum and when a change of strata was encountered.

3.6 Shear Vane tests provided additional information on the consistency of the material encountered.

3.7 Upon completion of boreholes BH1 & BH2, combined groundwater/gas monitoring standpipes were installed to a depth of 10.00m below existing ground floor level.

3.8 Full details of the borehole findings are given on the appended borehole record sheets.

Landborne Gas Emissions Monitoring

3.9 Following the initial site work, two return gas/groundwater monitoring visits were undertaken to the installations fitted within boreholes BH1 & BH2 on 13th and 25th February 2015.

3.10 The barometric pressure was recorded together with the level of Carbon Dioxide, Oxygen and Methane within the borehole. In addition, gas flow measurements were taken and the depth to groundwater recorded.

3.11 Full details of the readings are included on the appended Gas/Groundwater Monitoring Record Sheet.

4.0 GROUND CONDITIONS

4.1 According to information published by the British Geological Survey the underlying geology at this site is shown as the Claygate Member.

Claygate Member

4.2 The Claygate Member is a sedimentary bedrock which formed approximately 34 to 55 million years ago in the Palaeogene Period. These rocks were formed in shallow seas with mainly siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel. The average thickness of the Claygate Member is 16m in London and 17m to 25m in Essex.

4.3 Full details of the ground conditions encountered are presented on the borehole records appended to this report and can be summarised as follows:

Depth From GL (m)	Depth To From GL (m)	Description
0.00	1.30	FLOOR BOARD / VOID / CONCRETE
1.30	2.00	MADE GROUND
2.00	4.50/5.50	REWORKED GROUND
4.50/5.50	10.00+	Claygate Member

4.4 It should be noted that the MADE GROUND depths recorded above are those encountered within the boreholes undertaken during the current work. However, owing to the variable nature and unknown deposition criteria of MADE GROUND it is possible that deeper or more extensive areas of MADE GROUND may exist at this site which have not been revealed by the current work.

4.5 Groundwater was encountered within boreholes BH1 & BH2 during the current investigation. The following table summarises the findings:

Location	Water 'strike' depth (m bgl)	'Standing' Water depth (m bgl)	Water depth during monitoring visit 13/02/15 (m bgl)	Water depth during monitoring visit 25/02/15 (m bgl)
BH1	6.60	7.00	5.03	5.03
BH2	6.00	-	3.84	3.84

4.6 No roots were observed during the current investigation.

5.0 LABORATORY TESTING

5.1 The following geotechnical tests have been carried out on samples recovered from the boreholes drilled at this site.

5.2 Unless otherwise stated, the geotechnical tests have generally been carried out in accordance with the recommendations given in British Standard 1377:1990, "Methods of Test for Soils for Civil Engineering Purposes".

5.3 The chemical testing was carried out in accordance with standard industry methods in a UKAS approved laboratory which is also currently accredited in accordance with MCERTS for the majority of its testing. Further information regarding this accreditation is available on request together with a full list of test methods if required.

5.4 *Atterberg Limits and Moisture Content Tests*

The Atterberg Limit and moisture contents have been determined for five samples of REWORKED GROUND and a single sample from the Claygate Member.

REWORKED GROUND

The liquid limit (LL) was found to range between 48% and 49%, the plastic limit (PL) between 17% and 20%, and the modified plasticity index (PI) between 29% and 31%. The moisture content of these samples was found to range between 28% and 33%.

These results indicate that the samples tested would be classified as Clay of 'intermediate' (CI) plasticity in accordance with the Casagrande Geotechnical classification system.

In addition, the samples would fall into the "medium" volume change potential category of the National House Building Council's (NHBC) classification system given in Part 4 of their Standards.

Claygate Member

The liquid limit (LL) was found to be 47%, the plastic limit (PL) 16%, and the modified plasticity index (PI) 31%. The moisture content of this sample was found to be 40%.

These results indicate that the sample tested would be classified as Clay of 'intermediate' (CI) plasticity in accordance with the Casagrande Geotechnical classification system.

In addition, the sample would fall into the "medium" volume change potential category of the National House Building Council's (NHBC) classification system given in Part 4 of their Standards.

5.5 *pH and Sulphate Tests*

The pH and sulphate content has been determined for four samples recovered at various depths from the boreholes drilled at this site.

The pH values were found to vary between 6.9 and 7.8 with the sulphate content, on a 2:1 water:soil extract was found to vary between 0.12 and 0.41 g/l.

5.6 *BRE Special Digest 1:2005 Concrete Classification Tests*

Four samples taken from the site were selected and tested to assess the aggressive chemical environment for concrete (ACEC) within the site; a single sample of MADE GROUND at a depth of 1.50m below existing ground floor level, two samples of REWORKED GROUND at depths of 3.00m and 4.00m below existing ground floor level and a single sample of Claygate Member at a depth of 10.00m below existing ground floor level.

The pH values of these samples was found to range between 7.2 and 7.3.

Full details of the results are given on the appended result sheets.

5.7 *Chemical Analysis*

Three representative samples of the MADE GROUND encountered across the site were selected and tested for a range of commonly occurring contaminants and indicators of contamination including those given by the Contaminated Land Exposure Assessment (CLEA).

The contamination suite undertaken at this site included heavy metals, speciated **P**olycyclic **A**romatic **H**ydrocarbon (PAH), speciated **T**otal **P**etroleum **H**ydrocarbon (TPH), BTEX (benzene, toluene, ethylbenzene, xylene) and MTBE (Methyl tertiary-butyl ether).

5.8 *Waste Classification Tests*

A sample of the MADE GROUND was collected from borehole BH1 at 1.50m bgl and tested for Waste Acceptance Criteria (WAC) in accordance with BS EN 12457 Part 3.

Full details of the results are given on the appended results sheets.

5.9 *Soil Samples*

All soil samples will be kept for a period of 28 days after the date of the invoice for this project unless otherwise notified to Chelmer Site Investigation Laboratories Limited in writing. Should samples be required to be stored for longer than 28 days then a storage charge will be levied.

6.0 DISCUSSION

PROPOSED DEVELOPMENT & SCOPE OF WORKS

6.1 As discussed in Section 2 above, it is understood that the proposed development will comprise the construction of a single storey basement under the full footprint of the existing building, with a lightwell to the front of the building. *Existing and Proposed Development Plans* have been appended to this report.

6.2 The Phase I *Non-intrusive* investigation undertaken by CSI ref. DTS/5058 comprised a 'Desk Study' and included a Walkover Survey, an Environmental Disclosure Report and a Historical Map Search.

6.3 This *Intrusive* site investigation has now been commissioned to provide information on the sub-soil conditions of the site together with laboratory testing and reporting, in order to enable future foundations to be designed together with associated environmental reporting.

6.4 In addition, a limited gas/groundwater monitoring survey was also carried out within the boreholes which were drilled during the current intrusive investigation work, together with a ***preliminary contamination assessment***.

6.5 At the time of the current investigation, as no detailed information is available regarding the precise loadings associated with proposed new development, the foundation design discussed below is, by necessity, general in nature.

6.6 This report presents the work carried out and discusses the findings.

FOUNDATION DESIGN

6.7 The current work encountered MADE GROUND to a maximum depth of 2.00m below existing ground floor level. The MADE GROUND was found to be underlain by REWORKED GROUND to a maximum depth of 5.50m below existing ground floor level. The REWORKED GROUND was found to be underlain by CLAY of the Claygate Member to the maximum borehole termination depth of 10.00m below existing ground floor level.

6.8 Groundwater was encountered within boreholes BH1 & BH2 during the current investigation. The following table summarises the findings:

Location	Water 'strike' depth (m bgl)	'Standing' Water depth (m bgl)	Water depth during monitoring visit 13/02/15 (m bgl)	Water depth during monitoring visit 25/02/15 (m bgl)
BH1	6.60	7.00	5.03	5.03
BH2	6.00	-	3.84	3.84

6.9 No roots were observed during the current investigation.

6.10 The REWORKED GROUND and Claygate Member encountered beneath the site have been confirmed to possess 'medium' volume change potential in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards.

6.11 It should be noted that should ground conditions differing significantly from those described in our report be encountered during foundation excavation, then Chelmer Site Investigation Laboratories Limited should be contacted immediately and that the below noted allowable bearing pressures or recommended foundation type may need to be altered accordingly.

BASEMENT CONSTRUCTION

6.12 It is assumed that the basement slab will be set at a depth of approximately 3.60m below existing ground floor level, with the underpins set at a depth of approximately 3.85m-3.90m below existing ground floor level. At this depth the basement slab will most likely be set within the REWORKED GROUND, which has demonstrated 'good' load-bearing characteristics according to the in-situ testing.

6.13 In this case the REWORKED GROUND appears to have relatively 'good' load bearing characteristics, with the results of the in-situ and laboratory testing, in conjunction with research undertaken by Skempton, indicating a maximum safe (design) bearing pressure of approximately 160 kN/m^2 at a depth of 3.60m below existing ground level and approximately 170 kN/m^2 at a depth of 3.90m below existing ground floor level. These values are considered appropriate for RC rafts and monolithic upstand RC walls at basement floor level with a minimum founding width of 600mm, and for possible mass concrete pad foundations supporting temporary loads relating to the in-situ superstructure.

6.14 Given the apparently good condition of the Reworked Ground, then the above foundation should suitable providing that the engineering design results in no net stress change at basement foundation level.

6.15 Excavating up to approximately 2.40-2.60m of cohesive material from over the Claygate Member would release a significant amount of overburden pressure. It is possible that the weight of the proposed new basement and retained structure above may largely counteract the effects arising from the release of overburden pressure. The appointed Structural Engineer should be able to provide additional advice on this matter.

6.16 The construction would also be required to resist pressures arising from the assumed groundwater regime, which is likely to be more onerous than those indicated during the current investigation.

6.17 Once the basement construction has been completed, there is always a possibility that this will act as a local "sump" for surface groundwater and run-off. Therefore, we would recommend that the basement construction is designed to minimise any ingress of groundwater. Detailed recommendations for the waterproofing system are beyond the scope of this report although it is noted that, as a minimum, it would be prudent for the system to be designed in compliance with the requirements of BS8102:2009.

6.18 Again, it should be noted that should ground conditions differing significantly from those described in our report be encountered during foundation excavation, then Chelmer Site Investigation Laboratories Limited should be contacted immediately and that the recommended foundation type discussed may need to be altered accordingly.

PILED FOUNDATIONS

6.19 If due to the presence of groundwater, the magnitude of the anticipated loads, or for any other economic reason that shallow foundations are not deemed acceptable, as an alternative, the installation of a combination of secant/contiguous piles around the perimeter of the site in order to construct the basement could be undertaken.

6.20 At this site the piles could be bored or driven to support foundation loads mainly in adhesion within the underlying Claygate Member. Given the nature of the ground conditions encountered, and the proximity to adjacent residential buildings, a bored pile solution would appear the most appropriate. However, we do not recommend cfa solid auger piles at this site as these would leave piles sides unsupported prior to placing of concrete.

