GROUND INVESTIGATION & BASEMENT IMPACT ASSESSMENT REPORT

King's Cross Methodist Church
58 Birkenhead Street
London
WC1H 8WB

PART 01

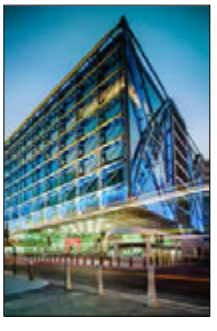
Client: West London Mission

Engineer: Conisbee

J14336

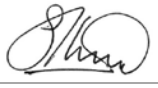
November 2015



GEA Geotechnical & Environmental Associates

Document Control

Project title	Kings Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Project ref**	J14336
Report prepared by			
	Matthew Legg BEng FGS	Jack Deaney BSc FGS	
With input from			
	Martin Cooper BEng CEng MICE FGS		
			
	John Evans MSc FGS CGeol		
			
	Rupert Evans MSc CEnv CWEM MCIWEM AIEMA		
Report checked and approved for issue by			
	Steve Branch BSc MSc CGeol FGS FRGS MIEnvSc		

Issue No	Status	Date	Approved for Issue
1	Final	12 March 2015	
2	Final (revised)	2 November 2015	

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

Geotechnical & Environmental Associates Limited (GEA) disclaims any responsibility to the Client and others in respect of any matters outside the scope of this work. This report has been prepared with reasonable skill, care and diligence within the terms of the contract with the Client and taking account of the manpower, resources, investigation and testing devoted to it in agreement with the Client. This report is confidential to the Client and GEA accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known, unless formally agreed beforehand. Any such party relies upon the report at their own risk. This report may provide advice based on an interpretation of legislation, guidance notes and codes of practice. GEA does not however provide legal advice and if specific legal advice is required a lawyer should be consulted.

CONTENTS

Part 3: GROUND MOVEMENT ANALYSIS

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 site investigation carried out by Geotechnical and Environmental Associates Limited (GEA), on the instructions of Conisbee, on behalf of West London Mission, with respect to the demolition of the existing church and the subsequent construction of a new five-storey and six-storey building with a single level basement across the entire footprint. The purpose of the investigation has been to research the history of the site, to determine the ground conditions, to identify the presence of contamination and to provide advice with respect to the design of suitable foundations and basement structure. This report has been revised to include a Basement Impact Assessment in order to comply with London Borough of Camden (LBC) Planning Guidance CPG4.

DESK STUDY FINDINGS

On the earliest historical map studied, Greenwood's map of London dated 1827, part of the existing church, which is understood to have been constructed by 1824, is shown to occupy the site, although the southwestern boundary was undeveloped. By 1877, the surrounding area had been extensively developed with mainly residential streets. A large rectangular building, approximately 100 m southeast of the site, was labelled as 'London General Depository', which was later annotated on the map dated 1916 as bottling stores. The aerial photograph dated 1946 shows the church building to have been extended across the remainder of the site and forming the present day layout. It was also by that time that a block of terraced houses directly to the southwest of the site had been demolished and replaced with a large building known as Belgrove House. The aerial photograph also indicates a number of terraced buildings to the southwest of the site had been demolished, which according to the bomb damage map of the area, was as a result of World War II bombing. By 1953, the damaged buildings had been cleared and replaced by the existing four blocks of apartments, which were constructed across Birkenhead Street.

GROUND CONDITIONS

Below a variable thickness of made ground, London Clay was found to overlie the Reading Formation of the Lambeth Group, which was proved to the full depth of investigation. The made ground was encountered to depths of between 0.22 m (14.84 m OD) and 2.20 m (14.96 m OD) and generally comprised brown, dark brown and dark grey clayey sandy silt with variable inclusions of gravel, brick, chalk and slate fragments. The London Clay initially comprised a weathered horizon of firm becoming stiff fissured high strength brown silty clay with partings of bluish grey and orange-brown silt, bluish grey staining along fissures and selenite crystals, which extended to depths of between 4.00 m (13.55 m OD) and 6.00 m (11.16 m OD). The weathered zone was underlain by typical unweathered London Clay which comprised stiff becoming very stiff fissured high strength to very high strength dark grey silty clay with pale grey veins, traces of selenite and occasional shell fragments and pyrite nodules, and was found to extend to a depth of 24.00 m (-6.84 m OD). Claystones were encountered at depths of 6.50 m (10.66 m OD) and 8.30 m (8.86 m OD) and below 18.00 m the clay increased in strength to extremely high strength and became sandy with partings of pale grey fine sand. The London Clay was underlain by the Reading Formation of the Lambeth Group, which comprised very stiff fissured reddish brown and brown mottled orange-brown and grey silty sandy clay, which was proved to the maximum depth investigated, of 30.00 m (-12.84 m OD). Groundwater was not encountered during drilling and the standpipe installed in Borehole No 1 was recorded to be dry during two monitoring visits carried out over a one month period.

RECOMMENDATIONS

Excavations for the proposed basement structure will require temporary support to maintain stability and to prevent any excessive ground movements. Based on the observations to date, groundwater is not likely to be encountered within the basement excavation. On this basis, the most appropriate method of constructing the basement and supporting the excavation sides will be through conventional mass concrete underpinning coupled with the use of a bored piled wall. On the basis that groundwater is unlikely to be encountered within the basement excavation a contiguous bored piled wall may be the most suitable option. As the basement structure will not intercept the groundwater table, it is unlikely to have an effect on the local hydrogeology. There is considered to be a low risk to end users from contamination and therefore a requirement for remedial measures is not envisaged.

