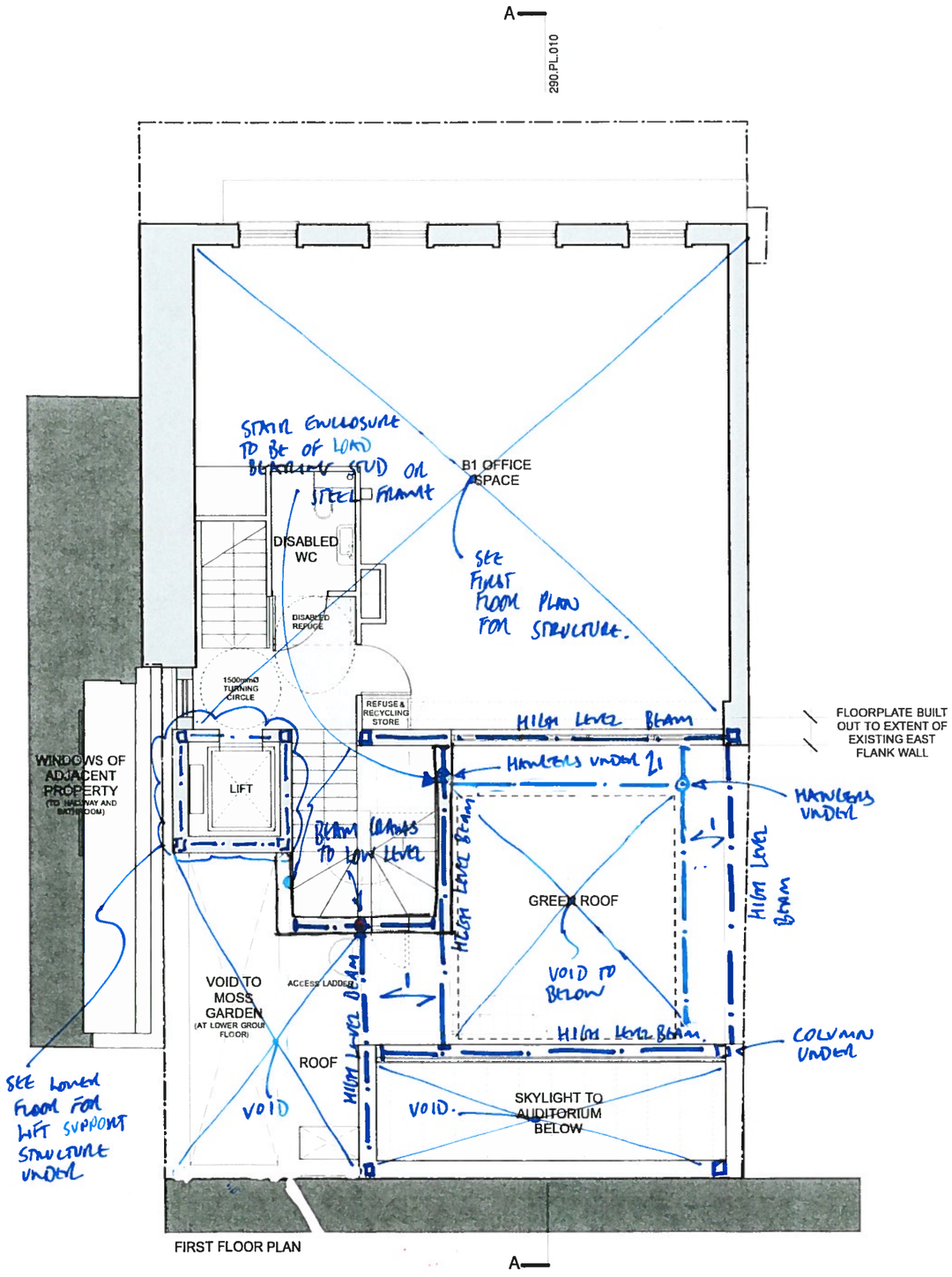
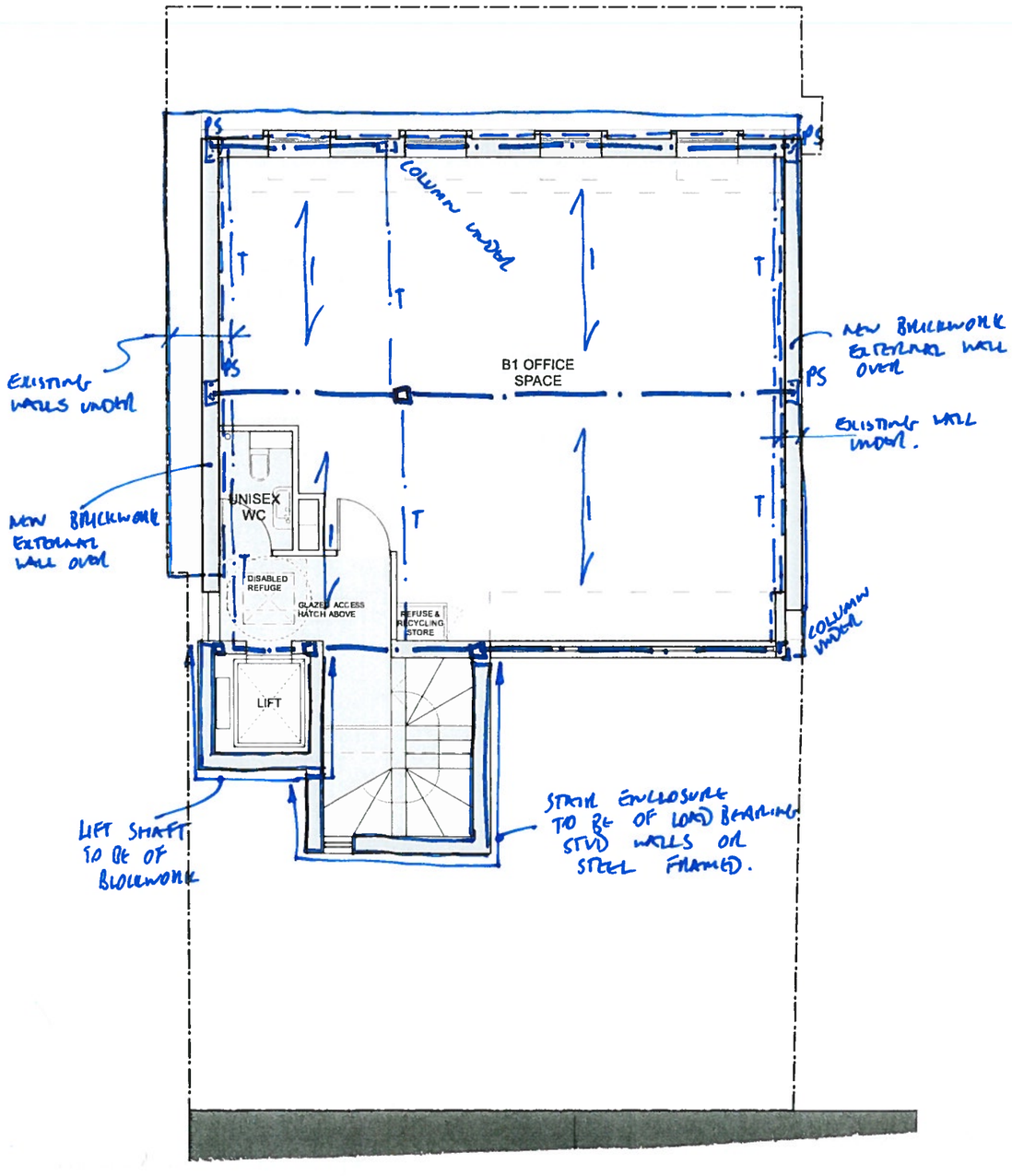