6.21 It is beyond our brief to provide a full and detailed pile design and the advice of a specialist piling contractor should be sought in this respect. All pile design is of course the responsibility of the selected piling contractor, and thus the soil parameters/assumptions listed below are given for guidance purposes only. These soil parameters/assumptions relate to "static design" for vertically loaded single bored/cfa piles:-

Made Ground

Bulk unit weight, γ_b –	18kN/m^3
Effective angle of internal friction, φ'	Zero
Undrained shear strength, Su/Cu	Zero

Claygate Member

Bulk unit weight, γ_b -	20 kN/m^3
Undrained shear strength, Su/Cu	Approximately 80-130 kN/m^2 (from Shear Vane results)
Adhesion Factor, α	Piling contractor's advice, but within the range 0.45 to 0.60
Effective angle of internal friction, φ' -	18-22°
Bearing Capacity Factor, Nc	9

6.22 In addition, we have assumed that the top 2 to 3 metres of each pile is 'sleeved' to prevent 'heave' forces developing on the shaft.

6.23 The following table gives typical working loads for isolated bored piles to 8.00m below existing ground level.

Pile Type	Depth below existing ground level (m)	Diameter (m)	Working Load (tonnes)
Bored	8.00	0.30	15-20
Bored	8.00	0.45	25-30
Bored	8.00	0.60	35-40

6.24 Again, it is recommended that the advice of competent piling contractors is sought as to the most suitable pile type at this site and for confirmation of the order of working load achievable given the ground conditions encountered and the proprietary pile type selected.

6.25 Settlements of such piles can be expected to be small, typically less than 5-10mm.

6.26 Depending on pile spacing, the ultimate capacity of a pile group may be less than the sum of the ultimate capacities for the individual piles.

6.27 With regard to the possible downward migration of contaminants the recommendations given in the Environment Agency Document *"Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination : Guidance on Pollution Prevention"* National Groundwater and Contaminated Land Centre Report NC/99/73, May 2001, or similar updated guidance, should be followed when assessing pile design at this site.

RETAINING STRUCTURES

6.28 The full design of temporary and permanent retaining structures is beyond the scope of this report. The calculation of permanent lateral pressures against the sides should relate to long-term (effective) stress analysis using critical state soil parameters. However, the following preliminary guidelines are accordingly considered appropriate:-

Made Ground

Bulk unit weight, γ_b -	18 kN/m^3
Effective cohesion, c' -	Zero
Effective angle of internal friction, φ' -	24º

Reworked Ground

Bulk unit weight, γ_b -	20 kN/m^3
Effective cohesion, c' -	Zero
Effective angle of internal friction, φ' -	25º

6.29 For Surcharge loading it is necessary that the analyses take account of all lateral loadings arising from potential vehicle loading and any adjacent existing foundations.

6.30 Soil strengths and loads/actions should be factored in accordance with design code adopted.

BASEMENT CONSTRUCTION

6.31 Potential uplift movements relating to the proposed overburden removal are expected considering the amount of material that will be excavated in order to form the proposed basement. The construction would also be required to resist pressures arising from the assumed groundwater regime, which is likely to be more onerous than those indicated during the current investigation.

6.32 Groundwater was encountered within boreholes BH1 & BH2 during the current investigation. The following table summarises the findings:

Location	Water 'strike' depth (m bgl)	'Standing' Water depth (m bgl)	Water depth during monitoring visit 13/02/15 (m bgl)	Water depth during monitoring visit 25/02/15 (m bgl)
BH1	6.60	7.00	5.03	5.03
BH2	6.00	-	3.84	3.84

6.33 Current geotechnical design standards require use of a 'worst credible' approach to selection of groundwater pressures. As perched groundwater at shallow depth is suspected to be present (from the injected damp proof course which has been installed at No.38), and long-term discharge of land drainage to the mains drainage system is generally not acceptable to Thames Water, use is recommended of provisional design groundwater levels equal to ground level for short-term (total stress) design situations, and equal to 0.5m below ground level for long-term (effective stress) design situations. If the design is undertaken in accordance with Eurocode 7 (BS EN 1997-1), then groundwater should be taken at ground level in both short-term and long-term situations. Ground levels should be taken as:

- Front wall, rear wall and 34/36 party wall: The public footway and the ramp/floor in the communal garage.
- 36/38 party wall: At the floor levels beneath No.38, which is believed to have a ground bearing floor at the front of the building, and to step down to a much lower level to the rear; these levels must be confirmed as part of the Party Wall Act processes.

Further recommendations on groundwater can be found within the associated Basement Impact Assessment BIA/5058.

BURIED CONCRETE

6.34 The results of the BRE Standard Digest 1:2005 test indicates that the samples collected and tested would fall into Class AC-4 of the Building Research Establishments (BRE) classification system Special Digest Part 1:2005 "Concrete in aggressive ground".

6.35 The results of the pH and Sulphate tests undertaken on samples collected and tested from boreholes BH1 & BH2 indicate that the samples would fall into Class DS-1.

PRELIMINARY CONTAMINATION ASSESSMENT

6.36 The National Planning Policy Framework contains the legislative framework for the regulation of Development on a site which "is affected by contamination or land stability issues". This legislation states that decisions should ensure that "the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation" and that "adequate site investigation information, prepared by a competent person, is presented." A Competent Person is defined as "a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation". Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the "developer and/or landowner." It also states that "all investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 (2001)."

6.37 For this ***Preliminary Contamination Assessment*** the site has been modelled using the Source-Pathway-Receptor approach to produce a Conceptual Site Model.

Source	(substances or potential contaminants which may cause harm)
Pathway	(a linkage route between the source and receptor)
Receptor	(something which may be harmed by the source e.g. humans, plant, groundwater etc.)

Sources

6.38 From the Phase I Desk Top Study ref DTS/5058, MADE GROUND was the only potential source of contamination. MADE GROUND was encountered to a maximum depth of 2.00m bgl and therefore was tested as discussed in Section 5. In addition, MADE GROUND also may pose a potential gas risk.

Pathways

6.39 Any contamination could reach the receptors by a number of routes, although the most likely would be by direct contact with the soils via ingestion, inhalation or dermal contact.

6.40 Due to the low permeability of the underlying clay, ground gas vertical and lateral migrations are considered an unlikely pathway, however may be present within the MADE GROUND. Migration via preferential pathways may also present a pathway for ground gases.

6.41 Plastic potable water supply pipelines may also provide a pathway for the ingestion of organics via permeation of pipes.

6.42 During the construction phase, dust suppression measures may be required to minimise potential inhalation of dust by construction workers and neighbours.

Receptors

6.43 From the results of the desk study and the intended end site use the following potential receptors have been identified. The following potential receptors have been identified:

- *Construction workers on the site likely to come into contact with the soils.*
- *Structures/Services*
- *Neighbours*
- *Controlled Waters*
- *Future occupants of the proposed development.*

6.44 It should be noted that the CLEA software has limited functionality and contains algorithms, which the EA has publicly expressed its intention to update. As a consequence of this, some of the screening values generated by the CLEA software may not adequately reflect specific site conditions and in some instances are unduly conservative. In addition, it should also be noted that the figures given in the appended table are based on a 6% soil organic matter content.

6.45 The DEFRA/EA model has been developed on the basis of many critical assumptions about possible exposure to soil contamination and the development of conceptual exposure models to describe different land uses as follows:

Residential with plant uptake	Mainly refers to residential gardens in which vegetables are grown.
Residential without plant uptake	Refers to areas which have gardens (e.g. blocks of flats) but without vegetable uptake.
Open Spaces	Areas of open space only – not allocated for any specific usage.
Commercial/Industrial	Commercial/industrial usage where there are open areas which are not hard surfaced.

6.46 The Contaminated Land Exposure Assessment (CLEA) model was originally published in March 2002 as joint DEFRA/EA publications; Contaminated Land Research (CLR) Report CLR 11, with Report CLR7 as a supporting document, providing toxicity data and human tolerable daily intake (TDI) data to be used with this model. This model enabled the derivation of more site-specific values for contaminants present on a site, rather than the use of 'generic' values, which were previously used.

6.47 DEFRA/EA previously published a number of Soil Guideline Values (SGVs) for certain determinands, (common toxic metals), which were generic guideline criteria for assessing the risks to human health from chronic exposure to soil contamination for standard land-use functions. However, these were withdrawn in late 2008 and DEFRA/EA have now issued a new set of guidance documents. With regard to the Chelmer Site Investigations Laboratories Limited standard suite of tests, currently SGV figures have only been issued for Arsenic, Cadmium, Mercury, Nickel, Phenols and Selenium.

6.48 In the absence of currently published SGV values for the remaining contaminants, Messrs. W. S. Atkins have derived ATRISK^{soil} Soil Screening Values (SSVs) based on the new 2009 guidance (SC050021/SR3 (the CLEA Report) and SC050021/SR2 (the TOX report)) for commercial/industrial, residential without homegrown produce, residential with homegrown produce and allotment land uses. These have been based on the default assumptions provided in the CLEA report which it is understand will be used in the development of future Soil Guideline Values by DEFRA and the Environment Agency. Atkins SSVs have been derived in line with the new guidance using CLEA model v1.04. As the inhalation of vapour pathway contributes less than ten percent of total exposure, this is unlikely to significantly affect the combined assessment criterion and the SSV values used are the combined assessment criterion given by CLEA if free product is not observed.

6.49 Neither CLEA or ATRISK currently publish values for Hexavalent Chromium. Therefore, both Total Chromium and Hexavalent Chromium values have been compared against the Land Quality Management/Chartered Institute of Environmental Health (LQM/CIEH) Generic Assessment Criteria published in 2009 and based on CLEA v1.04 with Total Chromium values based on Chromium III.

6.50 The SGV and SSV levels represent "intervention" levels above which the levels of contamination may pose an unacceptable risk to the health of site-users such that further investigation and/or remediation is required.

6.51 Total Petroleum Hydrocarbons are considered in accordance with the fractions proposed by The Environment Agency, drawing on the TPHCWG methodology. These are contained in Table 4.2 – Petroleum hydrocarbon fractions for use in UK human health risk assessment, based on Equivalent Carbon (EC) number, contained in Science Report P5-080/TR3, *The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils.*

6.52 The proposed development will comprise a new basement underneath the existing property and front and rear gardens. *Proposed Development Plans* have been appended.

6.53 Considering the end usage of the site, the chemical results would generally be compared against the ***Residential with Plant Uptake*** criteria.

ASSESSMENT OF RESULTS

Soils

6.54 No constituents within the soil exceed the criteria set out by the ATRISK Contaminated Land Screening Values (SSVs), the CLEA Soil Guideline Values (SGVs) and the LQM/CIEH Generic Assessment Criteria (GAC) for *Residential with plant uptake* criteria.

6.55 No asbestos was identified within the tested samples.

Landborne Gas Emissions

6.56 During the return gas/groundwater monitoring visits, methane concentrations did not exceed 0.5%v/v. The maximum carbon dioxide concentration was recorded at 0.8%v/v. The associated flow rates reached a maximum of 0.1/hr. It should be noted that both visited were undertaken at low pressures so are considered to represent a 'worst' case.