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

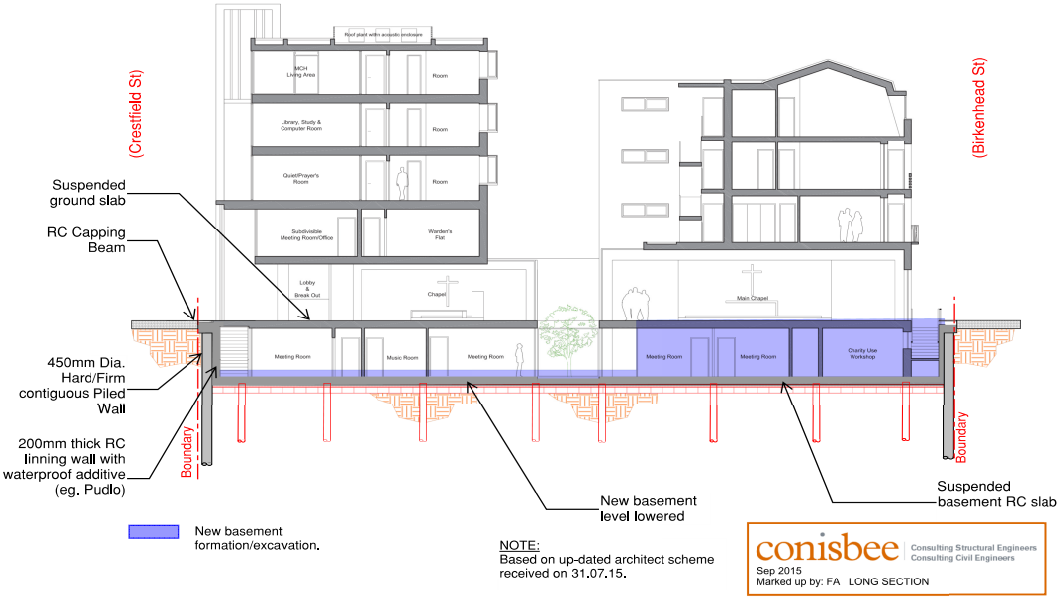
Geotechnical and Environmental Associates (GEA) has been commissioned by Conisbee, on behalf of West London Mission, to carry out a site investigation at the site of King's Cross Methodist Church, 58 Birkenhead Road, London WC1H 8BW.

This report has been revised to form part of a Basement Impact Assessment (BIA), including a ground movement analysis and damage assessment, which has been carried out in accordance with guidelines from the London Borough of Camden in support of a planning application.

1.1 Proposed Development

It is proposed to demolish the existing superstructure, whilst retaining the existing basement, and subsequently construct a new five-storey and four-storey building. The existing basement will be lowered by approximately 0.50 m and will be extended below the remaining footprint of the site. The new building will be used as a church on the lower levels, with a mixture of private and ancillary accommodation above

A cross-section through the proposed development is shown below.



This report is specific to the proposed development and the advice herein should be reviewed once the development proposals have been finalised.

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 investigate the configuration of existing foundations;
- to assess the possible impact of the proposed development on the local hydrogeology and hydrology and on surrounding structures;
- 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 historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database;
- a review of bomb damage maps; 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:

- a single borehole, advanced to a depth of 30.00 m, by means of a dismantlable cable percussion drilling rig;
- standard penetration tests (SPTs), carried out at regular intervals in the borehole, to provide additional quantitative data on the strength of the soils;
- two window sampler boreholes, advanced to depths of 5.30 m and 6.20 m;
- the installation of a single groundwater monitoring standpipe to depth of 6.00 m and two subsequent monitoring visits over a one month period;
- seven 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

The work carried out also includes a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment), all of 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 Arup Report'). The aim of the work is to provide information on surface water, groundwater and land stability and in particular to assess whether the development will affect neighbouring properties or groundwater movements and whether any identified impacts can be appropriately mitigated by the design of the development.

1.3.2 Qualifications

The land stability element of the Basement Impact Assessment (BIA) has been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng), member of the Institution of Civil Engineers (MICE), and Fellow of the Geological Society (FGS) who has over 20 years' specialist experience in ground engineering. The subterranean (groundwater) flow assessment has been carried out by John Evans, MSc in Hydrogeology, Chartered Geologist (CGeol) and Fellow of the Geological Society of London (FGS). The surface water and flooding assessment has been carried out by Rupert Evans, a hydrologist with more than ten years consultancy experience in flood risk assessment, surface water drainage schemes and hydrology / hydraulic modelling. Rupert Evans is a Chartered Environmentalist, Chartered Water and Environmental Manager and a Member of CIWEM.

The assessments have 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 over 25 years' experience in geotechnical engineering and engineering geology.

All assessors meet 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

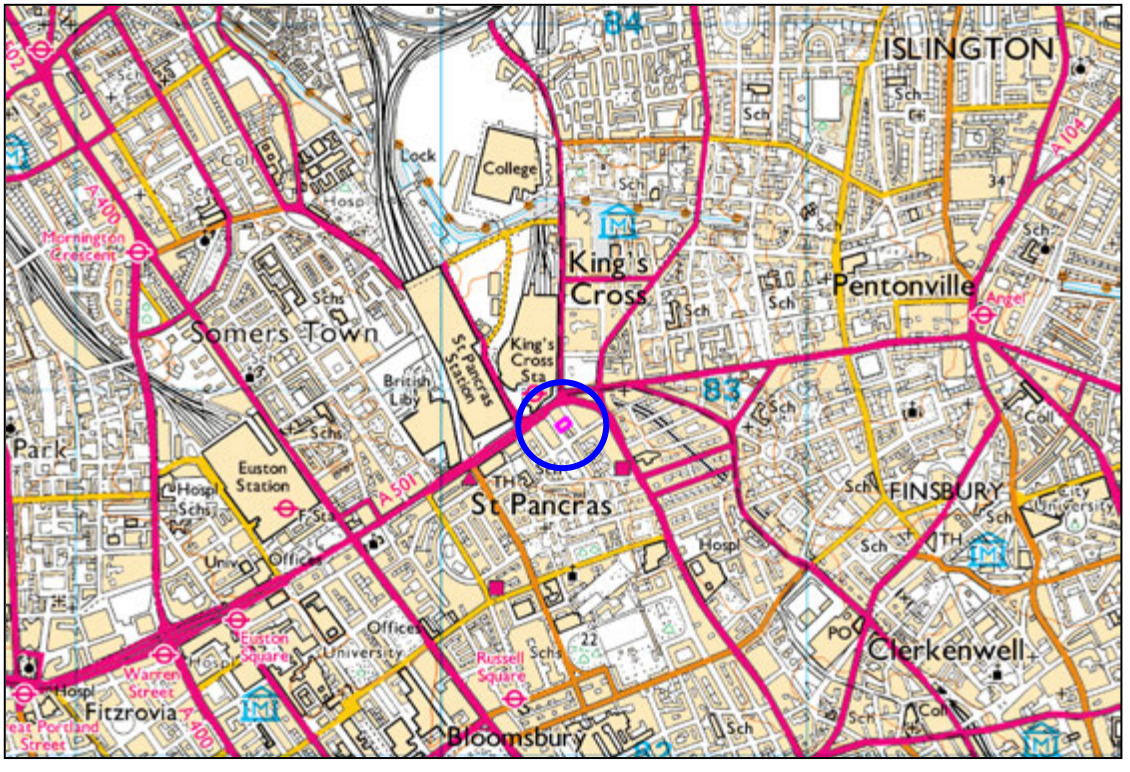
1 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004
2 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells* July 2015
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

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 in the London Borough of Camden, approximately 100 m to the southeast of King's Cross railway station and 800 m northeast of Euston railway station. The site may be additionally located by National Grid Reference 530339,182911 and is shown on the map below.