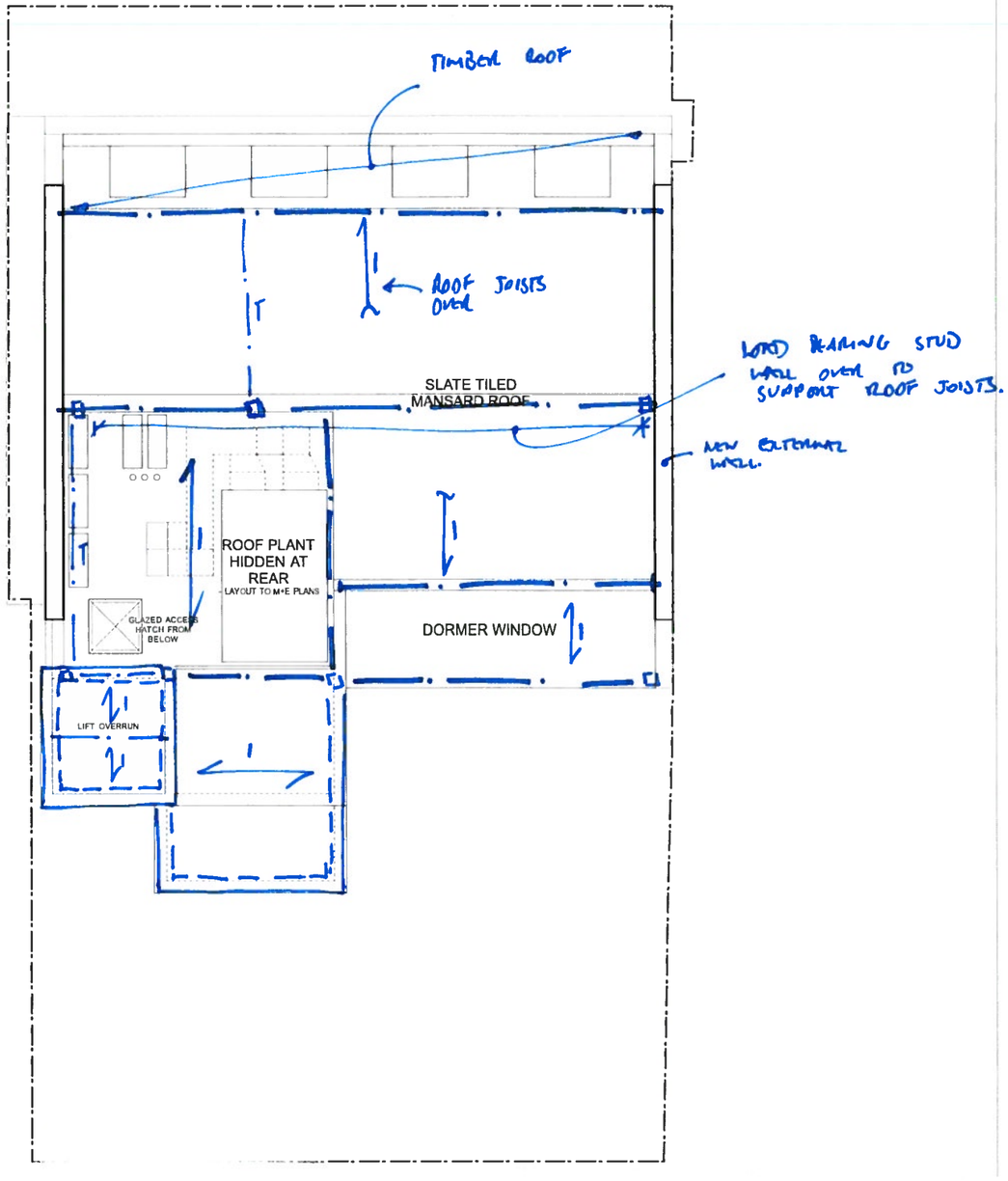
HEYNE | TILLETT | STEEL
STRUCTURAL ENGINEERS

Job: ST (HAT) ST		Date: 02/02/12	
Title: HIGH LEVEL FIRST FLOOR/ROOF GA		Eng: DL	
Job No: 0703	Sheet: SK 25	Rev: -	