6.57 We would therefore consider that the current site would be classified as **Green** or **Characteristic Situation 1** and no further action is therefore recommended, in accordance with CIRIA Publication C665 "Assessing Risks posed by Hazardous Ground Gases to Buildings (Revised 2007) including the NHBC "Traffic Light" system.

6.58 The Gas/Groundwater Monitoring Results Sheet is appended to this report.

WASTE ACCEPTANCE CRITERIA

6.59 A EN 14473/02 Waste Acceptance Criteria (WAC) test was undertaken to classify for waste disposal purposes. A single sample was collected and tested from borehole BH1 at a depth of 1.50m bgl.

6.60 The results of the WAC test indicated that the sample would probably be classified as "Stable Non-reactive Hazardous waste" or suitable for disposal/treatment at a site that can accept "Non-hazardous wastes". This is considered to be representative of the MADE GROUND strata. Full details of the results are given on the appended results sheets.

6.61 However, it should be noted that Chelmer Site Investigation Laboratories Ltd are not a licensed landfill operator and we therefore strongly recommend that the WAC data should be presented to potential Waste Management Companies in order for them to confirm the waste classification of surplus soils to be removed from this site and to determine its acceptability at appropriate landfill sites for disposal/treatment.

UPDATED CONCEPTUAL MODEL

6.62 The following diagram summaries the potential pollution linkages identified for this site in the form of an updated diagrammatic Conceptual Model.

CIRIA Contaminated Land Risk Assessment Table

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

*Extracted from CIRIA Publication C552 Contaminated Land Risk Assessment

Source	Potential Contaminants	Receptors	Pathways	Associated Hazard (Severity)	Likelihood of occurrence	Potential Risk	Notes
MADE GROUND	Heavy Metals TPHs PAHs Ground Gases Asbestos	Sites Users (including young children)	Direct contact, ingestion	Medium	Unlikely	Low	Low concentrations identified.
			Inhalation of vapours (acute)	Severe	Unlikely	Low	
		Neighbours	Inhalation of vapours (chronic)	Medium	Unlikely	Low	
		Constriction Workers	Ingestion of contaminated water through water main pipework	Medium	Unlikely	Low	
			Inhalation	Medium	Unlikely	Low	No asbestos identified.
		Surface Water	Leaching, lateral migration of shallow groundwater	Medium	Unlikely	Low	No surface water nearby
		Groundwater	Leaching, migration through granular material	Medium	Unlikely	Low	Low concentrations identified.
		Services	Direct contact	Medium	Unlikely	Low	

7.0 RECOMMENDATIONS

7.1 No elevated concentrations were identified and thus the risk to future site users is considered to be low. No further works are therefore considered necessary with regards to contaminated land.

Additional Comments

7.2 As always, the above recommendations are based on a selected number of representative samples and further testing may be required if any other contamination is suspected or encountered during future ground works.

7.3 We would recommend that standard Health and Safety precautions be taken, including PPE equipment such as gloves, overalls, dusk masks etc. to prevent dermal contact/ingestion with the soils by future ground/construction workers. Washing facilities should be made available on-site to reduce extended contact with site soils. During the groundwork and construction phases, dust suppression measures may be required to minimise potential inhalation of dust by neighbours or ground workers.

7.4 With regard to the installation of any future water supply pipe work, reference should be made to the UK Water Industry Research (UKWIR) published "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21; the 'UKWIR Guidance'). This publication supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 "Laying Pipes in Contaminated Land", which has been withdrawn. It is recommended that the results of the soil chemical analyses undertaken on the site should be provided to the potable water supply company in order to ensure that any pipe provided complies with their requirements.

Prepared By : Jack Hunter BSc (Hons)
Geo-environmental Engineer

Prepared By : Alexandra Ash MEng (Hons)
Graduate Geotechnical Engineer

END OF REPORT

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Chelmer Site Investigation Laboratories Limited (CSI) to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, CSI has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) CSI acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. CSI will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, CSI shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. CSI does not provide specialist legal advice and the advice of lawyers may be required.
g) In the Summary and Recommendations sections of this report, CSI has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by CSI and therefore any advice, opinions or recommendations set out in the Executive Summary, Summary and Recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data, which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
i) There may be special conditions appertaining to the site, which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.
j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by CSI for inaccuracies within the data supplied by other parties.
k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
l) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
m) This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a reinterpretation of the report in whole or part after its original submission.
n) The copyright in the written materials shall remain the property of the CSI but with a royalty-free perpetual license to the client deemed to be granted on payment in full to CSI by the client of the outstanding amounts.
o) These terms apply in addition to the CSI Standard Terms of Engagement (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing. (In the event of a conflict between these terms and the said Standard Terms of Engagement the said Standard Terms of Engagement shall prevail). In the absence of such a written contract the Standard Terms of Engagement will apply.
p) This report is issued on the condition that CSI will under no circumstances be liable for any loss arising directly or indirectly from subsequent information arising but not presented or discussed within the current Report.
q) In addition CSI will not be liable for any loss whatsoever arising directly or indirectly from any opinion within this report.

Chelmer Site Investigations 'Groundbreaking Services'

Client: Vidhur Mehra	Scale: N.T.S.	Sheet No: 1 of 1	Weather: Internal	Date: 09.02.15
Site: 36 Flask Walk, London, NW3 1HE	Job No: 5058	Borehole No: 1	Boring method: CFA 100mmØ Secondman	

Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type	Test Result	Root Information	Depth to Water	Depth Mtrs
F.L. 0.030	FLOOR BOARD	0.030							
	VOID (floor space)	1.17					No roots observed.		
1.2	CONCRETE	0.1		D					1.3
1.3	MADE GROUND: medium compact, dark brown, slightly gravelly slightly sandy silty clay with brick and concrete fragments.	0.7		D					1.5
2.0	REWORKED GROUND: mid brown, silty sandy clay with occasional fine gravel and brick fragments.	3.5		D	V	80 86			2.0
				D					2.5
				D	V	96 98			3.0
				D					3.5
				D	V	116 116			4.0
				D					4.5
				D	V	124 124			5.0
5.5				D					5.5
	Stiff orange/brown silty very sandy CLAY with fine gravel.	1.4		D	V	130+ 130+			6.0
								6.6	
6.9				D	V	130+ 130+		*7.0*	7.0
	Very stiff, mid grey, fissured silty CLAY with partings of grey silt and fine sand.	2.1		D	V	130+ 130+			8.0
9.0				D	V	130+ 130+			9.0
	Very stiff, dark grey, fissured silty CLAY with partings of grey silt.	1.0							
10.0				D	V	130+ 130+			10.0
	Borehole ends at 10.0m								

Drawn by: JP **Approved by:** JH

Remarks: *Groundwater strike at 6.6m.*
Groundwater standing at 7.0m on completion.
Borehole wet and open on completion.
Plastic standpipe installed to 10.0m.

Key: T.D.T.D. Too Dense to Drive
D Small Disturbed Sample J Jar Sample
B Bulk Disturbed Sample V Pilcon Vane (kPa)
U Undisturbed Sample (U100) M Mackintosh Probe
W Water Sample N Standard Penetration Test Blow Count

Chelmer Site Investigations 'Groundbreaking Services'

Client: Vidhur Mehra	Scale: N.T.S.	Sheet No: 1 of 1	Weather: Internal	Date: 09.02.15
Site: 36 Flask Walk, London, NW3 1HE	Job No: 5058	Borehole No: 2	Boring method: CFA 100mmØ Secondman	

Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type	Test Result	Root Information	Depth to Water	Depth Mtrs
F.L. 0.030	FLOOR BOARD	0.030							
	VOID(floor space)	1.17					No roots observed.		
1.2				D					1.3
1.3	CONCRETE	0.1							
	MADE GROUND: medium compact, dark brown, slightly gravelly slightly sandy silty clay with brick fragments.	0.1		D					1.5
1.4	MADE GROUND: medium compact, light grey silty sandy fine gravel with concrete and brick fragments.	0.6		D	V	80 86			2.0
2.0				D					2.5
	REWORKED GROUND: mid brown, silty sandy clay with occasional fine gravel and brick fragments.	2.5		D	V	96 98			3.0
				D					3.5
				D	V	116 116			4.0
4.5				D					4.5
	Stiff orange/brown, silty very sandy CLAY with occasional fine gravel.	1.5		D	V	121 121			5.0
				D					5.5
6.0				D	V	130+ 130+		*6.0*	6.0
	Very stiff, mid grey, fissured silty CLAY with partings of grey silt and fine sand.	4.0		D	V	130+ 130+			7.0
				D	V	130+ 130+			8.0
				D	V	130+ 130+			9.0
10.0				D	V	130+ 130+			10.0
	Borehole ends at 10.0m								

Drawn by: JP **Approved by:** JH

Remarks: *Groundwater strike at 6.0m.*
Borehole wet and open on completion.
Plastic standpipe installed to 10.0m.

Key: T.D.T.D. Too Dense to Drive
D Small Disturbed Sample J Jar Sample
B Bulk Disturbed Sample V Pilcon Vane (kPa)
U Undisturbed Sample (U100) M Mackintosh Probe
W Water Sample N Standard Penetration Test Blow Count

UKAS TESTING
8284

Chelmer Geotechnical Laboratories
'Groundbreaking Services'

Content Summary

This report contains all test results as indicated on the test instruction/summary (Form Q17).

CGL Reference :	CGL04684
Client Reference :	CSI5058
For the attention of :	Vidhur Mehra
This report comprises of the following :	2 Page(s) of Results
	1 Moisture/Shear Strength Chart
	1 Plasticity Chart
	4 Page(s) BRE SD1 Result(s)

Notes :

General

Please refer to report summary notes for details pertaining to methods undertaken and their subsequent accreditations

Samples were supplied by Chelmer Site Investigations

All tests performed in-house unless otherwise stated

Deviant Samples

Samples were received in suitable containers	Yes
A date and time of sampling was provided	Yes
Arrived damaged and/or denatured	No

Laboratory Testing Results

BS 1377 : 1990

Chelmer Geotechnical Laboratories "Groundbreaking Services"

Job Number : CGL04684
Client : Vidhur Mehra
Client Reference : CSI5058
Site Name : 36 Flask Walk, London, NW3 1HE

Date Received : 13/02/2015
Date Testing Started : 17/02/2015
Date Testing Completed : 20/02/2015
Laboratory Used : Chelmer Geotechnical, CM3 8AB

Sample Ref			Sample Type	*Moisture Content (%) [1]	*Soil Faction > 0.425mm (%) [2]	*Liquid Limit (%) [3]	*Plastic Limit (%) [4]	*Plasticity Index (%) [5]	*Liquidity Index (%) [5]	*Modified Plasticity Index (%) [6]	*Soil Class [7]	Filter Paper Contact Time (h) [8]	*Soil Sample Suction (kPa)	Insitu Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	*pH Value [11]	*Sulphate Content (g/l)		
BH/TP/WS	Depth (m)	UID															SO_3 [12]	SO_4 [13]	Class [14]
BH1	3.0	60491	D	28	<5	49	18	31	0.32	31	CI			97					
BH1	4.0	60492	D	29	<5	48	20	29	0.32	29	CI			116					
BH1	5.0	60493	D	29	<5	48	18	30	0.37	31	CI			124					
BH1	8.0	60494	D											>130		7.1	0.13	0.15	DS-1
BH1	10.0	60495	D	40	<5	47	16	31	0.75	31	CI			>130		7.8	0.10	0.12	DS-1