The site covers a roughly rectangular shaped area with maximum dimensions of approximately 35 m northeast-southeast by 20 m northwest-southwest and is occupied by King's Cross Methodist Church. The building is formed of three stories across the northeastern half of the site, which also includes a single level basement that extends to a depth of approximately 2.0 m below ground level, whilst a two-storey section is present across the remainder of the site. Two lightwells are also present at basement level along the northern and southern extent of the three-storey section of the building and a small paved entrance courtyard is present along the boundary with Birkenhead Street.

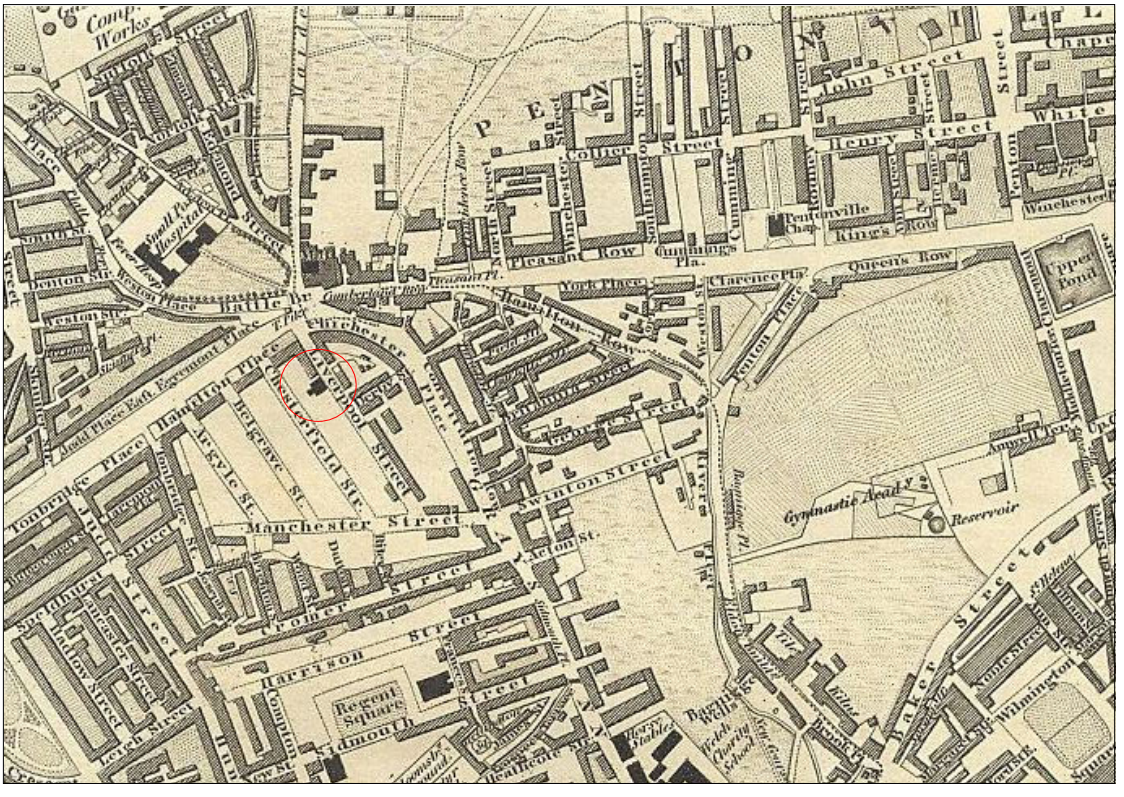
The site fronts onto Birkenhead Street to the northeast and Crestfield Street to the southwest and is bordered to the northwest by three-storey terraced properties that include lower ground floor levels and to the southeast by similar three-storey terraced properties that also include mansard roofs. The existing building and associated areas of hardstanding occupy the entire site, which is therefore devoid of vegetation and with the exception of the varying levels due to the partial basement, the site and the surrounding area are essentially level, although topographically the surrounding area slopes up towards the north beyond King's Cross

Station. A number of Network Rail and London Underground railway tunnels are present between 40 m and 50 m to the north of the site, below Euston Road.

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 historical map studied, Greenwood's map of London dated 1827, shows both Crestfield Street and Birkenhead Street to have been constructed, although Birkenhead Street was known as Liverpool Street at that time. An extract of the map is shown below, which indicates that the surrounding area had also been well developed by that time. In addition, a building is shown to already occupy the site, which is thought to be part of the existing church as an existing plaque on the wall of the church and online information indicates that the church was first constructed in 1824.



The earliest Ordnance Survey (OS) map studied, dated 1877, shows the site in more detail and occupied by a church building, although at that time it did not occupy the entire site, with the southwestern boundary undeveloped. It was by that time that the surrounding area had been extensively developed with mainly residential streets, although both King's Cross station and St Pancras Station had been constructed to the northwest. A large rectangular building, approximately 100 m southeast of the site, was labelled as 'London General Depository', which was later annotated on the map dated 1916 as bottling stores.

An aerial photograph dated 1946 shows the church building to have been extended across the remainder of the site to form the present day layout. It was also by that time that a block of terraced houses directly to the southwest of the site had been demolished and replaced with a large building known as Belgrove House. The aerial photograph also indicates that a number

of terraced buildings to the southwest of the site had been demolished, presumably as a result of World War II (WWII) bomb damage. A review of the bomb damage map of the area confirms that these buildings were either totally destroyed or damaged beyond repair. The site however is not shown to have suffered any bomb damage during WWII.

By 1953, the damaged buildings had been cleared and replaced by the existing four blocks of apartments that were constructed across Liverpool Street, which had been renamed to Birkenhead Street. The site and surrounding area have remained essentially unchanged since that time to the present day, although some time after 1976, the bottling stores to the southeast of the site became a depot, which is still present today.