A
290.PL.010

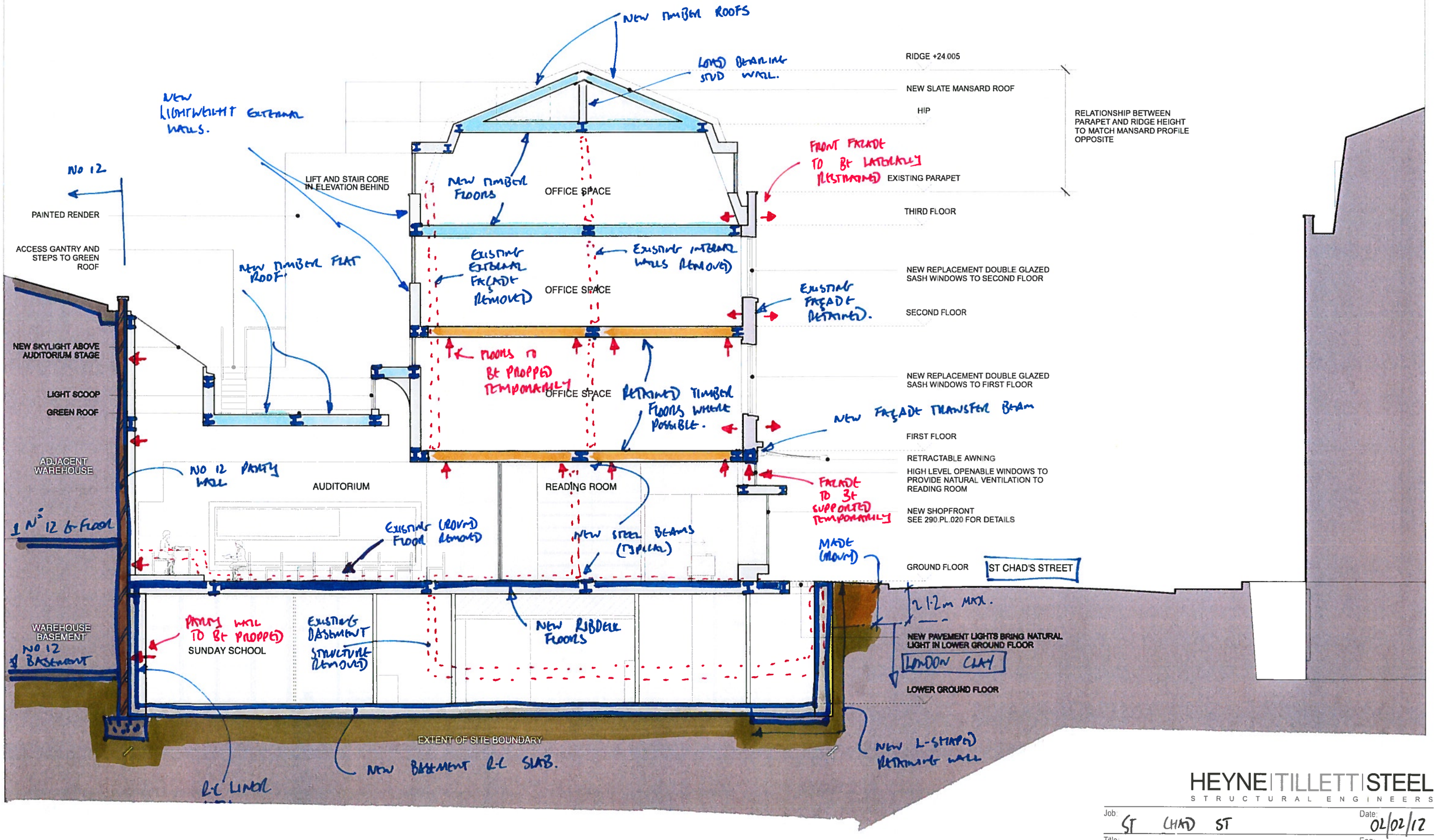


A
290.PL.010



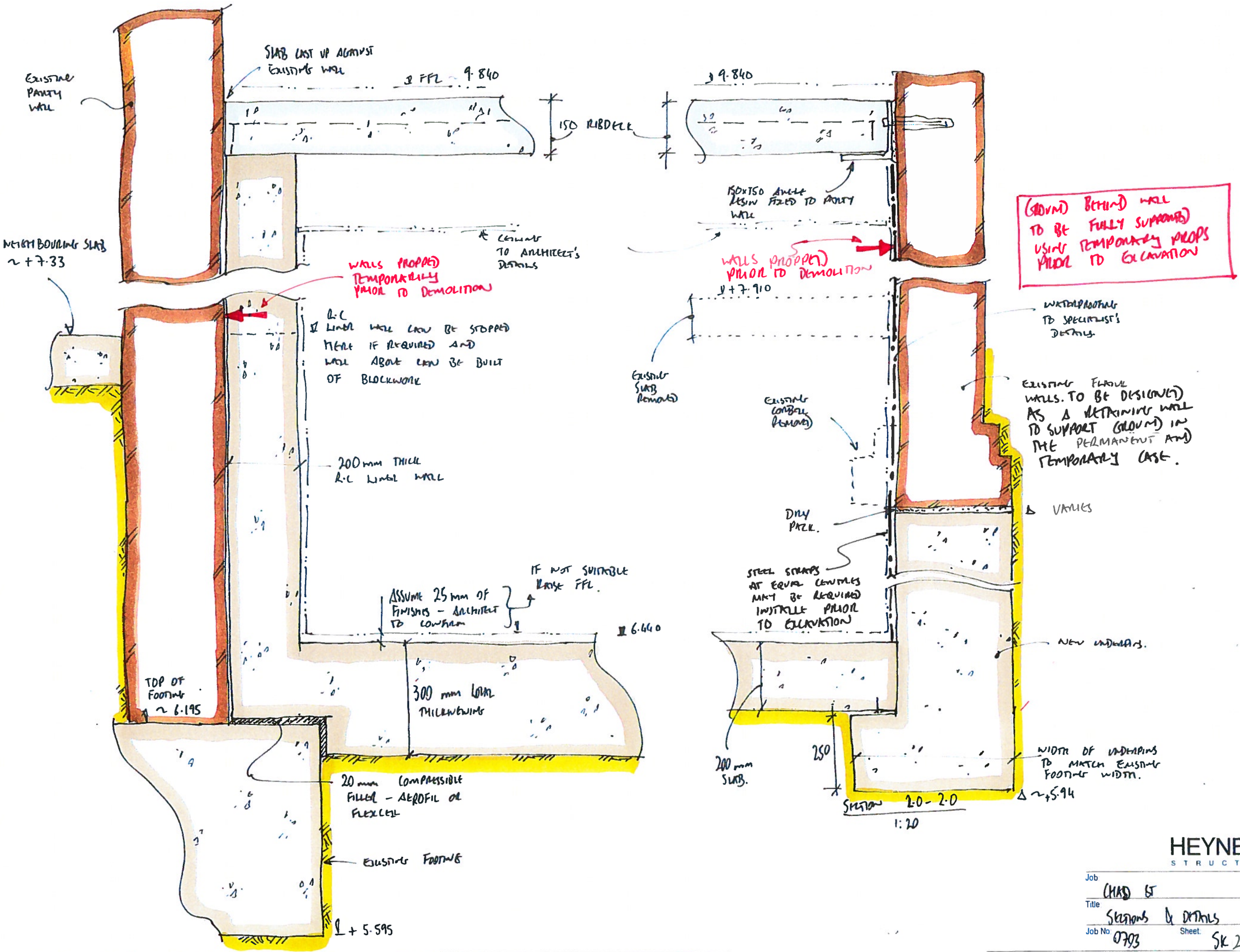
HEYNE|TILLETT|STEEL
STRUCTURAL ENGINEERS

Job: ST CHAD STREET		Date:	02/02/12
Title: THIRD FLOOR & ROOF G.A		Eng:	JC
Job No: 0703	Sheet: SK26	Rev:	



HEYNE|TILLETT|STEEL
STRUCTURAL ENGINEERS

Job: ST CHAD ST		Date:	02/02/12
Title: PROPOSED LONG SECTION		Eng:	DC
Job No: 0703	Sheet: SK 27	Rev:	



SECTION 1·0 – 1·0

1:20 (A3)

SECTION 2·0 – 2·0

1:20

HEYNE|TILLETT|STEEL
STRUCTURAL ENGINEERS

Job	CHKD ST	Date	16/12/11
Title	SECTIONS & DETAILS	Eng	DC
Job No	0793	Sheet	SK 28
		Rev	–

Appendix D - Geotechnical Report and BIA

Desk Study and Ground Investigation Report

11 St Chad's Street
London WC1

Client Elevenist Syndicate Limited

Engineer Heyne Tillett Steel

J11225

January 2012

GEA Geotechnical & Environmental Associates

Document Control

Project title	11 St Chad's Street, London, WC1H 8DG	**Project ref**	J11225
Report prepared by	Hannah Dashfield BEng FGS		
With input from	Martin Cooper BSc CEng MICE		
Report checked and approved for issue by	Steve Branch BSc MSc CGeol FGS FRGS MIEnvSc		

Issue No	Status	Date	Approved for Issue
1	Draft (by email)	18 January 2012	
2	Final (by email)	25 January 2012	
3	Final	27 January 2012	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

✓	Hertfordshire	tel 01727 824666	mail@gea-ltd.co.uk
	Nottinghamshire	tel 01509 674888	midlands@gea-ltd.co.uk

CONTENTS

EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a desk study and ground investigation carried out by Geotechnical and Environmental Associates Limited (GEA), on the instructions of Heyne Tillett Steel, on behalf of Elevenist Syndicate Limited, with respect to the refurbishment and extension of the existing building. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground and hydrogeological conditions, to assess the extent of any contamination and to provide information to assist with the design of the basement and suitable foundations for the proposed development. The report also includes a Basement Impact Assessment in accordance with guidelines from London Borough of Camden in support of a planning application.

DESK STUDY FINDINGS

The earliest map studied, dated 1877, indicates that St Chad's Street was known as Derby Street at that time and the site is shown to be developed with a main building and a small outbuilding along the southern boundary. By 1938, Derby Street had been renamed St Chad's Street. By 1953 the building along the southern part of the site had been demolished, as had terraced houses formerly attached to the current building. The site has remained essentially unchanged to the present day. Reference to Post Office Directories indicates that the site previously formed part of the bottling stores, located to the south of the site.

GROUND CONDITIONS

Below a moderate thickness of made ground, London Clay was encountered and proved to the maximum depth investigated. The made ground typically comprised brown clay with occasional fragments of brick, ash, glass and concrete and extended to depths of between 0.35 m and 0.42 m below basement level and 0.60 m and 1.10 m below ground floor level. The full thickness of the made ground was not proved in Trial Pit No 8, where it was encountered to the maximum depth investigated of 1.2 m. The London Clay comprised an initial horizon of weathered firm or stiff brown fissured silty clay to depths of between 3.75 m and 3.90 m below basement level, over stiff grey fissured silty clay which was encountered to the maximum depth investigated of between 5.50 m and 6.00 m below basement level. The base of the weathered clay was not proved in Borehole No 4, and extended to the full depth investigated at that location of 5.70 m below ground floor level.

Trial pits excavated from basement level revealed that the existing foundations comprise brick and concrete footings bearing on firm London Clay at depths of between 0.48 m and 0.80 m. Pits from ground level found the existing building to be bearing at depths of between 0.72 m and 3.70 m, where proved, on firm or stiff London Clay.

RECOMMENDATIONS

The proposed development will result in a formation level at a depth of about 3.5 m below current ground floor level and groundwater inflows are not anticipated in the basement excavation. Moderate width pad or strip foundations may be designed to apply a net allowable bearing pressure of 120 kN/m^2 within the firm clay or 150 kN/m^2 below the level of the proposed basement floor if all foundations are extended to bear on stiff clay. The existing foundations will need to be underpinned prior to construction of the proposed basement or will need to be supported by new retaining walls. The BIA has not indicated any concerns with respect to land stability or groundwater.

The chemical analyses did not reveal any elevated concentrations of contaminants and no remedial measures are deemed necessary.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Heyne Tillett Steel, on behalf of Elevenist Syndicate Limited, to carry out a desk study and ground investigation at 11 St Chads Street, London, WC1H 8DG. This report also forms part of a Basement Impact Assessment (BIA), which has been carried out in accordance with guidelines from the London Borough of Camden (LBC) in support of a planning application.