Notes :- *UKAS Accredited Tests

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method S9a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D - Disturbed sample
B - Bulk sample
U - U100 (undisturbed sample)
W - Water sample
ENP - Essentially Non-Plastic
U/S - Underside Foundation

UKAS TESTING 8284

Comments :-

Technician :- HS
Checked By :- MC
Date Checked :- 20-Feb-15

Laboratory Testing Results

BS 1377 : 1990

Chelmer Geotechnical Laboratories "Groundbreaking Services"

Job Number : CGL04684
Client : Vidhur Mehra
Client Reference : CSI5058
Site Name : 36 Flask Walk, London, NW3 1HE

Date Received : 13/02/2015
Date Testing Started : 17/02/2015
Date Testing Completed : 20/02/2015
Laboratory Used : Chelmer Geotechnical, CM3 8AB

Sample Ref			Sample Type	*Moisture Content (%) [1]	*Soil Faction > 0.425mm (%) [2]	*Liquid Limit (%) [3]	*Plastic Limit (%) [4]	*Plasticity Index (%) [5]	*Liquidity Index (%) [5]	*Modified Plasticity Index (%) [6]	*Soil Class [7]	Filter Paper Contact Time (h) [8]	*Soil Sample Suction (kPa)	Insitu Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	*pH Value [11]	*Sulphate Content (g/l)		
BH/TP/WS	Depth (m)	UID															SO_3 [12]	SO_4 [13]	Class [14]
BH2	1.5	60496	D													7.3	0.34	0.41	DS-1
BH2	3.0	60497	D	29	<5	48	18	30	0.39	30	CI			97					
BH2	4.0	60498	D	33	<5	48	17	31	0.50	31	CI			116		6.9	0.10	0.12	DS-1

Notes :- *UKAS Accredited Tests

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method S9a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D - Disturbed sample
B - Bulk sample
U - U100 (undisturbed sample)
W - Water sample
ENP - Essentially Non-Plastic
U/S - Underside Foundation

UKAS TESTING 8284

Comments :-

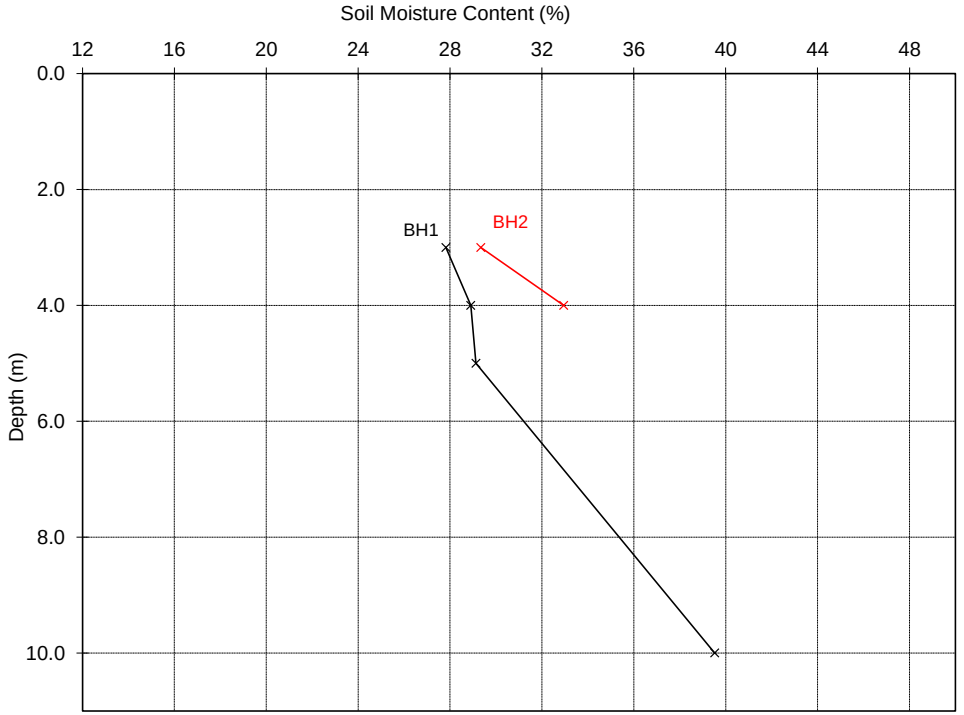
Technician :- HS
Checked By :- MC
Date Checked :- 20-Feb-15

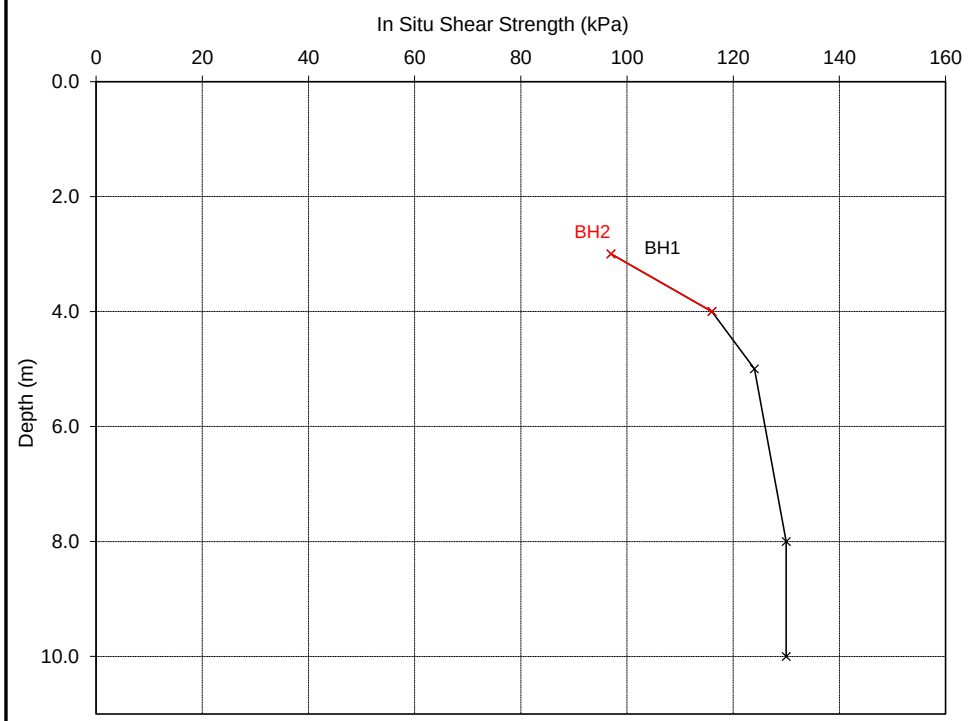
Laboratory Testing Results

Moisture Content/Shear Strength Profile

Chelmer Geotechnical Laboratories 'Groundbreaking Services'

Job Number :	CGL04684	Date Received :	13/02/2015
Client :	Vidhur Mehra	Date Testing Started :	17/02/2015
Client Reference :	CSI5058	Date Testing Completed :	20/02/2015
Site Name :	36 Flask Walk, London, NW3 1HE	Laboratory :	Chelmer Geotechnical Laboratories, CM3 8AB





Notes :-

1. If the Soil Fraction > 0.425mm exceeds 5% the Equivalent Moisture Content of the remainder (calculated in accordance with BS 1377: Part 2 : 1990, cl.3.2.4 note 1) is also plotted and the alternative profile additionally shown as an appropriately coloured broken line.
2. If plotted, 0.4 LL and PL+2 (after Driscoll, 1983) should only be applied to London Clay (and similarly over consolidated clays) at shallow depths.

Unless otherwise stated, values of Shear Strength were determined in situ by Chelmer Site Investigations using a Pilcon Hand Vane the calibration of which is limited to a maximum reading of 140 kPa. (Not UKAS accredited)

UKAS TESTING 8284

Comments :-

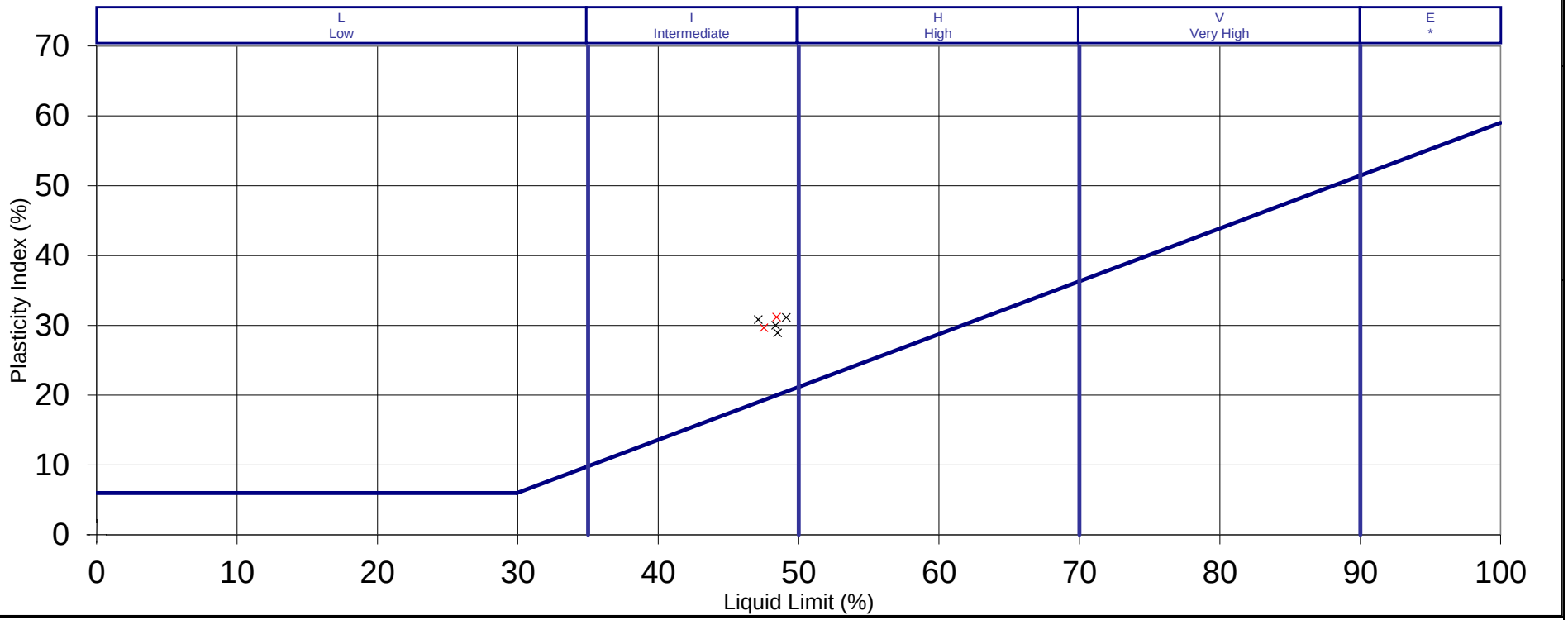
Checked By :- MC Date Checked :- 20-Feb-15

Laboratory Testing Results

Plasticity Chart for the classification of fine soils and the finer part of coarse soils
In Compliance with BS5930 : 1999

Chelmer Geotechnical Laboratories
'Groundbreaking Services'

Job Number :	CGL04684	Date Received :	13/02/2015
Client :	Vidhur Mehra	Date Testing Started :	17/02/2015
Client Reference :	CSI5058	Date Testing Completed :	20/02/2015
Site Name :	36 Flask Walk, London, NW3 1HE	Laboratory :	Chelmer Geotechnical Laboratories, CM3 8AB



Notes :-

SILT (M-SOIL), M, plots below A-Line
CLAY, C, plots above A-Line }M and C may be combined as FINE SOIL, F.