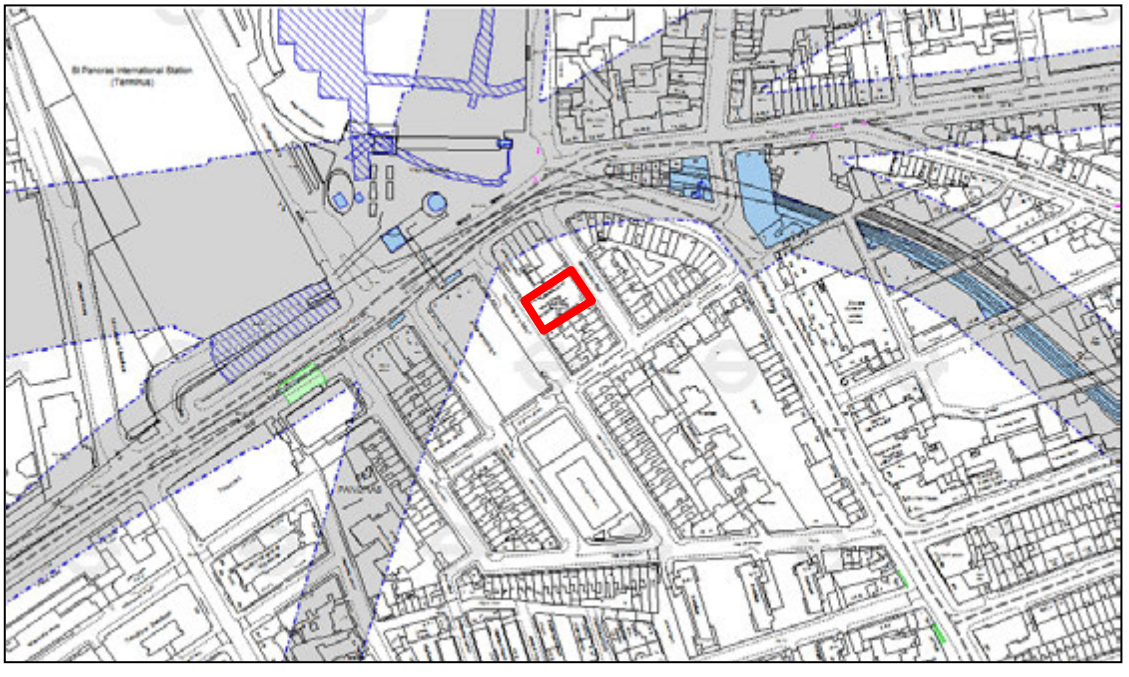
2.3 Other Information

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 can be provided if required.

The search has revealed that there are no landfills, waste management, transfer, treatment or disposal sites within 500 m of the site. There have also not been any recorded pollution incidents to controlled waters within 250 m of the site and there are no registered contaminated land sites within 500 m.

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.

A search of online Transport for London (TfL) infrastructure maps[4] has indicated that the site is not located within the exclusion zones of any underground tunnels, as shown by the map extract below.

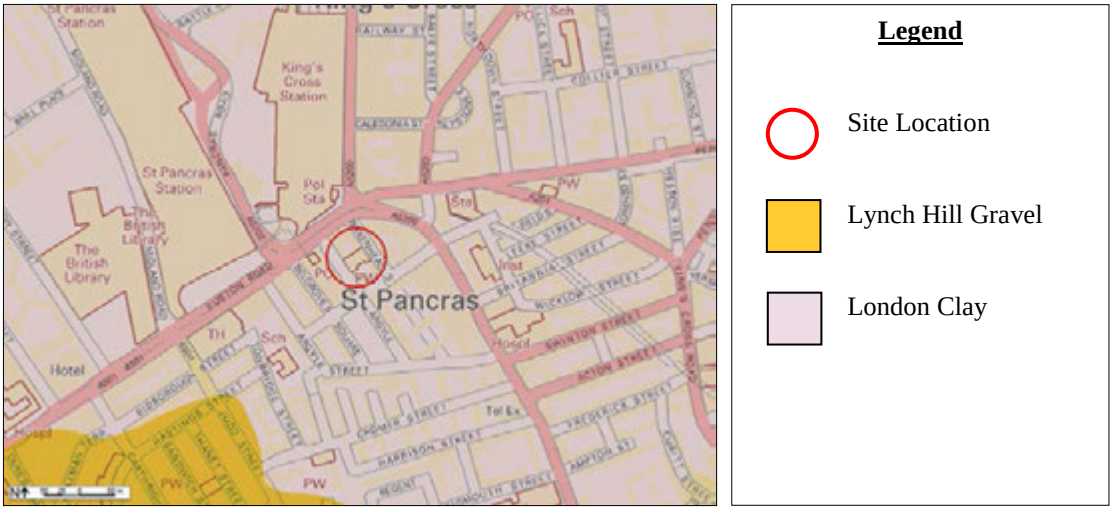


4 https://par.tfl.gov.uk/propertymap/Full.aspx

The plan below indicates lower ground floor and basement levels in the buildings neighbouring the site, which has been compiled using information from the site walkover and information available on the Local Authority planning portal.

2.4 Geology

The British Geological Survey (BGS) map of the area (sheet 256) indicates that the site is underlain by the London Clay Formation from the surface, as shown by the digital geological map extract below. The geological map also indicates that the site is located approximately 260 m northwest of the boundary with the overlying river terrace gravel of the Lynch Hill Gravel.



Information from a number of previous GEA investigations and records held by the BGS of boreholes advanced close to the site, confirms that the London Clay Formation is present below a cover of made ground. Furthermore, this formation was found to extend to a depth of approximately 22 m below ground level, whereupon a thin layer of the Harwich Formation is present over the Reading Formation of the Lambeth Group.

2.5 Hydrology and Hydrogeology

The London Clay is classified as a Non-Aquifer and Unproductive Stratum, which refers to a soil or rock with low permeability that has a negligible effect on local water supply or river base flow, as defined by the Environment Agency (EA). On the basis of the above, groundwater is unlikely to be present within the London Clay, with the exception of perched groundwater within fissures and silt and sand partings.

Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10^{-10} m/s and 1 x 10^{-8} m/s, with an even lower vertical permeability.

The topographical maps show that the nearest surface water feature is the Grand Union Canal, which is located approximately 590 m to the north of the site, which is therefore not within an area at risk from flooding, as defined by the EA. The site is located approximately 90 m south of the former course of one of London's Lost Rivers, the River Fleet[5]. The source of the river is in Hampstead Heath from where it flowed southwards through Camden, Kentish Town and Kings Cross close to the site. From there it flowed through Clerkenwell and south down Farringdon Road, where it issued into the Thames below Blackfriars Bridge. Although the former river has been culverted, groundwater flow in the area is still likely to migrate towards the former line of the river.

Neither Birkenhead Street or Crestfield Street are listed in the Guidance for Subterranean Development[6] prepared by Arup as being at risk from surface water flooding, nor is there a record of them having suffered from such an event in the past. The site is however shown to be located close to an area with the potential to be at risk from surface water flooding, which is approximately 100 m to the northeast/east of the site.

2.6 Preliminary Contamination 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

5 Nicholas Barton (2000) *London's Lost Rivers.* Historical Publications Ltd
6 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

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 a church since 1824 and as such no sources of potential contamination have been identified. In addition, the desk study has also not indicated any potential sources of contamination within the immediate surrounding area.