1.1 Proposed Development

It is understood that the current proposal involves extensive refurbishment of the existing building, which will include demolition of the existing rear extensions, all the internal walls, the ground floor slabs, roofs and the rear facade. The existing basement will be extended under the whole footprint of the site and the existing lower ground floor level will be partly lowered by approximately 1.5 m. In addition, a new storey will be added on top of the existing three-storey building, with a new single storey extension at the rear. The existing front facade, first and second floor structure will be retained and refurbished. The new structure is currently proposed as a steel frame with steel beams supported on internal and external columns.

The proposed end use of the site will remain commercial, with offices on the upper levels and the ground floor level and basement level will be used for church functions.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site with respect to previous contaminative uses;
- to determine the ground conditions and their engineering properties;
- to assess the possible impact of the proposed development on the local hydrogeology;
- to provide advice with respect to the design of suitable foundations and retaining walls;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of readily available geological and hydrogeological maps;
- a review of the Post Office directories and bomb damage maps held by the London Metropolitan Archives;
- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database; and
- a walkover survey of the site carried out in conjunction with the fieldwork.

In the light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- four window sampler boreholes advanced to depths of between 5.50 m and 6.00 m;
- ten trial pits manually excavated in order to investigate the configuration of existing foundations;
- laboratory testing of selected soil samples for geotechnical purposes and for the presence of contamination; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11[1] and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment.

1.3.1 Basement Impact Assessment (BIA)

The work carried out also includes information required for a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment), which form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG4[2] and their Guidance for Subterranean Development[3] prepared by Arup. The aim of this work is to provide information on the groundwater conditions specific to this site and land stability, in particular to assess whether the development will affect the stability of neighbouring properties and whether any identified impacts can be appropriately mitigated.

The hydrogeological and land stability elements of the work have been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng) and member of the

1 *Model Procedures for the Manageent of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004
2 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development*. For London Borough of Camden November 2010

Institution of Civil Engineers (MICE), who has over 20 years specialist experience in ground engineering. The assessment has been made in conjunction with Steve Branch, a BSc in Engineering Geology and Geotechnics, MSc in Geotechnical Engineering, a chartered geologist (CGeol) and Fellow of the Geological Society (FGS) with 25 years' experience in geotechnical engineering, engineering geology and hydrogeology. Both assessors meet the Geotechnical Adviser criteria of the Site Investigation Steering Group and satisfy the qualification requirements of the Council guidance.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 THE SITE

2.1 Site Description

The site is located approximately 180 m to the southeast of King's Cross Railway Station. It is rectangular in shape, measuring roughly 17 m by 11 m and fronts onto St Chad's Street to the north and is attached to a two-storey brick building to the west; it is bordered to the east by a car parking area and by an access road to a large car maintenance workshop that bounds the site to the south. The site may additionally be located by National Grid Reference 530420, 182880.

The general topography of the area slopes gently down towards the northeast and northwest and there a number of changes in level across the building. The entire footprint of the site is currently occupied by a building which comprises a three-storey building with single level basement, extending to a depth of approximately 2 m below current ground floor level. There are also single and two-storey extensions at the rear of the building and the site is devoid of vegetation.

The site was until recently used as a charity shop at ground floor level with offices on the upper levels. At the time of the investigation the building was boarded up and vacant.

2.2 Site History

The site history has been researched by reference to historical Ordnance Survey (OS) maps sourced from the Envirocheck database.

The earliest map studied, dated 1877, indicates that St Chad's Street was known as Derby Street at that time and the site is shown to be developed with a main building and a small outbuilding along the southern boundary. On the OS map dated 1877, the existing large rectangular building to the south of the site is labelled as the "London General Depository" and by the time of the 1916 map the building was being used as a bottling stores. By 1938, Derby Street had been renamed St Chad's Street. By 1953 the building along the southern part of the site had been demolished, as had terraced houses formerly attached to the current

building.

Reference to bomb damage maps do not indicate that the site was damaged during World War II. General blast damage affected the large building to the south of the site and there was minor blast damage to the buildings to the west of the site.

By 1953 the terraced house to the west of the site had been replaced with two new buildings. The bottling stores to the south remained depicted on the OS maps until 1991, when it is shown as a depot. The site has remained essentially unchanged to the present day and has most recently been used as a charity shop on the ground floor and offices on the upper levels.

Reference to Post Office (PO) Directories indicates that the site previously formed part of the bottling stores to the south of the site. The PO directories indicates that by 1905 the site was used by Swan and Co. glass bottle agents. Further research of the Post Office directories indicates that by 1930 the site was being used by McDonald, Swan and Co. Limited as a brewery machine manufacturers. At some time between 1950 and 1960 was being used by Whitbread and Co. Limited bottling stores laboratory.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search are included in the appendix.

The search has revealed that there are no landfills, waste management, transfer, treatment or disposal sites within 250 m of the site. There have been no pollution incidents within 500 m of the site.

Potential off-site historical sources of contamination include a laundrette, dry cleaners, garage and printers, all located within 250 m of the site, with the closest being the laundrette, 41 m north of the site. The site is directly underlain by low permeability London Clay and there is a limited pathway for the migration of potential contaminants to the site from off-site uses and surrounding land uses are not thought have had an impact on the site.

The search has indicated that the site is located in an area where less than 1% of homes are affected by radon emissions; which is the lowest classification given by the Health Protection Agency (HPA) and therefore no radon protective measures will be necessary.

The Circle Line runs beneath Birkenhead Street, located to the northwest of the site, which leads onto St Chad's Street. Contact has been made with the London Underground Limited and they have confirmed that they have no assets located with 50 m of the site.

2.4 Geology

The Geological Survey map of the area (Sheet 256) indicates the site to be directly underlain by London Clay.

2.5 Hydrology and Hydrogeology

The Envirocheck Report indicates that the site is underlain by "Unproductive Strata", as defined by the Environment Agency as rock or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Any groundwater flow within the London Clay will be at a very slow rate, due to its negligible permeability; the permeability will be predominantly secondary, through fissures in the clay. Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10^{-11} m/s and 1 x 10^{-9} m/s, with a lower vertical permeability.

The current development proposal includes the construction of a single level basement to a depth of about 3.5 m below present ground level. The proposed basement is unlikely to have any significant effect on groundwater levels as it is wholly within the London Clay so does not provide any form of cut-off into less permeable strata.

There are no Environment Agency designated Groundwater Source Protection Zones (SPZs) on the site. The closest water abstraction point is located 392 m southwest of the site.

The nearest surface water feature is the Regent's Canal, located 452 m north of the site.

Reference to published information[4] indicates that The River Fleet previously flowed down Pancras Road, crossing Gray's Inn Road before continuing down King's Cross Road. The site is located approximately 150 m south of the course of the River Fleet and roughly 80 m to the east of a tributary that flowed parallel to Euston Road. The River Fleet has since been culverted.

The site is not at risk of flooding from rivers or sea, as defined by the Environment Agency; nor has St Chad's Street been identified as a street at risk of surface water flooding, specified in the London Borough of Camden (LBC) Planning Guidance CPG4 [5] and therefore a flood risk assessment will not be required.

The entire footprint of the site is essentially currently occupied by a building which comprises a three-storey building with single level basement, extending to a depth of approximately 2 m below current ground floor level. There are also single and two-storey extensions at the rear of the building. The proposed basement will not alter the amount of soft cover available for surface water infiltration.

2.6 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.6.1 Source

The historical usage of the site that has been established by the desk study and the site walkover indicates that the site does not have a potentially contaminative history, by virtue of it having been occupied by the existing building, since before 1877. The building was known to be used as bottling stores and more recently a shop on the ground floor and offices on the upper levels. There are thus no obvious likely sources of contamination on the site or in its immediate vicinity.

[4] Nicholas Barton (2000) *London's Lost Rivers.* Historical Publications Ltd
[5] London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*

There are no historical or existing landfill sites within 1 km of the site and on this basis no potential sources of soil gas have been identified.

2.6.2 Receptor

The entire site will be covered by the commercial building and therefore the end users of the site represent a relatively low sensitivity end use. Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are likely to come into direct contact with any contaminants present in the soil and through inhalation of vapours during basement excavation and construction. Being underlain by a non-aquifer, groundwater is not considered to be a receptor.

2.6.3 Pathway

Within the site, end users will be isolated from direct contact with any contaminants present within the made ground by the presence of the building. Thus no potential contaminant exposure pathways exist with respect to end users.