Key :- BH1
BH2

UKAS TESTING
8284

Comments :-

Checked By :- MC Date Checked :- 20-Feb-15

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Chelmer Site Investigation Laboratories Ltd
Unit 15
East Hanningfield Industrial Estate
Old Church Road
East Hanningfield
Essex
CM3 8AB

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 15-28825

Site Reference:	36 Flask Walk, London NW3 1HE
Project / Job Ref:	CSI5058 CGL04684
Order No:	PO/3838/5058/MC
Sample Receipt Date:	17/02/2015
Sample Scheduled Date:	17/02/2015
Report Issue Number:	1
Reporting Date:	23/02/2015

Authorised by:

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate							
QTS Environmental Report No: 15-28825	**Date Sampled**	09/02/15	09/02/15	09/02/15	09/02/15	
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 36 Flask Walk, London NW3 1HE	**TP / BH No**	60490	60492	60497	60499	
Project / Job Ref: CSI5058 CGL04684	**Additional Refs**	BH1	BH1	BH2	BH2	
Order No: PO/3838/5058/MC	**Depth (m)**	1.50	4.00	3.00	10.00	
Reporting Date: 23/02/2015	**QTSE Sample No**	136362	136363	136364	136365	

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	7.2	7.3	7.2	7.2	
Total Sulphate as SO_4	mg/kg	< 200	NONE	2146	714	973	2296	
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	**MCERTS**	0.40	0.24	0.13	0.10	
Total Sulphur	mg/kg	< 200	NONE	720	247	463	4740	
Ammonium as NH_4	mg/kg	< 0.5	NONE	0.6	0.9	1	1.7	
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	23	20	18	16	
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	21	29	21	8	
W/S Magnesium	g/l	< 0.0001	NONE	0.0258	0.0142	0.0111	0.0139	

Analytical results are expressed on a dry weight basis where samples are dried at less than $30^{O}C$
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis $^{(S)}$

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 15-28825	
Chelmer Site Investigation Laboratories Ltd	
Site Reference: 36 Flask Walk, London NW3 1HE	
Project / Job Ref: CSI5058 CGL04684	
Order No: PO/3838/5058/MC	
Reporting Date: 23/02/2015	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
136362	60490	BH1	1.50	18.8	Light brown clay
136363	60492	BH1	4.00	20.2	Light brown clay
136364	60497	BH2	3.00	20.3	Light brown clay
136365	60499	BH2	10.00	24.7	Light brown clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 15-28825
Chelmer Site Investigation Laboratories Ltd
Site Reference: 36 Flask Walk, London NW3 1HE
Project / Job Ref: CSI5058 CGL04684
Order No: PO/3838/5058/MC
Reporting Date: 23/02/2015

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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Chelmer Geotechnical Laboratories
'Groundbreaking Services'

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Where our involvement consists exclusively of testing samples, the results and comments (if provided) relate only to the samples tested.

Any samples that are deemed to be subject to deviation will be recorded as such within the test summary.

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QTS Environmental Report No: 15-28830

Site Reference:	36 Flask Walk, London, NW3 1HE
Project / Job Ref:	CSI5058 CGL04682
Order No:	PO/3836/5058/MC
Sample Receipt Date:	17/02/2015
Sample Scheduled Date:	17/02/2015
Report Issue Number:	2
Reporting Date:	31/03/2015

Authorised by:

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director
On behalf of QTS Environmental Ltd

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Soil Analysis Certificate							
QTS Environmental Report No: 15-28830	**Date Sampled**	09/02/15	09/02/15	09/02/15		
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 36 Flask Walk, London, NW3 1HE	**TP / BH No**	60471	60472	60473		
Project / Job Ref: CSI5058 CGL04682	**Additional Refs**	BH1	BH2	BH2		
Order No: PO/3836/5058/MC	**Depth (m)**	1.50	1.50	2.00		
Reporting Date: 31/03/2015	**QTSE Sample No**	136377	136378	136379		

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected	Not Detected			
pH	pH Units	N/a	MCERTS	7.1	7.1	7.0		
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2		
Total Sulphate as SO_4	mg/kg	< 200	NONE	2771	2140	1685		
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	1.02	0.90	0.40		
Elemental Sulphur	mg/kg	< 10	NONE	< 10	< 10	< 10		
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5		
Arsenic (As)	mg/kg	< 2	MCERTS	6	4	3		
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (Cr)	mg/kg	< 2	MCERTS	29	41	34		
Copper (Cu)	mg/kg	< 4	MCERTS	15	15	12		
Lead (Pb)	mg/kg	< 3	MCERTS	91	29	15		
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	13	20	21		
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		
Zinc (Zn)	mg/kg	< 3	MCERTS	53	41	41		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Javeed Malik

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis $^{(S)}$

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Soil Analysis Certificate - Speciated PAHs							
QTS Environmental Report No: 15-28830	**Date Sampled**	09/02/15	09/02/15	09/02/15		
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 36 Flask Walk, London, NW3 1HE	**TP / BH No**	60471	60472	60473		
Project / Job Ref: CSI5058 CGL04682	**Additional Refs**	BH1	BH2	BH2		
Order No: PO/3836/5058/MC	**Depth (m)**	1.50	1.50	2.00		
Reporting Date: 31/03/2015	**QTSE Sample No**	136377	136378	136379		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	0.15	< 0.1	< 0.1		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	0.20	< 0.1	< 0.1		
Pyrene	mg/kg	< 0.1	MCERTS	0.16	< 0.1	< 0.1		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

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Soil Analysis Certificate - TPH CWG Banded							
QTS Environmental Report No: 15-28830	**Date Sampled**	09/02/15	09/02/15	09/02/15		
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 36 Flask Walk, London, NW3 1HE	**TP / BH No**	60471	60472	60473		
Project / Job Ref: CSI5058 CGL04682	**Additional Refs**	BH1	BH2	BH2		
Order No: PO/3836/5058/MC	**Depth (m)**	1.50	1.50	2.00		
Reporting Date: 31/03/2015	**QTSE Sample No**	136377	136378	136379		

Determinand	**Unit**	**RL**	**Accreditation**					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10		
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21		
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10		
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21		
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

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Soil Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 15-28830	**Date Sampled**	09/02/15	09/02/15	09/02/15		
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 36 Flask Walk, London, NW3 1HE	**TP / BH No**	60471	60472	60473		
Project / Job Ref: CSI5058 CGL04682	**Additional Refs**	BH1	BH2	BH2		
Order No: PO/3836/5058/MC	**Depth (m)**	1.50	1.50	2.00		
Reporting Date: 31/03/2015	**QTSE Sample No**	136377	136378	136379		

Determinand	**Unit**	**RL**	**Accreditation**					
Benzene	ug/kg	< 2	**MCERTS**	< 2	< 2	< 2		
Toluene	ug/kg	< 5	**MCERTS**	< 5	< 5	< 5		
Ethylbenzene	ug/kg	< 2	**MCERTS**	< 2	< 2	< 2		
p & m-xylene	ug/kg	< 2	**MCERTS**	< 2	< 2	< 2		
o-xylene	ug/kg	< 2	**MCERTS**	< 2	< 2	< 2		
MTBE	ug/kg	< 5	**MCERTS**	< 5	< 5	< 5		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

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UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

QTS Environmental Report No: 15-28830	**Date Sampled**	09/02/15
Chelmer Site Investigation Laboratories Ltd	**Time Sampled**	None Supplied
Site Reference: 36 Flask Walk, London, NW3 1HE	**TP / BH No**	60471
Project / Job Ref: CSI5058 CGL04682	**Additional Refs**	BH1
Order No: PO/3836/5058/MC	**Depth (m)**	1.50
Reporting Date: 31/03/2015	**QTSE Sample No**	136377

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits**		
				Inert Waste Landfill	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	0.3	3%	5%	6%
Loss on Ignition	%	< 0.01	3.32	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.7	< 0.7	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	7.1	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1	--	To be evaluated	To be evaluated

Eluate Analysis	**2:1 mg/l**	**8:1 mg/l**		**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.01		< 0.2	0.5	2	25
Barium[U]	0.38	0.10		1.3	20	100	300
Cadmium[U]	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium[U]	0.006	< 0.005		< 0.20	0.5	10	70
Copper[U]	< 0.01	< 0.01		< 0.5	2	50	100
Mercury[U]	< 0.005	< 0.005		< 0.01	0.01	0.2	2
Molybdenum[U]	0.027	0.016		0.2	0.5	10	30
Nickel[U]	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead[U]	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony[U]	< 0.005	< 0.005		< 0.06	0.06	0.7	5
Selenium[U]	< 0.005	< 0.005		< 0.1	0.1	0.5	7
Zinc[U]	0.006	< 0.005		< 0.2	4	50	200
Chloride[U]	33	4		70	800	15000	25000
Fluoride[U]	< 0.5	< 0.5		< 1	10	150	500
Sulphate[U]	1102	147		2454	**1000**	20000	50000
TDS	1060	250		3328	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	11.7	6.7		72.4	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.21						
Dry Matter (%)	83						
Moisture (%)	20.6						
Stage 1							
Volume Eluate L2 (litres)	0.31						
Filtered Eluate VE1 (litres)	0.18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 15-28830	
Chelmer Site Investigation Laboratories Ltd	
Site Reference: 36 Flask Walk, London, NW3 1HE	
Project / Job Ref: CSI5058 CGL04682	
Order No: PO/3836/5058/MC	
Reporting Date: 31/03/2015	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
136377	60471	BH1	1.50	17	Brown gravelly clay with rubble
136378	60472	BH2	1.50	18.4	Light brown clay
136379	60473	BH2	2.00	18.6	Light brown clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 15-28830
Chelmer Site Investigation Laboratories Ltd
Site Reference: 36 Flask Walk, London, NW3 1HE
Project / Job Ref: CSI5058 CGL04682
Order No: PO/3836/5058/MC
Reporting Date: 31/03/2015

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Chelmer Consultancy Services
'Groundbreaking Services'