2.6.2 Receptor

The proposed use of the new building as a church on the lower levels with residential apartments above represents a relatively low sensitivity end-use. End users are not considered to be a particularly sensitive receptor and as the underlying London Clay is a Non-Aquifer, groundwater is not considered to be a sensitive receptor. Site workers will come into contact with underlying soils during the construction phase, as will new buried services. Neighbouring sites would also be considered to be moderately sensitive receptors.

2.6.3 Pathway

As the proposed building, including the basement level, will occupy the entire site, there is not considered to be a pathway between end users and the underlying soil. As groundwater is not expected to be present below the site, there is not considered to be a pathway by which contamination can migrate off or on to site, other than within any perched water movements within the made ground on the interface of the London Clay. This pathway is however considered to already be in existence. The construction phase is considered to be a pathway by which site workers and new buried services may come in contact with any contamination.

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. Furthermore as there is no evidence of filled ground within the vicinity, there is not considered to be a significant potential for hazardous soil gas to be present on or migrating towards the site; there should thus be no need to consider soil gas exclusion systems.

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 Appendices E1, E2 and E3 which include a series of questions within screening flowcharts for surface flow and flooding, subterranean (groundwater) flow and land stability. The flowchart questions and responses to these questions are tabulated overleaf.

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for 58 Birkenhead Street
1a. Is the site located directly above an aquifer?	No. The site is underlain by the London Clay Formation, which classified as a non-aquifer.
1b. Will the proposed basement extend beneath the water table surface?	Unlikely. A continuous groundwater table is not present within the London Clay.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	Yes. The site is approximately 90 m to the south of the former River Fleet.
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. The proposed building footprint will occupy the same area as the existing building and therefore will occupy the site in its entirety.
5. As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No. Run-off from hardstanding will remain the same.
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 identified the following potential issues that need to be assessed:

Q2 The site is located within 100 m of the former River Fleet.

3.1.2 Stability Screening Assessment

Question	Response for 58 Birkenhead Street
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.
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?	No.
8. Is the site within 100 m of a watercourse or potential spring line?	Yes. The site is approximately 90 m to the south of the former 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.

Question	Response for 58 Birkenhead Street
12. Is the site within 5 m of a highway or pedestrian right of way?	Yes. Crestfield Street and Birkenhead Street both border the site to the southwest and northeast respectively.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes. The lowering of the basement and the basement extension below the remaining footprint of the site is likely to result in differential founding depths.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No.

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

Q5 The London Clay is the shallowest strata.
Q8 The site is located within 100 m of the former River Fleet.
Q12 The site borders both Crestfield Street and Birkenhead Street.
Q13 The basement extension is likely to result in differential founding depths.

3.1.3 Surface Flow and Flooding Screening Assessment

Question	Response for 58 Birkenhead 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. There will not be an increase in impermeable area across the ground surface. There will be no surface expression of the basement development, so the surface water flow regime will be unchanged. The basement will be located under the proposed building and therefore the ground surface above the basement will not change and will remain as hardstanding. This will ensure no increase in runoff rate or volume as a result of the proposed basement construction.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. There will not be an increase in impermeable area across the ground surface above the basement.
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. There will not be an increase in impermeable area across the ground surface above the basement. The basement will be entirely beneath the footprint of the proposed building and therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report does not generally apply.
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	
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 Camden Flood Risk Management Strategy dated 2013, North London Strategic Flood Risk Assessment dated 2008, and Environment Agency online flood maps show that the site has a low flooding risk from surface water, sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses.

The above assessment has not identified any potential issues that need further assessment, although the hydrological setting is discussed further within this report.

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 impacts are assessed for each of the identified potential impact factors.

4.1 Potential Impacts

The following potential impacts have been identified by the screening process

Potential Impact	Consequence
Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	The site is approximately 90 m south of the former course line of the River Fleet. Whilst this feature may indicate a shallow groundwater table and may also pose a risk to the site from flooding, the former river has been culverted. Furthermore, the site is not shown to be an area at risk of flooding and therefore this is not considered to be an issue to the site or the proposed development.
5. Is the London Clay the shallowest strata at the site?	The London Clay is formed of highly shrinkable clay soils that are of high plasticity. This means that it can be affected by seasonal shrinking and swelling caused by tree growth and / or tree removal, which can lead to movement and instability of nearby structures. In addition, the unloading of the clay soils will result in heave movements, which can cause a level of damage to neighbouring structures.
Is the site located within 5 m of a public highway or pedestrian right of way?	The public walkway of both Crestfield Street and Birkenhead Street borders the site to the southwest and northeast respectively. The excavation of a basement can cause instability of such structures.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Where differential founding depths between adjacent foundations occur, it may result in structural damage to both the neighbouring structures and the proposed development if foundations are not designed to support additional loading or where neighbouring foundations are not underpinned.

Whilst the ground investigation was carried out prior to the completion of the screening and scoping sections, the scope of the previous investigation, as detailed below, is considered to have been sufficient in order to investigate the above potential impacts.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2, a single borehole was drilled to a depth of 30.00 m using a dismantlable cable percussion drilling rig. Standard penetration tests (SPTs) were carried out at regular intervals in the borehole and disturbed and undisturbed samples were recovered for subsequent laboratory examination and testing. These boreholes were supplemented by two window sampler boreholes, advanced to depths of 5.30 m and 6.20 m under the supervision of a geotechnical engineer from GEA.

A groundwater monitoring standpipe was installed in the cable percussion borehole to a depth of 6.00 m and has subsequently been monitored on two occasions over a one month period.

In addition to the boreholes, seven trial pits were manually excavated adjacent to various existing external elevations and boundary walls in order to expose and allow the inspection of the existing foundations by the GEA engineer.

The borehole and trial pit records and results of the laboratory analyses are appended, together with a site plan indicating the exploratory positions. The Ordnance Datum (OD) levels shown on the borehole and trial pit records and quoted within this report have been interpolated from spot heights shown on a site plan (ref: SSK001, dated October 2014) provided by Consibee, the consulting engineers.

4.3 Sampling Strategy

The borehole and trial pit locations were specified by the consulting engineers and positioned on site by GEA to provide optimum coverage of the site with due regard to the proposed development, whilst avoiding 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 sample was 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.

A number of disturbed and undisturbed samples recovered from the cable percussion boreholes were submitted to a geotechnical laboratory for a programme of testing that included undrained triaxial compression tests, moisture content and Atterberg limit tests and soluble sulphate and pH level analysis.

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 encountered the expected ground conditions in that, below a variable thickness of made ground, the London Clay Formation was encountered and underlain by the Reading Formation of the Lambeth Group, which was proved to the maximum depth investigated.