The presence of negligibly permeable London Clay beneath the site will limit the potential for groundwater percolation into the underlying chalk, and thus a pathway is not considered likely to exist to the major aquifer. There will be limited potential for contaminants to move on or off the site, except horizontally within any made ground. Buried services may be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the soils during construction works. There is thus considered to be a low potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

2.6.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a very low risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work.

3.0 SCREENING

The LBC guidance suggests that any development proposal that includes a subterranean basement should be screened to determine whether or not a full BIA is required.

3.1 Screening Assessment

A number of screening tools are included in the Arup document and for the purposes of this report reference has been made to Appendix E which includes a series of questions within a screening flowchart for three categories; groundwater flow; land stability; and surface water flow. Responses to the questions are tabulated below.

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for 11 St Chad's Street
1a. Is the site located directly above an aquifer?	No
1b. Will the proposed basement extend beneath the water table surface?	No
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	No known spring or well within 100 m of the site. The nearest surface water feature is located 452 m north of the site and is the Regent's Canal. The River Fleet previously flowed approximately 150 m north of the site and a tributary of this river flowed 80 m to the west of the site.

3. Is the site within the catchment of the pond chains on Hampstead Heath?	No
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No
5. As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	It is assumed that additional surface water will be discharged to existing surface water sewers, however, this is not known (outside scope of this report)
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than, the mean water level in any local pond or spring line?	No

The above assessment has not identified any potential issues that need to be assessed.

3.1.2 Stability Screening Assessment

Question	Response for 11 St Chad's Streetl
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No
5. Is the London Clay the shallowest strata at the site?	Yes, the site is directly underlain by London Clay.
6. Will any trees be felled as part of the proposed development and / or are any works proposed within any tree protection zones where trees are to be retained?	No
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Yes - the Envirocheck report indicates a moderate potential of shrink / swell at the site. However, there is no evidence of structural distress of the existing building on site and no vegetation on or around the site.
8. Is the site within 100 m of a watercourse or potential spring line?	Not at present, however, historically the site was within 100 m of a former tributary of the River Fleet.
9. Is the site within an area of previously worked ground?	No
10. Is the site within an aquifer?	No
11. Is the site within 50 m of Hampstead Heath ponds?	No
12. Is the site within 5 m of a highway or pedestrian right of way?	Yes, the site fronts onto St Chad's Street.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No; the proposed basement will decrease differential depths of foundations, by underpinning the existing foundations to a common level. The site is attached to a workshop to the south of the site and the footing is founded at a depth of 3.70 m. The site is also attached along its western elevation to a two-storey brick building and it is known that the footing of the neighbouring property extends to a depth of at least 1.8 m. The footing of the western wall of 11 St Chad's Street is founded at a depth of 0.57 m.
14. Is the site over (or within the exclusion zone of) any tunnels, eg railway lines?	No. Confirmation from LUL indicate that there are no assets located within 50 m of our site.

The above assessment has identified the following potential issues that need to be assessed:

Q7 The site is underlain by London Clay, at risk of shrink / swell potential.
Q11 The site is within 5 m of a public highway.

3.1.3 Surface Flow and Flooding Screening Assessment

This element of the BIA is based on the desk study findings and the existing buildings survey and the proposed development plans. The information used to make the assessment is as per Section 6.2.1 of the LBC Guidance for Subterranean Development by Arup.

Question	Response for 11 St Chad's Street
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No
4. Will the proposed basement development result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No.
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	No
6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?	No

The above assessment has not identified any potential issues that need to be assessed.

4.0 SCOPING AND SITE INVESTIGATION

The purpose of scoping is to assess in more detail the factors to be investigated in the impact assessment. Potential consequences are assessed for each of the identified potential impact factors.

4.1 Potential Impacts

The following potential impacts have been identified.

Potential Impact	Possible Consequence
The London Clay is prone to seasonal shrink / swell (subsidence and heave).	Structural stress to the building.
Site within 5 m of a highway or pedestrian right of way	Excavation of a basement may result in structural damage to the road or footway.

These potential impacts have been investigated through the site investigation, as detailed below.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2 and to assess the potential impacts identified in the screening exercise of the BIA, four window sampler boreholes were advanced to depths of between 5.5 m and 6.0 m. A selection of the samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

Standpipes were not installed in the boreholes as groundwater was not encountered in the boreholes during the investigation and the London Clay has a low horizontal permeability and an even lower vertical permeability; as such any trapped water will be very slow to drain away and the London Clay presents an almost complete barrier to groundwater.

In addition ten trial pits were manually excavated in order to expose and allow the inspection of the existing foundations.

The field work was carried out under the supervision of a geotechnical engineer from GEA in full or part time attendance.

The borehole and trial pit records and results of the laboratory analyses are appended, together with a site plan indicating the exploratory positions. The ground levels shown on the borehole and trial pit records have been interpolated from spot heights shown on a building survey drawing (reference Job Number: 0703, sheet SK01), dated September 2011 by Heyne Tillett Steel. The consulting engineers also provided a copy of survey drawings (reference survey elevations 5273-1 and 5273-2), dated August 2011 by Inline Surveys Limited. It is not known to what datum the levels on these drawings are related, so they have not been used within the report but are shown on the logs for comparative purposes.

4.3 Sampling Strategy

The borehole and trial pit locations were agreed on site by the consulting engineers and GEA and positioned to avoid the areas of known services.

Four samples of made ground were subjected to analysis for a range of common industrial contaminants and contamination indicative parameters. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification.

The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. Details of the MCERTs accreditation and test methods are included in the Appendix together with the analytical results.

5.0 GROUND CONDITIONS

The investigation has confirmed the expected ground conditions in that, beneath a moderate thickness of made ground, London Clay was encountered.

5.1 Made Ground

The made ground typically comprised brown clay with occasional fragments of brick, ash, glass and concrete and extended to depths of between 0.35 m and 0.42 m below basement level and 0.60 m and 1.10 m below ground floor level. The thickness of the made ground was not proved in Trial Pit No 8, where it was encountered to the maximum depth investigated of 1.2 m.

No significant evidence of contamination was observed during the fieldwork, apart from the presence of extraneous material such as glass, brick and charcoal fragments. Four samples of the made ground have been analysed for a range of contaminants and the results are summarised in Section 5.4.

5.2 London Clay

The London Clay comprised an initial horizon of weathered firm or stiff brown fissured silty clay which extended to depths of between 3.75 m and 3.90 m below basement level. Below this depth stiff grey fissured silty clay was encountered to the maximum depth investigated of between 5.50 m and 6.00 m below basement level. The base of the weathered clay was not proved in Borehole No 4, where it was found to extend to the full depth investigated of 5.70 m below ground floor level.

Plasticity index tests have indicated the clay to be of moderate to high volume change potential. These soils were observed to be free of any evidence of soil contamination.

5.3 Groundwater

Groundwater was not encountered in the boreholes or trial pits, except in Trial Pit Nos 1 and 3, where localised perched water was encountered within the made ground in the vicinity of the existing foundations.

Borehole No 2 was drilled through the base of Trial Pit No 3, where local perched water was encountered around the base of the footings. This water was able to enter the borehole when drilling and therefore water was encountered on the surface of clay recovered from this borehole.

5.4 Soil Contamination

The table below sets out the values measured within four samples of made ground analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	TP1: 0.3 m	TP6: 0.3 m	TP4: 0.3m	TP8: 0.6 m
pH	8.4	8.1	8.1	10.0
Arsenic	21	8	12	13
Cadmium	0.14	<0.10	<0.10	0.11
Chromium	63	33	43	24
Copper	43	25	31	63
Mercury	0.46	1.6	0.60	17
Nickel	54	26	38	18
Lead	63	50	36	490
Selenium	0.69	0.23	0.59	<0.20
Zinc	120	80	89	68
Total Cyanide	<0.50	<0.50	<0.50	<0.50
Total Phenols	<0.3	<0.3	<0.3	<0.3
Total Sulphate	1200	1400	1000	3600
Sulphide	1.3	1.2	1.6	1.3
Soluble Chloride (g/l)	0.027	0.027	0.027	0.031
Total TPH	<10	<10	<10	<10
Total PAH	<2	<2	<2	<2
Benzo(a)pyrene	<0.1	<0.1	<0.1	<0.1
Naphthalene	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon %	0.61	0.41	0.40	3.2

Note: Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed below

5.4.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end the contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[6] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a commercial end use.