Contamination Test Results on Soil Samples

Location: 36 Flask Walk		Date : April 2015		Job No. : 5058		Sheet 1 of 1	

Borehole No.	Units	BH1	BH2	BH2	ATRISK Contaminated Land Screening Values (SSV) derived using CLEA v1.04 for 6% SOM			
Sample No.		136377	136378	136379				
Depth (m)		1.50	1.50	2.00	Residential with plant uptake	Residential without plant uptake	Allotments	Commercial/ Industrial
Material Type		MADE GROUND	MADE GROUND	MADE GROUND				
Aromatic Hydrocarbons (mg/kg)	>C5-C7	< 0.01	< 0.01	< 0.01	0.06	0.07	0.07	7.37
	>C7-C8	< 0.05	< 0.05	< 0.05	14.9	15.2	106	1780
	>C8-C10	< 2	< 2	< 2	23.7	24.1	53.2	2700
	>C10-C12	< 2	< 2	< 2	132	147	71.3	36800
	>C12-C16	< 3	< 3	< 3	452	700	132	38000
	>C16-C21	< 3	< 3	< 3	804	1330	288	28400
	>C21-C35	< 10	< 10	< 10	1220	1330	1550	28400
Aliphatic Hydrocarbons (mg/kg)	>C5-C6	< 0.01	< 0.01	< 0.01	26.1	26.1	4250	>1000000
	>C6-C8	< 0.05	< 0.05	< 0.05	87.8	87.9	13900	>100000
	>C8-C10	< 2	< 2	< 2	14.5	14.5	1780	86700
	>C10-C12	< 2	< 2	< 2	87.7	87.8	7460	94600
	>C12-C16	< 3	< 3	< 3	4010	4050	13300	95300
	>C16-C21	< 3	< 3	< 3	88200	88900	281000	>1000000
	>C21-C35	< 10	< 10	< 10	88200	88900	281000	>1000000
Naphthalene	mg/kg	< 0.1	< 0.1	< 0.1	8.71	9.22	23.4	22700
Acenaphthylene	mg/kg	< 0.1	< 0.1	< 0.1	-	-	-	-
Acenaphthene	mg/kg	< 0.1	< 0.1	< 0.1	2130	4770	612	106000
Fluorene	mg/kg	< 0.1	< 0.1	< 0.1	1930	3100	725	72100
Phenanthrene	mg/kg	0.15	< 0.1	< 0.1	-	-	-	-
Anthracene	mg/kg	< 0.1	< 0.1	< 0.1	18300	24000	10400	545000
Fluoranthene	mg/kg	0.20	< 0.1	< 0.1	2160	3210	924	72700
Pyrene	mg/kg	0.16	< 0.1	< 0.1	1550	2400	620	54500
Benzo(a)anthracene	mg/kg	< 0.1	< 0.1	< 0.1	18	18.2	76.8	218
Chrysene	mg/kg	< 0.1	< 0.1	< 0.1	2280	2330	6350	22000
Benzo(b)fluoranthene	mg/kg	< 0.1	< 0.1	< 0.1	24.1	24.4	93	223
Benzo(k)fluoranthene	mg/kg	< 0.1	< 0.1	< 0.1	244	246	1100	2240
Benzo(a)pyrene	mg/kg	< 0.1	< 0.1	< 0.1	2.43	2.46	10.3	22.3
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	< 0.1	< 0.1	23.9	24.3	84.9	222
Dibenz(a,h)anthracene	mg/kg	< 0.1	< 0.1	< 0.1	2.4	2.42	12.3	22.4
Benzo(ghi)perylene	mg/kg	< 0.1	< 0.1	< 0.1	248	249	1630	2250
TOTAL PAH	mg/kg	< 1.6	< 1.6	< 1.6				
Cyanide (Free)	mg/kg	< 2	< 2	< 2	34	34	34	34
pH	unit	7.1	7.1	7	-	-	-	-
Copper (Total)	mg/kg	15	15	12	4020	8370	1110	109000
Lead (Total)	mg/kg	91	29	15	322	444	160	6830
Zinc (Total)	mg/kg	53	41	41	17200	46800	3990	917000
					LQM/CIEH Generic Assessment Criteria			
Chromium (Total)	mg/kg	29	41	34	3000	3000	34600	30400
					CLEA Soil Guideline Values (SGV)			
Arsenic (Total)	mg/kg	6	4	3	32	32	43	640
Cadmium (Total)	mg/kg	< 0.2	< 0.2	< 0.2	10	10	1.8	230
Mercury (Total)	mg/kg	< 1	< 1	< 1	170	170	80	3600
Nickel (Total)	mg/kg	13	20	21	130	130	230	1800
Phenols (Total)	mg/kg	< 2	< 2	< 2	420	420	280	3200
Selenium (Total)	mg/kg	< 3	< 3	< 3	350	350	120	13000
Total Sulphate as SO4	mg/kg	2771	2140	1685	-	-	-	-
W/S Sulphate as SO4 (2:1)	g/l	1.02	0.9	0.4				
Elemental Sulphur	mg/kg	< 10	< 10	< 10	-	-	-	-
Sulphide	mg/kg	< 5	< 5	< 5	-	-	-	-

Key

PAH - Polyaromatic Hydrocarbons
TPH - Total Petroleum Hydrocarbons
- Not determined

Result exceeds ATRISK screening value
Result exceeds EQS/CIEH generic assessment criteria
Result exceeds CLEA Soil Guideline Value (SGV)

Landborne Gas Assessment

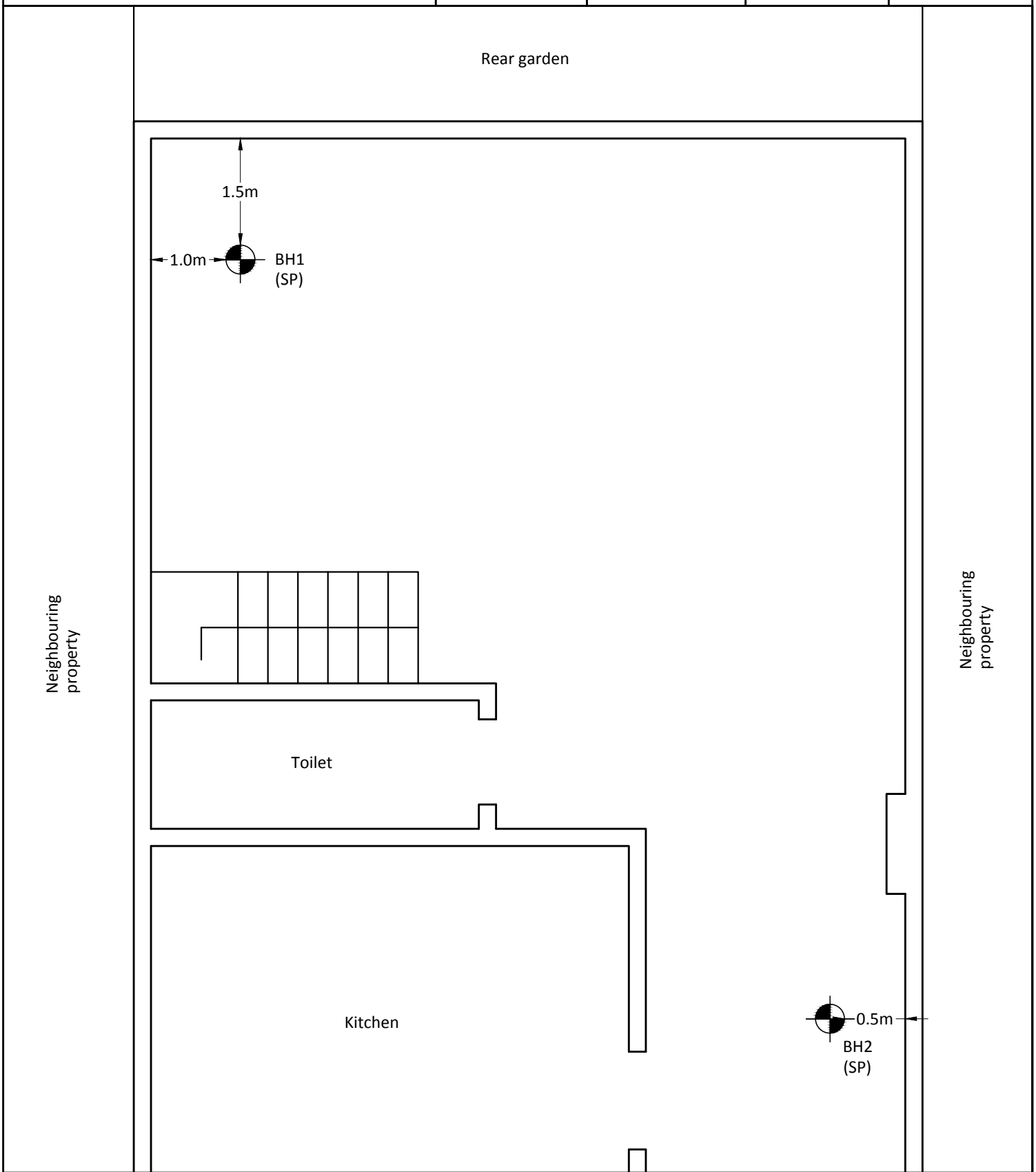
Site Ref: 5058
Site Name: 36 Flask Walk NW3 1HE

Well	Date	Methane Peak	Methane Steady	Methane GSV	Carbon Dioxide Peak	Carbon Dioxide Steady	Carbon Dioxide GSV	Oxygen	Atmos.	Flow	Response Zone	Depth to Water	CO	H2S
		%v/v	%v/v	l/hr	%v/v	%v/v	l/hr	%v/v	mbar	l/hr	m bgl	m bgl	ppm	ppm
BH1	13.02.15	0.5	0.5	0.0005	0.7	0.7	0.0007	20.7	988	0.1	1.00-10.00	5.03	4	0
	25.02.15	0.5	0.5	0.0005	0.7	0.7	0.0007	20.6	1000	0.1		5.03	3	0
BH2	13.02.15	0.5	0.5	0.0005	0.8	0.8	0.0008	20.4	987	0.1	1.00-10.00	3.84	4	0
	25.02.15	0.4	0.4	0.0004	0.8	0.8	0.0008	20.4	1000	0.1		3.84	4	0

Notes

NR = Not recorded
Values in Bold exceed the CO_2 Building Regulations threshold (>1.5%)
Values in Red exceed the Buildings Regulations Action Level (CO_2 >5.0% and CH_4 >1.5%)

Client:	Vidhur Mehra	**Scale:** N.T.S.	**Sheet:** 1 of 1	**Date:** 09.02.15	
Location:	36 Flask Walk, London, NW3 1HE	**Job No:** 5058	**Weather:** Internal	**Drawn by: JP**	**Checked by: JH**