5.1 Made Ground

The made ground was encountered to depths of between 0.22 m (14.84 m OD) and 2.20 m (14.96 m OD), with the greater thicknesses encountered where the boreholes were advanced from a higher level. It generally comprised brown, dark brown and dark grey clayey sandy silt with variable inclusions of gravel, brick, chalk and slate fragments.

With the exception of notable fragments of extraneous material, no visual or olfactory evidence of significant contamination was observed within these soils, although four samples have been analysed for a range of contaminants and the results are summarised in Section 4.5.

5.2 London Clay Formation

The London Clay initially comprised a weathered horizon of firm becoming stiff fissured high strength brown silty clay with partings of bluish grey and orange-brown silt, bluish grey

staining along fissures and selenite crystals. The initial horizon extended to depths of between 4.00 m (13.55 m OD) and 6.00 m (11.16 m OD), whereupon typical unweathered London Clay was encountered and comprised stiff becoming very stiff fissured high strength to very high strength dark grey silty clay with pale grey veins, traces of selenite and occasional shell fragments and pyrite nodules, which was proved to a depth of 24.00 m (-6.84 m OD).

Claystones were encountered at depths of 6.50 m (10.66 m OD) and 8.30 m (8.86 m OD) and below 18.00 m (-0.84 m OD) the clay increased in strength to extremely high strength and became sandy with partings of pale grey fine sand.

Atterberg limit tests have indicated the clay to be of high shrinkability with plasticity indices ranging from 47% and 52 %. The clay was also noted to generally increase in strength with depth with the undrained shear strength increasing from 92 kPa to 387 kPa.

These soils were observed to be free of any evidence of soil contamination.

5.3 Reading Formation

This stratum consisted of the Upper Mottled Beds, which comprised very stiff fissured reddish brown and brown mottled orange-brown and grey silty sandy clay, which was proved to the maximum depth investigated, of 30.00 m (-12.84 m OD).

The soils were found to be of high shrinkability and free of any evidence of soil contamination.

5.4 Groundwater

Groundwater was not encountered during drilling of the boreholes and the standpipe installed in Borehole No 1 was recorded to be dry during two monitoring visits carried out over a one month period. A perched groundwater level of 0.30 m (14.58 m OD) was encountered in the made ground in Trial Pit No 2.

5.5 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 – 0.2 m	TP3 – 0.4 m	TP4 – 0.1 m	TP5 – 0.3 m
pH	7.7	8.7	8.2	8.0
Arsenic	82	29	10	13
Cadmium	3.5	0.11	0.12	0.15
Chromium	56	24	45	48
Copper	430	76	37	38
Mercury	3.5	6.8	0.22	0.13
Nickel	77	26	47	52
Lead	**3000**	2100	50	33
Selenium	0.99	<0.20	<0.20	<0.20

Determinant	TP1 – 0.2 m	TP3 – 0.4 m	TP4 – 0.1 m	TP5 – 0.3 m
Zinc	1300	100	81	81
Total Cyanide	5.4	<0.5	<0.5	<0.5
Total Phenols	<0.3	<0.3	<0.3	<0.3
Sulphide	2.3	2.0	2.2	1.9
Total TPH	150	25	<10	450
Naphthalene	0.23	<0.1	<0.1	0.13
Benzo(a)pyrene	5.0	1.0	<0.1	<0.1
Total PAH	57	15	<2	2.8
Total organic carbon %	7.7	1.7	0.5	0.51
Note: Figure in **bold** indicates concentration in excess of risk-based soil guideline values, as discussed below				

5.5.1 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 table below indicates those contaminants of concern that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[7] Soil Guideline Value where available, or is a Generic Screening Value calculated using the CLEA UK Version 1.06[8] software assuming a commercial end use, or is based on the DEFRA Category 4 Screening values[9]. The key generic assumptions for this end use are as follows:

- that groundwater is not a critical risk receptor;
- that the critical receptor for human health will be working female adults aged 16 to 65 years old;
- that young children will not have prolonged exposure to the site;
- that the exposure duration will be a working lifetime of 49 years;
- 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 commercial building.

It is considered that these assumptions are considered acceptable for this generic 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.

7 *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.
8 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.06 Environment Agency 2009
9 CL:AIRE (2013) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Final Project Report SP1010 and DEFRA (2014) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Policy Companion Document SP1010

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.

The contamination testing has revealed a single elevated concentration of lead within a sample of made ground recovered from Trial Pit No 1 at a depth of 0.2 m. This assessment is based upon the potential for risk to human health, which at this site is considered to be the critical risk receptor. The significance of the contamination results is considered further in Part 2 of the report.

5.6 Existing Foundations

Trial Pit No 1 was excavated adjacent to the northwestern party wall, but the base of footing was not encountered at the maximum extent of the trial pit, at a depth of 1.30 m (16.41 m OD). Trial Pit Nos 2 and 6 were also excavated adjacent to this party wall, although from a lower level. The foundations were found to be bearing on London Clay at 0.30 m (14.58 m OD) and 0.60 m (14.51 m OD) respectively.

Trial Pit No 3 was excavated adjacent to the northwestern elevation of the two-storey section of the church, which was found to be supported by a concrete footing bearing within the made ground at a depth of 0.70 m (16.33 m OD). Trial Pit No 4 was excavated at basement level, adjacent to the dividing wall between the two-storey section and the five-storey section of the church, which was found to be supported by brick footing bearing on the London Clay at a depth of 0.30 m (14.76 m OD).

The southeastern party wall was found to be supported by a concrete footing bearing within the London Clay at a depth of 0.60 m (14.45 m OD and 14.46 m OD), as indicated by Trial Pit Nos 5 and 7 respectively.

Logs and photographs are included within 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 other aspects of the development.

6.0 INTRODUCTION

Following the demolition of the existing superstructure, it is understood that it is proposed to construct a new five-storey and four-storey building, whilst the existing basement will be lowered by approximately 1.0 m and will be extended below the remaining footprint of the site. Loads are not known at this stage but are anticipated to moderate to high.

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 church since 1827. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- Below a variable thickness of made ground, the London Clay Formation is present over the Reading Formation of the Lambeth Group, which was proved to the maximum depth investigated;
- the made ground generally extends to depths of between 0.22 m (14.84 m OD) and 2.20 m (14.96 m OD), with the greater thicknesses encountered from ground floor level;
- below the made ground, weathered London Clay extends to depths of between 4.00 m (13.55 m OD) and 6.00 m (11.16 m OD), and is underlain by typical unweathered London Clay to a depth of 24.00 m (-6.84 m OD);
- claystones were encountered at 6.50 m (10.66 m OD) and 8.30 m (8.86 m OD) and below 18.00 m (-0.84 m OD) the clay becomes increasingly more sandy with partings of pale grey sand;
- the London Clay is of high plasticity and increases in strength with depth, with the undrained shear strength increasing from 92 kPa to 387 kPa;
- the underlying Lambeth Group comprises very stiff fissured reddish brown and brown mottled orange-brown and grey silty sandy clay, which is present to the maximum depth investigated, of 30.00 m (-12.84 m OD);
- a continuous groundwater level has not been found beneath the site, although perched groundwater is present in close proximity of existing foundations; and
- the made ground is generally free from significant contamination, however an elevated concentration of lead has been recorded in a single sample of made ground.