The key generic assumptions for the commercial end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be a working female aged 16 to 65 years old;
- that the exposure duration will be 49 years;

6 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a three-storey office.

It is considered that these assumptions are acceptable for this generic risk assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

This assessment is based upon the potential for risk to human health, which at this site is considered to be the critical risk receptor.

When comparing the results from the contamination testing to those in the Soil Guideline Values and Generic Guideline Values, the analyses have revealed no elevated concentrations in excess of the generic risk-based screening values.

The significance of these results is considered further in Part 2 of the report.

5.5 Existing Foundations

Trial Pit Nos 1 to 6, excavated from basement level, revealed that the existing foundations comprise brick and concrete footings bearing on firm London Clay at depths of between 0.48 m and 0.80 m.

In Trial Pit No 1, a probe was extended 1.15 m at an angle horizontally from the face of the western wall of No 11 St Chad's Street in Trial Pit No 1, beneath the footing and there was no evidence of the footing of the neighbouring wall to the west.

Trial Pit Nos 7, 9 and 10 were excavated from ground floor level, and found the foundations of the existing building to be bearing at depths of between 0.72 m and 3.7 m, where proved, on firm or stiff London Clay.

In Trial Pit No 8 the footing was bearing on made ground at a depth of 0.78 m below ground floor level on the eastern wall, with the footing of the southern wall not proved. This pit was abandoned due to time constraints and it was agreed on site between GEA and the consulting engineer to continue Trial Pit No 9 to determine the configuration of the footings along the southern boundary wall with shoring installed in this pit to reach the required depths in a safe manner.

In Trial Pit No 10, a probe was extended at an angle horizontally beneath the western wall of No 11 St Chad's Street and the neighbouring wall is located roughly 350 mm from the face of the internal wall and is still present at a depth of 1.8 m. Due to time constraints Trial Pit No 10 was terminated at a depth of 1.6 m.

Trial pit logs and photographs are included in the Appendix.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to foundation options and contamination issues.

6.0 INTRODUCTION

The site is on a number of levels and there is a basement beneath part of the site extending to a depth of approximately 2.0 m below ground floor level. It is understood that the current proposal involves extensive refurbishment of the existing building, which will include lowering the existing lower ground floor level by approximately 1.5 m and extending the existing basement under the whole footprint of the site to a depth of about 3.5 m below current ground floor level. In addition it is proposed to demolish the existing rear extensions, all the internal walls, the ground floor slabs, roofs and the rear facade. A new storey will be added on top of the existing three-storey building, with a new single storey extension at the rear. The existing front facade, first and second floor structure will be retained and refurbished. The anticipated maximum unfactored design loads are 700 kN for internal columns and 160 kN/m for perimeter walls.

7.0 GROUND MODEL

The desk study has revealed that the site has not had a potentially contaminative history, having apparently been occupied by the existing building since before 1877 and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- Beneath a moderate thickness of made ground, London Clay was encountered and proved to the maximum depth investigated;
- the made ground typically comprised brown clay with occasional fragments of brick, ash, glass and concrete and extended to depths of between 0.35 m and 0.42 m below basement level and 0.60 m and 1.10 m below ground floor level. The thickness of the made ground was not proved in Trial Pit No 8, where it was encountered to the maximum depth investigated of 1.2 m;
- the underlying London Clay comprised an initial horizon of weathered firm or stiff brown fissured silty clay which extended to depths of between 3.75 m and 3.90 m below basement level. Below this depth stiff grey fissured silty clay was encountered to the maximum depth investigated of between 5.50 m and 6.00 m below basement level;
- plasticity index tests have indicated the clay to be of moderate to high volume change potential;
- localised perched water was encountered in Trial Pit Nos 1 and 3 within the made ground in the vicinity of existing foundations; and
- the results of the contamination analysis do not indicate any elevated concentrations in excess of the generic risk-based screening values.

8.0 ADVICE AND RECOMMENDATIONS

Formation level for the proposed basement should be within firm or stiff London Clay. Significant groundwater inflows are not anticipated in the basement excavation and it should be possible to adopt spread foundations constructed from basement level to support the new development, provided that the proposed loads are not high. Alternatively, consideration could be given to piled foundations and further investigations in the form of a deep borehole would be required in this respect to provide pile design parameters.

8.1 Basement Excavation

The proposed new basement will extend to a depth of approximately 3.5 m below current ground floor level and formation level will be within the firm or stiff London Clay and groundwater is not anticipated to be encountered during basement excavation. However, local perched water may be encountered within the made ground in the vicinity of existing foundations and within thin partings of silt rather than in continuous layers. On the basis of information obtained from this investigation it is considered likely that the rate of any inflows will be relatively slow and localised and should be adequately dealt with through sump pumping.

The design of basement support in the temporary and permanent conditions needs to take account of the need to maintain the stability of the existing building and surrounding structures at all times.

The area of the proposed basement extension is bounded by party walls to the south and west that have been found to extend below the site level to a depth of 3.7 m along the southern boundary wall at the location investigated and this wall will to a large extent serve as a retaining wall for the new basement excavation. The most suitable method of support will probably therefore be to form the retaining walls by mass concrete underpinning of the existing foundations of the party walls if required, using a traditional 'hit and miss' approach.

Careful workmanship will be required to ensure that movement of the surrounding structures does not arise, but this method will have the benefit of minimising the plant required and maximising usable space in the new basement.

The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition. Thus, a suitable amount of propping will be required to provide the necessary rigidity or the new retaining walls or underpins will need to be designed to support the surrounding ground. In this respect the timing of the provision of support to the wall will have an important effect on movements. The retaining walls will need to be designed to accommodate the loads from neighbouring structures.

8.1.1 Basement Retaining Wall

The following parameters are suggested for the design of the new retaining walls.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion (c' – kN/m^2)	Effective Friction Angle (ϕ' – degrees)
Made ground	1700	Zero	20
London Clay	1950	Zero	25

Groundwater is unlikely to be encountered within the excavation and it is recommended that the basement is designed with a water level assumed to be two-thirds of the basement depth, unless a fully effective drainage system can be ensured. It may, however, be possible to review this requirement following additional investigation by means of trial excavations and the advice in BS8102:2009 should be followed in this respect.

8.1.2 Basement Heave

The proposed construction of a 3.5 m beneath the rear part of the site and lowering of the existing lower ground floor at the front of the site will result in a variable unloading of the London Clay at formation level. The excavations will result in an approximate unloading of between 27 kN/m^2 and around 63 kN/m^2, at the front and rear respectively, which will result in an elastic heave and long term swelling of the London Clay. The effects of the longer term swelling movement within the London Clay will be mitigated to some extent by the continued pressure applied by the existing building which will be retained and the load applied by the new foundations. It would, however, be prudent to a detailed analysis of these movements once the basement design has been finalised. Consideration should also be given to the effects of differential movement at the front and rear of the house.

8.1.3 Basement Floor Slab

Following a proof rolling exercise and infilling any soft spots with suitably compacted granular fill, a ground bearing floor slab may be adopted on the clay. Consideration will need to be given to designing the slab to accommodate heave movements. This should be considered in more detail once the proposed loads and levels are known. If it proves to be uneconomical to attempt to resist the heave the floor slab should be suspended over a void.

8.2 Spread Foundations

Formation level for the proposed development will be within the firm or stiff London Clay, which should provide an eminently suitable bearing stratum for spread foundations excavated from basement level. Groundwater is unlikely to be encountered within the basement excavation, although some groundwater inflows may be encountered from perched water within silt partings of the London Clay and in the vicinity of existing foundations and made ground, but these should be adequately dealt with by sump pumping if encountered.

Moderate width pad or strip foundations bearing in the firm or stiff clay may be designed to apply a net allowable bearing pressure of 120 kN/m^2 within the firm clay or 150 kN/m^2 below the level of the proposed basement floor if all foundations are extended to bear on stiff clay. This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

8.3 Shallow Excavations

On the basis of the borehole and trial pit findings it is considered likely that it will be generally feasible to form relatively shallow excavations terminating within the made ground or London Clay without the requirement for lateral support, although localised instabilities may occur. Inflows of groundwater into shallow excavations are not generally anticipated, although seepages may be encountered from perched water tables within the made ground, particularly within the vicinity of existing foundations, although such inflows should be suitably controlled by sump pumping.