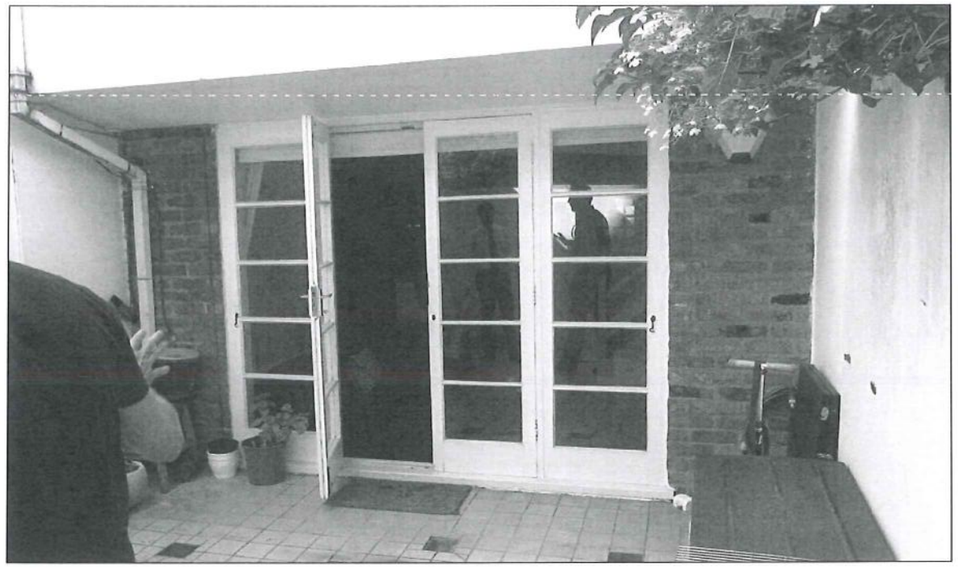


Notes: *On site tree identification for guidance only. Not authenticated.*

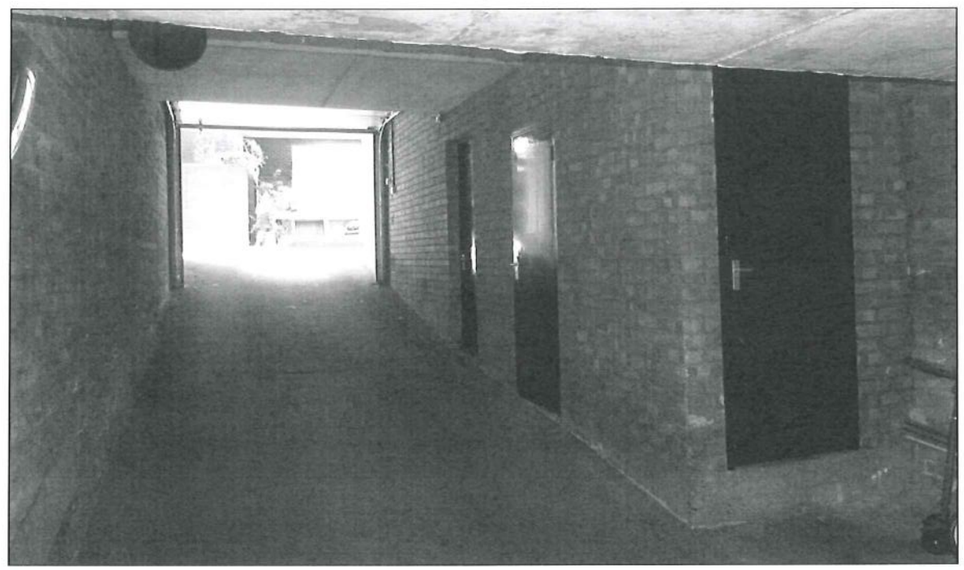
Standpipes located under floor board.

Key:

Tree/Shrub | Borehole | Trial Pit | G Gully | Tree Stump | Rain Water/ Soil Pipe | MH Manhole



1/ REAR ELEVATION -GF-
SCALE NTS@A3 PH-01



2/ RAMP ENTRANCE IN NUMBER 34 TO COMMUNAL PARKING SPACE
SCALE NTS@A3 PH-01

3/ FRONT ELEVATION
SCALE NTS@A3 PH-01

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ADDITIONAL NOTES:

REVISIONS

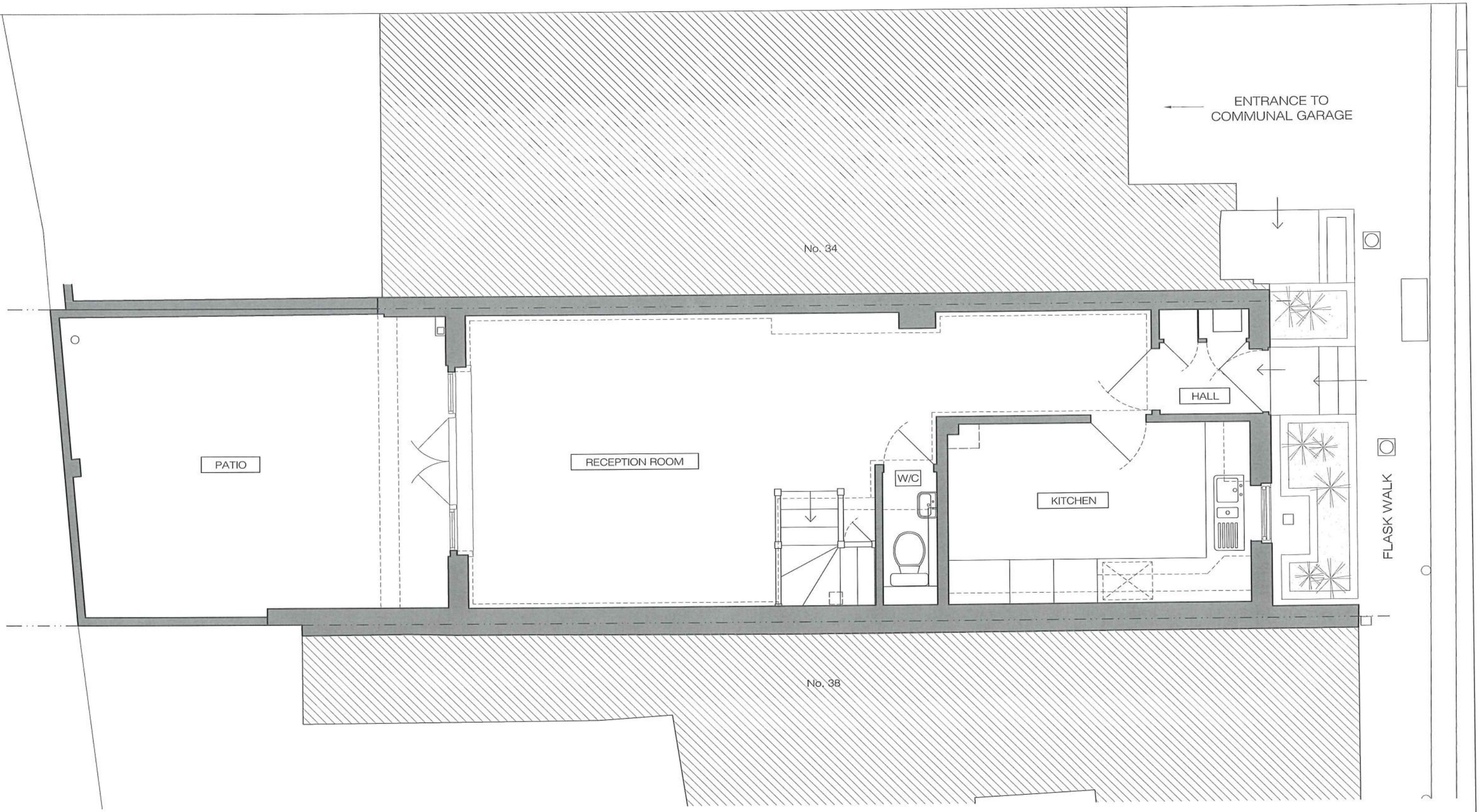
No	Date	Description / Issue For	Issue By
00	04/08/14	PRE-PLANNING	GL
01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

Project
36 Flask Walk
NW3 1HE

Title
EXISTING
Site Photographs

Scale	NTS@A3	Dwg. No.	Rev.
Date	13/08/14	PH-01	01
Drawn	GL	Project Number	14_18
Checked	SS		



EXISTING
Ground Floor Plan
SCALE 1/50@A3 EX-01

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No	Date	Description Issue For	Issue By
00	04/08/14	PRE-PLANNING	GL
01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

Project
36 Flask Walk
NW3 1HE

Title
EXISTING
Ground Floor Plan

Scale	1/50@A3	Dwg. No.	Rev.
Date	13/08/14	EX-01	01
Drawn	GL	Project Number	14_18
Checked	SS		

COMMUNAL GARAGE

No. 36

No. 38

FLASK WALK

EXISTING
Basement Floor Plan
SCALE 1/50@A3 EX-02

0 1 2 3 4 5m

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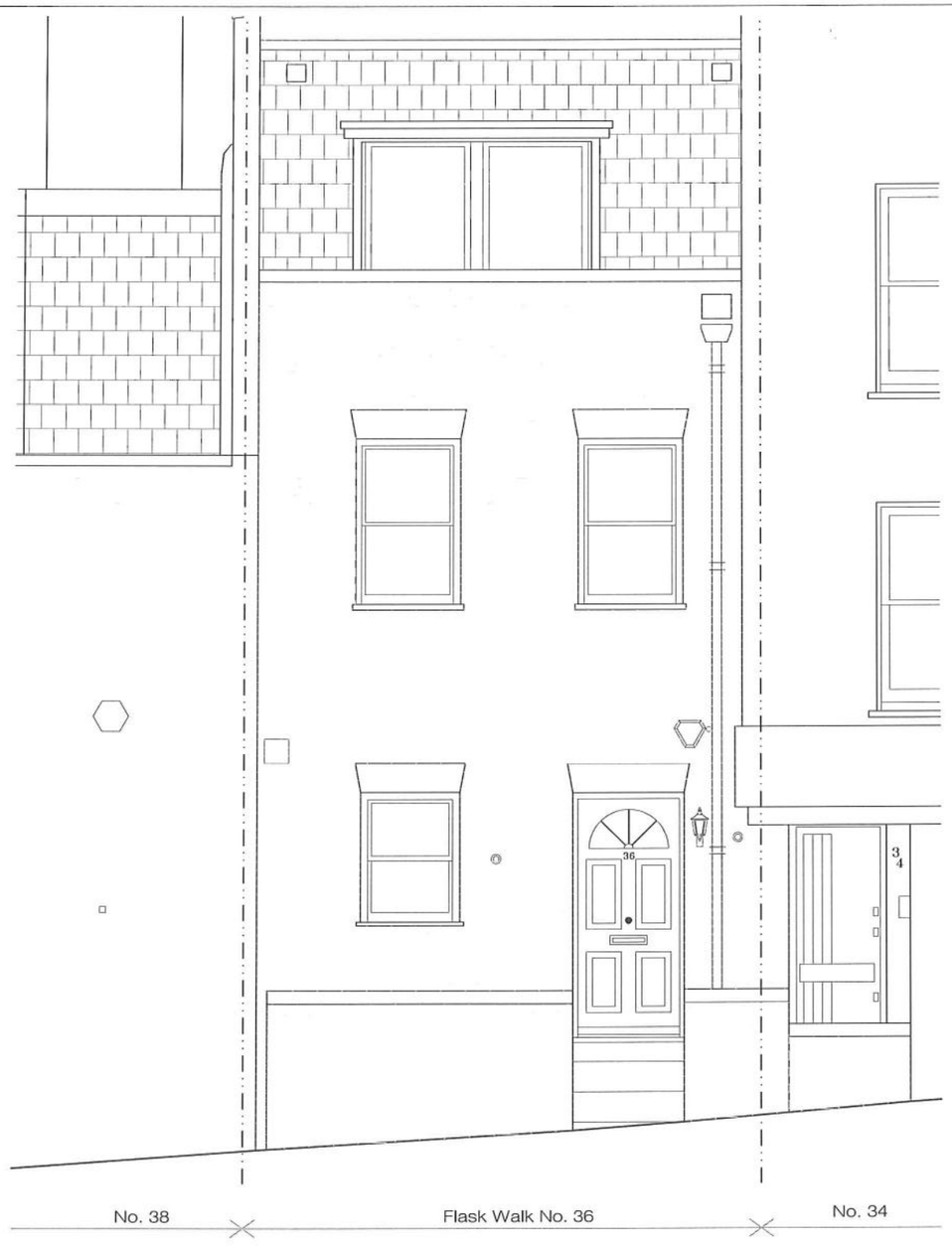
No	Date	Description Issue For	Issue By
00	04/08/14	PRE-PLANNING	GL
01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