8.0 ADVICE AND RECOMMENDATIONS

It is understood that the existing basement will be lowered by 1.0 m and extended under the entire footprint of the site. Significant groundwater inflows are unlikely to be encountered within the basement excavation and therefore the use of conventional underpinning coupled with the use of a bored pile retaining wall is likely to be the best option of constructing the basement.

On the basis of the anticipated moderate to high loads, piled foundations are likely to be required, although consideration may also be given to the use of a basement raft foundation.

8.1 Basement Excavation

The formation level for the basement is likely to be within the stiff London Clay at a depth of approximately 3.00 m below ground level, at a level of approximately 14.05 m OD. On the basis of the observations to date, significant groundwater inflows are not anticipated to be encountered within the basement excavation, although minor inflows from pockets of perched water may be encountered. As with any basement project in low permeability soil, these inflows are unlikely to be prolonged and should be adequately dealt with using sump pumping.

There are a number of methods by which the sides of the basement excavation could be supported in the temporary and permanent conditions. The choice of wall may be governed to a large extent by whether it is to be incorporated into the permanent works and have a load bearing function. The final choice will depend to a large extent on the need to protect nearby structures from movements, the required overall stiffness of the support system, and the need to control groundwater movement through the wall in the temporary condition. In this respect the stability of the adjacent buildings and surrounding highway structures will be paramount.

On the basis of the trial pit observations, the use of conventional mass concrete underpinning using a 'hit and miss' approach is likely to be the most suitable option of extending the existing basement down by the proposed 1.0 m. Perched groundwater may be encountered in close proximity of existing foundations, although as discussed above, these inflows should be adequately dealt with using sump pumping. It would however be prudent for the chosen contractor to have a contingency plan in place to deal with more significant inflows as a precautionary measure.

For the proposed new basement extension, the use of localised underpinning, coupled with a bored piled wall for the basement extension under the southwestern half of the site, is likely to be most suitable option of supporting the excavation. On the basis that groundwater is unlikely to be encountered, a contiguous bored piled wall may be suitable, although the use of a secant bored pile wall generally provides an additional amount of stiffness, negates the requirement for any secondary groundwater control and also maximises the useable space within the basement structure. The use of sheet piles is not considered to be a viable option due to the noise and vibrations associated with their installation.

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 and the timing of the provision of support to the wall will have an important effect on movements. In this respect the use of a top-down construction sequence may provide an appropriate construction method as casting of the slabs to the ground and first basement level will provide permanent support to the retaining walls. Careful workmanship will be required in

the construction of the underpins and it is recommended that a suitable specialist contractor is consulted in this respect.

8.1.1 Basement Retaining Walls

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

Stratum	Bulk Density (kg/m^3)	Effective Cohesion ($c' - kN/m^2$)	Effective Friction Angle (Φ' – degrees)
Made ground	1700	Zero	27
London Clay	2000	Zero	25

Groundwater is unlikely to be encountered within the excavation, although monitoring of the standpipe should be continued in order to establish equilibrium levels. At this stage, it is recommended that for the design of the retaining walls, that groundwater level should be assumed to be ¾ of the retained height, unless the risk of groundwater and surface water collecting behind the retaining walls can be suitably mitigated through the use of a fully effective drainage system. The advice in BS8102:2009[10] should be followed in the design of the basement retaining walls and with regard to waterproofing requirements.

8.1.2 Basement Heave

The unloading of the soil will vary across the basement footprint due to the differences in depth of excavation. Where only a 1.00 m deep excavation is proposed a net unloading of around 20 kN/m^2 will occur, whilst in the area of the basement extension, which will require an approximately 3.00 m deep excavation, there will be an unloading of about 60 kN/m^2, resulting in heave of the underlying London Clay. This will comprise immediate elastic movement, which will account for approximately 50% of the total movement and be expected to be complete during the construction period, and long term movements, which will theoretically take many years to complete. These movements will, to some extent, be mitigated by the retained basement structure and the loads imposed by the proposed building.

On the basis of the unloading of the soil alone, it has been estimated that short term heave of between less than 5 mm and 5 mm to 10 mm is likely to occur, whilst total heave movements are likely to be in the order of between 5 mm and about 20 mm. The higher movements are likely to occur across the southwestern portion of the proposed basement where the greater unloading will take place due to the basement extension. However, as discussed above, these movements will be minimised by the loads of the proposed structure and furthermore this analysis has not taken into account the loads being applied by the existing building. As such, modelling the soil on the basis of an unloaded state and without taking into account the loads of the new building, provides a worst case scenario.

8.2 Piled Foundations

For the ground conditions at this site some form of bored pile is likely to be the most appropriate type. A conventional rotary augered pile may be appropriate, with temporary casing installed to maintain stability and prevent groundwater inflows, or alternatively the use of bored piles installed using continuous flight auger (cfa) techniques, which would not require the provision of casing, would also be appropriate.

10 BS8102 (2009) *Code of practice for protection of below ground structures against water from the ground*

The following table of ultimate coefficients may be used for the preliminary design of bored piles, based on the SPT & Cohesion / level graph in the appendix.

Ultimate Skin Friction		**kN/m^2**
Made Ground and London Clay	All soil above 14.50 m OD	Ignore (basement)
London Clay ($\alpha = 0.5$)	14.50 m OD to -6.80 m OD	Increasing linearly from 55 to 110
Lambeth Group ($\alpha = 0.5$)	-6.80 m OD to -12.84 m OD	Increasing linearly from 110 to 145
Ultimate End Bearing		**kN/m^2**
London Clay	2.05 m OD to -6.80 m OD	Increasing linearly from 1485 to 2025
Lambeth Group	-6.80 m OD to -12.84 m OD	Increasing linearly from 2025 to 2610

In the absence of pile tests, guidance from the London District Surveyors Association[11] (LDSA) suggests that a factor of safety of 2.6 should be applied to the above coefficients in the computation of safe theoretical working loads. On the basis of the above coefficients and a factor of safety of 2.6, it has been estimated that a 450 mm diameter pile founding at a depth of 12.5 m below basement level at a toe level of approximately 2 m OD, should provide a safe working load of about 515 kN, whilst the same diameter pile founding at 17.5 m below basement level, about -3.5 m OD, should provide a safe working load of about 785 kN. A 600 mm diameter pile founding at the same depth should provide a safe working load of about 1100 kN.