However, should deeper excavations be considered or if excavations are to remain open for prolonged periods it is recommended that provision be made for battered side slopes or lateral support. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides considered in order to comply with normal safety requirements.

8.4 Effect of Sulphates

Chemical analyses have revealed a low concentration of soluble sulphate and near-neutral pH in accordance with Class DS-1 and Class DS-2 conditions of Table C2 of BRE Special Digest 1 Part C (2005). The measured pH values of the samples show that a ACES class of AC-1s would be appropriate for the site. This assumes a static water condition at the site. The guidelines contained in the above digest should be followed in the design of foundation concrete.

8.5 Site Specific Risk Assessment

The results of the contamination analysis do not indicate any elevated concentrations in excess of the generic risk-based screening values. On this basis, it is not considered that any remedial measures to protect sensitive receptors are necessary.

8.6 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are classified as accepting inert, non-hazardous or hazardous wastes in accordance with the EU waste Directive.

Based upon on the technical guidance provided by the Environment Agency[7] it is considered likely that the made ground from this site, as represented by the four chemical analyses carried out, would be generally classified as a Non-hazardous waste, whilst the natural soils may be classified as an Inert waste. WAC leaching tests should not be necessary upon samples of natural soils which are to be disposed of as an inert waste as the site may be considered as having had an uncontaminated history, although this should be confirmed by the receiving landfill.

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[8] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

7 Environment Agency May 2008. Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance WM2 Second Edition Version 2.2

8 *Regulatory Position Statement 'Treating non-hazardous waste for landfill - Enforcing the new requirement' Environment Agency 23 Oct 2007*

9.0 BASEMENT IMPACT ASSESSMENT

The screening identified a number of potential impacts. The desk study and ground investigation information has been used below to review the potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

The table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

Potential Impact	Site Investigation Conclusions
Seasonal shrink / swell (subsidence and heave)	The investigation has confirmed that the site is directly underlain by London Clay and plasticity index tests indicate the London Clay to be of moderate to high volume change potential at the site. No evidence of desiccation of the clay was recorded and there are no trees on the site.
Location of public highway	The basement will be located within the site, at approximately 2.0 m from the closest highway; therefore consideration will need to be given to its stability and limiting any ground movements.

The results of the site investigation have therefore been used below to review the remaining potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

Shrink / swell potential of London Clay

There is no structural evidence of movement within the existing building and the foundations of the proposed new basement will extend beyond the zone affected by seasonal changes. In any case there are no trees or other vegetation on the site.

Location of public highway

There is currently a single level basement located beneath the three-storey building on the site, which is located approximately 2.0 m from the nearest public highway. As part of the proposed plans the existing lower ground floor level will be lowered by approximately 1.5 m and extend the existing basement under the whole footprint of the site to a depth of about 3.5 m below current ground floor level. Most of the substantive excavation work will therefore take place away from the highway.

The stability of neighbouring structures, including St Chad's Street will be ensured at all times through underpinning or new retaining walls.

10.0 OUTSTANDING RISKS AND ISSUES

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work is considered to be required.

The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the ground conditions based on the discrete points at which the ground was sampled, but the ground conditions should be subject to review as the work proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

It is recommended that heave movements are checked by further analysis once the loadings and final levels are known.

Due to time constraints, it is not known what depth the foundation of the neighbouring property to the west of No 11 St Chad's Street extends to in Trial Pit No 10 and the base of the footing in Trial Pit No 8 along the southern wall was not proved. Further investigations will be required if this information is needed before construction work is carried out.

11 St Chad's Street, London, WC1H 8DG
Elevenist Syndicate Limited
Desk Study and Ground Investigation Report

APPENDIX

Borehole Records

Trial Pit Records

Geotechnical Laboratory Test Results

Chemical Analyses (Soil)

Generic Risk Based Screening Values

Envirocheck Report and Extracts

Historical Maps

World War II Bomb Damage Map (Sheet 50)

Site Plan

GEA Geotechnical & Environmental Associates
Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site
11 St Chads Street, London, WC1H 8DG

Number
BH 1

Excavation Method	Dimensions	Ground Level (mTBM)	Client	Job Number
Drive-in Window Sampler		7.91	Elevenist Syndicate Limited	J11225
	Location	**Dates**	**Engineer**	**Sheet**
	Lower Ground Floor Level	29/11/2011	Heyne Tillett Steel	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mTBM)	Depth (m) (Thickness)	Description	Legend	Water
				7.89	(0.02)	Screed		
				7.85	0.02			
0.30	D1			7.56	(0.06)	Concrete		
					0.08			
0.65	D2				(0.27)	Made Ground (brown clay with occasional fragments of brick, ash and concrete)		
					0.35			
					(1.05)	Firm brown silty fissured CLAY with rare partings of orange-brown fine sand and silt, fine selenite crystals and occasional claystones		
1.20	D3			6.51	1.40			
1.60	D4					Stiff brown silty fissured CLAY with rare partings of orange-brown fine sand and silt, abundant fine selenite crystals and occasional claystones		
2.20	D5							
					(2.35)			
2.80	D6							
3.30	D7							
3.60	D8			4.16	3.75			
4.00	D9					Stiff grey silty fissured CLAY with abundant fine selenite crystals and rare claystones		
					(1.75)			
4.80	D10							
5.30	D11			2.41	5.50			
						Complete at 5.50m		

Remarks
Starter pit excavated to a depth of 0.45 m for access reasons
Groundwater not encountered

Scale (approx) 1:50
Logged By HD
Figure No. J11225.BH 1

GEA Geotechnical & Environmental Associates
Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site
11 St Chads Street, London, WC1H 8DG

Number
BH 2

Excavation Method	Dimensions	Ground Level (mTBM)	Client	Job Number
Drive-in Window Sampler		7.91	Elevenist Syndicate Limited	J11225
	Location	**Dates**	**Engineer**	**Sheet**
	Lower Ground Floor Level	29/11/2011	Heyne Tillett Steel	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mTBM)	Depth (m) (Thickness)	Description	Legend	Water
				7.76	(0.15)	Concrete		
					0.15	Made Ground (brown clay with rare fragments of brick and concrete)		
0.30	D1			7.51	(0.25)			
					0.40	Stiff grey silty fissured CLAY with occasional claystones		
					(1.10)			
1.10	D2							
				6.41	1.50	Stiff brown silty fissured CLAY with abundant fine selenite crystals and rare claystones		
1.80	D3							
2.30	D4							
					(2.25)			
2.90	D5							
3.50	D6							
				4.16	3.75			
3.90	D7					Stiff grey silty fissured CLAY with rare claystones		
4.40	D8							
					(2.25)			
5.00	D9							
5.90	D10			1.91	6.00			
						Complete at 6.00m		

Remarks
Borehole carried out through base of Trial Pit No 1
Local perched water was encountered within the made ground in the vicinity of existing foundations and water was able to enter the borehole when drilling and therefore water was noted on the surface of the clay recovered

Scale (approx) 1:50
Logged By HD
Figure No. J11225.BH 2

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site
11 St Chads Street, London, WC1H 8DG

Number
BH 3

Excavation Method	Dimensions	Ground Level (mTBM)	Client	Job Number
Drive-in Window Sampler		7.91	Elevenist Syndicate Limited	J11225
	Location Lower Ground Floor Level	**Dates** 29/11/2011	**Engineer** Heyne Tillett Steel	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mTBM)	Depth (m) (Thickness)	Description	Legend	Water
				7.79	(0.12) 0.12	Concrete		
0.30	D1			7.49	(0.30) 0.42	Made Ground (light orange-brown mottled grey ckay with fragments of brick, charcoal and concrete)		
0.50	D2				(1.08)	Firm brown occasionally mottled grey silty fissured CLAY with abundant fine selenite crystals and very rare pockets of orange-brown fine sand and silt with occasional claystones		
1.20	D3			6.41	1.50	Stiff brown occasionally mottled grey silty fissured CLAY with abundant fine selenite crystals and very rare pockets of orange-brown fine sand and silt with occasional claystones		
1.80	D4							
2.20	D5				(2.40)			
2.90	D6							
3.50	D7							
4.00	D8			4.01	3.90	Stiff grey silty fissured CLAY with abundant selenite crystals and occasional claystones		
4.90	D9				(1.60)			
5.50	D10			2.41	5.50	Complete at 5.50m		