Project
36 Flask Walk
NW3 1HE

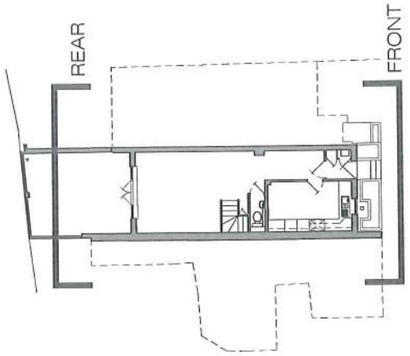
Title
EXISTING
Basement Floor Plan

Scale	1/50@A3	Dwg. No.	Rev.
Date	13/08/14	EX-02	01
Drawn	GL	Project Number	14_18
Checked	SS		



EXISTING
Front Elevation
SCALE 1/50@A3 EX-03

EXISTING
Rear Elevation
SCALE 1/50@A3 EX-03



EXISTING KEY
SCALE NTS

0 1 2 3 4 5m

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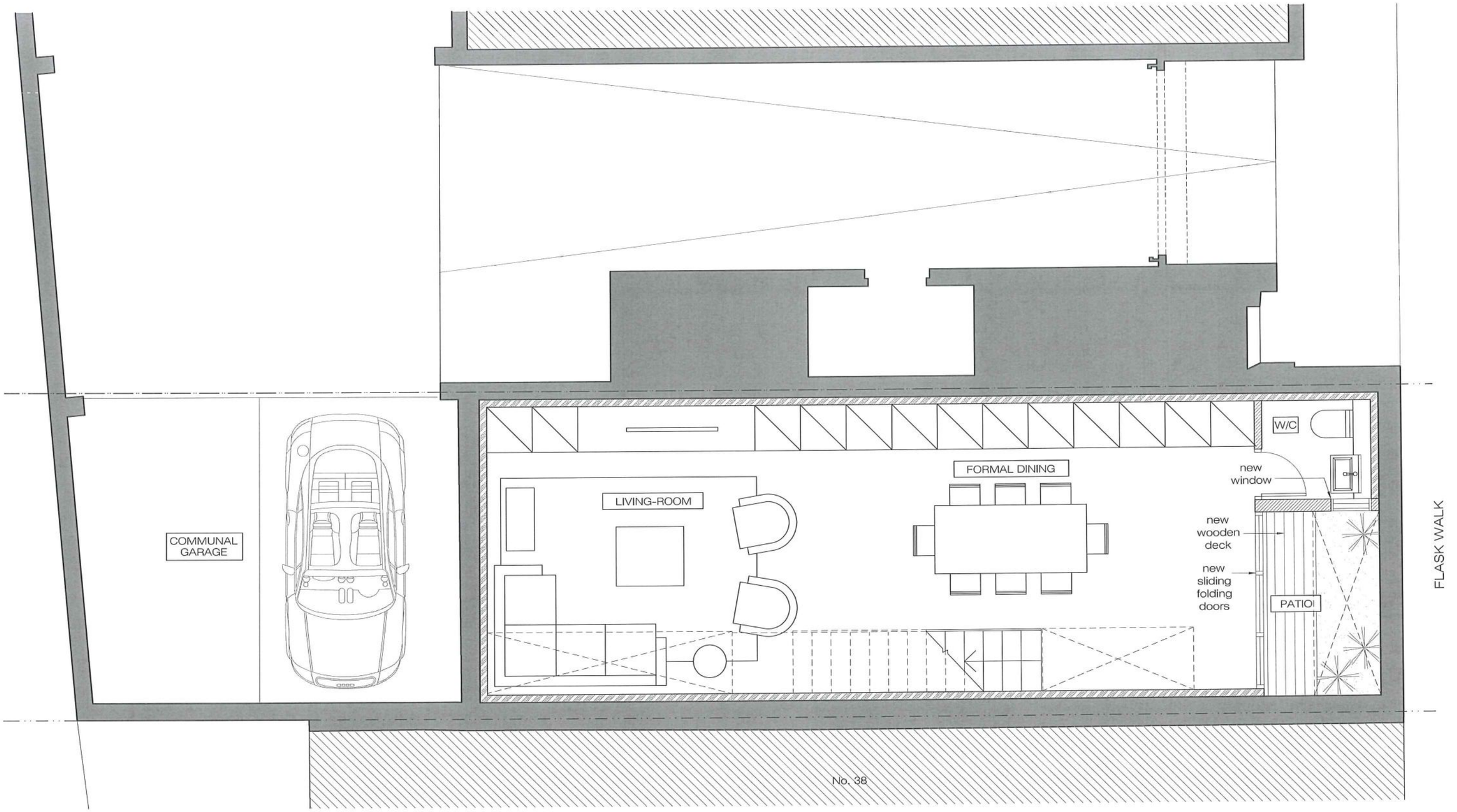
01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

Project
36 Flask Walk
NW3 1HE

Title
EXISTING
Front & Rear Elevation

Scale	1/50@A3	Dwg. No.	Rev.
Date	13/08/14	EX-03	01
Drawn	GL	Project Number	14_18
Checked	SS		



PROPOSED
Basement Floor Plan
SCALE 1/50@A3 PA-02

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REVISIONS

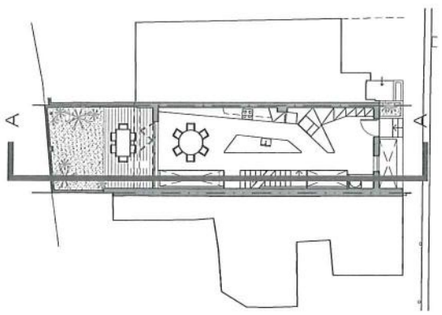
No	Date	Description Issue For	Issue By
00	04/08/14	PRE-PLANNING	GL
01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

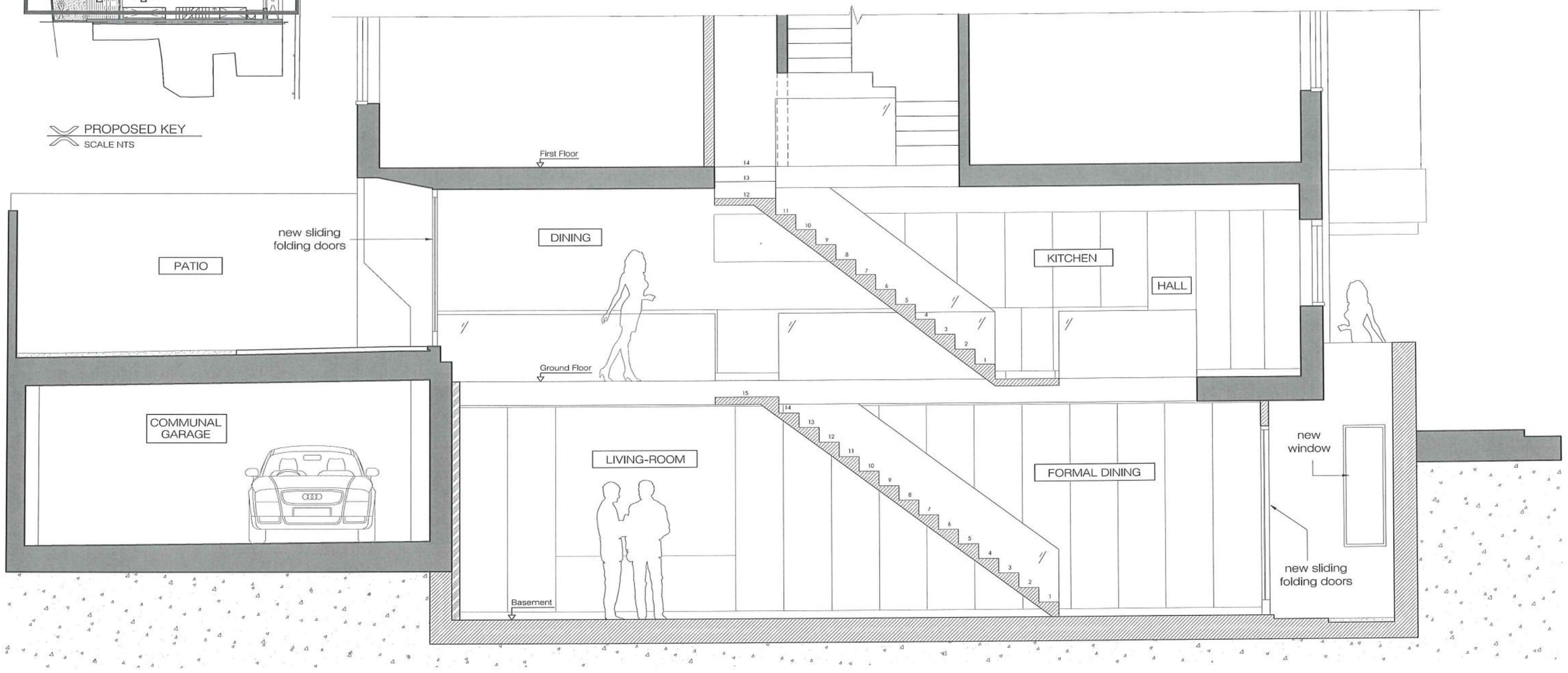
Project
36 Flask Walk
NW3 1HE

Title
PROPOSED
Basement Floor Plan

Scale	1/50@A3	Dwg. No.	Rev.
Date	13/08/14	PA-02	01
Drawn	GL	Project Number	14_18
Checked	SS		



PROPOSED KEY
SCALE NTS



PROPOSED
Section A-A
SCALE 1/50@A3 PA-04

0 1 2 3 4 5m

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No	Date	Description Issue For	Issue By
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01	13/08/14	PRE-PLANNING	GL

Client
PRIVATE CLIENT

Project
36 Flask Walk
NW3 1HE

Title
PROPOSED
Section A-A

Scale	1/50@A3	Dwg. No.	Rev.
Date	13/08/14	PA-04	01
Drawn	GL	Project Number	14_18
Checked	SS		