Remarks
Borehole No 3 carried out through base of Trial Pit No 3 for access
Local perched water was encountered within the made ground in the vicinity of existing foundations
Groundwater not encountered in borehole

Scale (approx)	Logged By
1:50	HD

Figure No.
J11225.BH 3

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site
11 St Chads Street, London, WC1H 8DG

Number
BH 4

Excavation Method	Dimensions	Ground Level (mTBM)	Client	Job Number
Drive-in Window Sampler		9.70	Elevenist Syndicate Limited	J11225
	Location Ground Floor Level	**Dates** 29/11/2011	**Engineer** Heyne Tillett Steel	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mTBM)	Depth (m) (Thickness)	Description	Legend	Water
				9.55	(0.15) 0.15	Concrete		
0.40	D1			9.20	(0.35) 0.50	Made Ground (greyish brown sand with loose brick fill, concrete, glass fragments and occasional gravel)		
0.70	D2			9.10	(0.10) 0.60	Concrete		
1.50	D3				(2.90)	Firm light brown fissured silty CLAY with very rare pockets of orange-brown fine sand and silt. Claystone encountered at a depth of 2.6 m		
2.10	D4							
2.70	D5							
3.10	D6			6.20	3.50	Stiff light brown fissured silty CLAY with very rare pockets of orange-brown fine sand and silt. Claystone encountered at a depth of 5.6 m		
3.80	D7							
4.20	D8				(2.20)			
4.90	D9							
5.50	D10			4.00	5.70	Complete at 5.70m		

Remarks
Borehole carried out through base of Trial Pit No 10
Groundwater not encountered

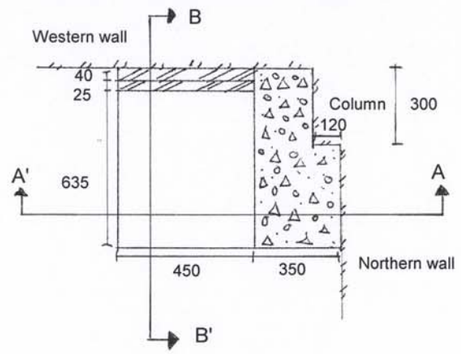
Scale (approx)	Logged By
1:50	HD

Figure No.
J11225.BH 4

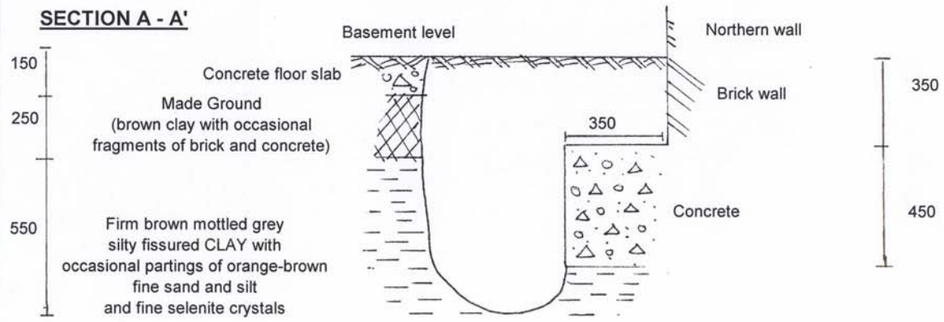
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	Site 11 St Chads Street, London, WC1H 8DG	Trial Pit Number 1

Excavation Method	Dimensions	Ground Level	Client	Job Number
Manual	800 x 700 x 950	7.91	Elevenist Syndicate Limited	J11225
	Location	**Dates**	**Engineer**	**Sheet**
		20/10/2011	Heyne Tillett Steel	1/21

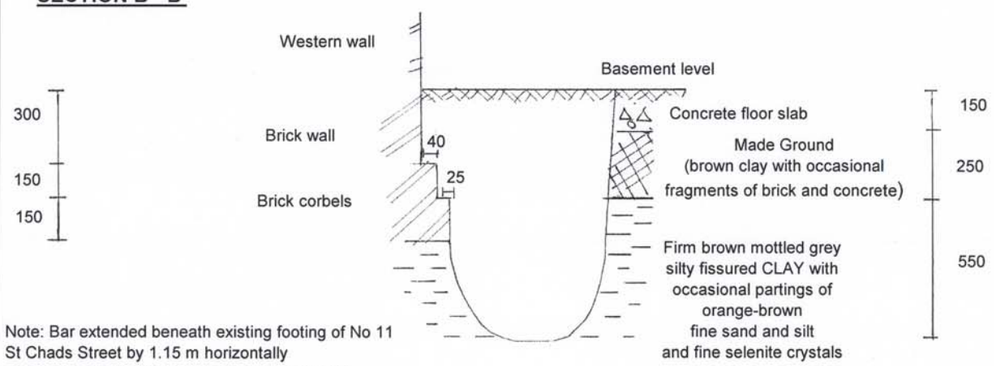
PLAN



SECTION A - A'



SECTION B - B'



Note: Bar extended beneath existing footing of No 11 St Chads Street by 1.15 m horizontally and the neightbourng wall was not encountered

Remarks:	Scale:
All dimensions in millimetres	1:20
Perched water encountered around base of existing footings	Logged by:
Borehole No 1 carried out through base of Trial Pit No 1	HD

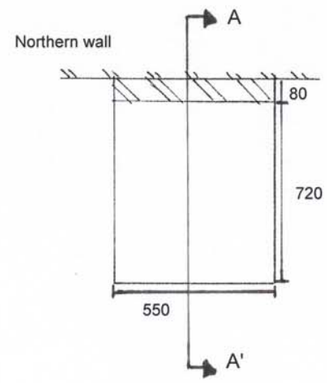
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Trial Pit No 1**

Site	11 St Chads Street, London, WC1H 8DG	Job Number J11225
Client	Elevenist Syndicate Limited	Sheet 2/21
Engineer	Heyne Tillett Steel	

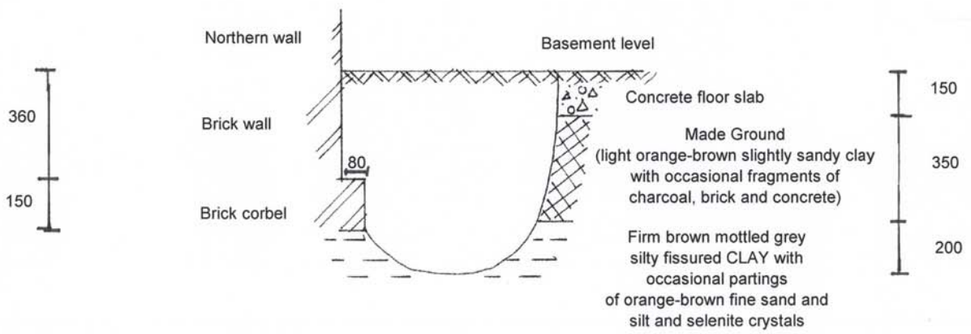
View of the footing encountered in Trial Pit No 1, looking west (20/10/2011)

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	Site 11 St Chads Street, London, WC1H 8DG	Trial Pit Number 2
Excavation Method Manual	**Dimensions** 800 x 550 x 700	**Ground Level** 7.91	**Client** Elevenist Syndicate Limited	**Job Number** J11225
	Location	**Dates** 20/10/2011	**Engineer** Heyne Tillett Steel	**Sheet** 3/21

PLAN



SECTION A - A'



Remarks: All dimensions in millimetres Groundwater not encountered	Scale: 1:20
	Logged by: HD

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Trial Pit No 2**
Site 11 St Chads Street, London, WC1H 8DG		**Job Number** J11225
Client Eleveist Syndicate Limited		**Sheet** 4/21
Engineer Heyne Tillett Steel		

View of the footing encountered in Trial Pit No 2, looking north (20/10/2011)