The above examples are not intended to constitute any form of recommendation with regard to pile size or type, but merely serve to illustrate the use of the above coefficients. Specialist piling contractors should be consulted with regard to the design of a suitable piling scheme for this site and their attention should be drawn to the presence of claystones and the possibility of associated groundwater inflows.

8.3 Spread Foundations

The excavation to form the basement level will result in a formation level in the London Clay. Spread foundations excavated from below basement level may be designed to apply a net allowable bearing pressure of 175 kN/m^2 below the level of the proposed basement floor. This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

8.4 Basement Raft

Given the ground conditions at this site, a raft foundation would be considered a viable option, although the suitability of a raft foundation will depend on the resultant net load of the

11 LDSA (2009) *Foundations No 1 – Guidance notes for the design of straight shafted bored piles in London Clay*. LDSA Publication

new structure, taking into consideration the overburden and potential heave associated with the basement excavation. The raft would need to be designed to be rigid to resist any variation in upwards and downwards forces, in order to prevent differential movements. In this respect, if a raft is considered and once the loads have been finalised, it would be prudent to carry out additional analysis in order to determine the likely heave / settlements associated with the use of a raft foundation.

8.5 Shallow Excavations

On the basis of the trial pit findings, it is considered likely that it will be feasible to form relatively shallow excavations that extend through the made ground and terminate within the underlying clay without the requirement for lateral support, although localised instabilities may occur from within the made ground. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides will be required in order to comply with normal safety requirements.

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.

8.6 Basement Slab

Following the excavation of the basement, it is likely that the basement slab will need to be suspended over a void or a layer of compressible material to accommodate the anticipated heave, unless the slab can be suitably reinforced to cope with these movements and / or sufficiently anchored using tension piles.

8.7 Effect of Sulphates

Generally high concentrations of total sulphate have been measured in selected soil samples and therefore indicate that buried concrete could be designed in accordance with Class DS-4 conditions of Table C2 of BRE Special Digest 1: SD1 Third Edition (2005). The measured pH conditions are near neutral and therefore on the basis of static groundwater conditions being assumed for buried concrete an ACEC classification of AC-3s may be adopted.

The guidelines contained in the above digest should be followed in the design of foundation concrete.

8.8 Site Specific Risk Assessment

The chemical analyses have revealed a single elevated concentration of lead. No other elevated concentrations of the contaminants tested were identified. Furthermore, the desk study has indicated that the site has not had a contaminative history and therefore there is not considered to be a risk of significant contamination being present at the site. In any case, the made ground will be removed by the basement excavation, which will occupy the entire site and therefore with a combination of source removal and a permanent barrier there is not a continued risk to future end users of the site.

8.9 Waste Disposal

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE guidance[12], will need to be disposed of to a licensed tip. Under the European Waste Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste going to landfill is subject to landfill tax at either the standard rate of £80 per tonne (about £145 per m^3) or at the lower rate of £2.50 per tonne (roughly £5 per m^3). However, the classification for tax purposes is not the same as that for disposal purposes. Currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring rocks and soils which are accurately described as such in terms of the 2011 Order[13] would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the Environment Agency[14] it is considered likely that the made ground from this site, as represented by the chemical analyses carried out, would be classified as a NON-HAZARDOUS waste under the waste code 17 05 04 (soils and stones not containing dangerous substances) and would be taxable at the standard rate. It is likely that the natural soils, if separated out, could be classified as an INERT waste also under the waste code 17 05 04. This material would be taxable at the lower rate, if accurately described as naturally occurring sand and gravel in terms of the 2011 Order on the waste transfer note. As this site has not had a contaminative history there should be no requirement for WAC leaching analyses to confirm that this material is suitable for landfilling, although this would require confirmation from the receiving site.

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[15] 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 and its likely landfill taxable rate is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

The local waste regulation department of the Environment Agency should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

12 CL:AIRE (2011) *The Definition of Waste: Development Industry Code of Practice* Version 2, March 2011
13 *Landfill Tax (Qualifying Material) Order 2011*
14 Environment Agency (2013) *Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance* WM2 Third Edition, August 2013
15 Regulatory Position Statement (2007) *Treating non-hazardous waste for landfill - Enforcing the new requirement* Environment Agency 23 Oct 2007

Part 3: GROUND MOVEMENT ANALYSIS

This section of the report comprises an analysis of the ground movements arising from the proposed basement and foundation scheme discussed in Part 2 and the information obtained from the investigation, presented in Part 1 of the report.

9.0 INTRODUCTION

The sides of a basement excavation will move to some extent regardless of how they are supported. The movement will typically be both horizontal and vertical and will be influenced by the engineering properties of the ground, groundwater level and flow, the efficiency of the various support systems employed during underpinning and the efficiency or stiffness of any support structures used.

An analysis has been carried out of the likely movements arising from the proposed basement excavation and the results of this analysis have been used to predict the effect of these movements on surrounding structures.

9.1 Construction Sequence

The following sequence of operations has been assumed from drawing No SSK100.P2, dated 22/09/2015, issued by the consulting engineer. It has been used to enable analysis of the ground movements around the basement both during and after construction.

In general, the sequence of works for basement construction will comprise the following stages.

1. Construct retaining walls through underpinning neighbouring party walls with maximum 900 mm wide underpins in a 'hit and miss' construction sequence. The 'hit and miss' sequence is typically formed by using a trench box excavation, commonly sheet lined, shored and strutted; all temporary shoring and propping to be inspected by a suitably qualified person.

2. Installation of contiguous bored piled wall to form basement retaining walls running parallel to both Birkenhead Street and Crestfield Street.

3. Demolition of the existing building and provision of temporary propping strategy to support existing neighbouring party walls to ensure lateral stability is maintained during construction. Excavation below basement floor level to accommodate space for heave protection board and RC slab and installation of ground bearing piles.

4. Basement slab, RC column and ground floor slab construction.

5. Construction of upper floors

The underpins should be adequately laterally propped and sufficiently dowelled together, with the concrete cast and adequately cured prior to excavation of the basement and removal of the formwork and supports.

The detail of the support provided to adjacent walls is beyond the scope of this report at this stage and the structural engineer will be best placed to agree a methodology with the underpinning contractors once appointed.

10.0 GROUND MOVEMENTS

An assessment of ground movements within and surrounding the excavation has been undertaken using the X-Disp and P-Disp computer programs licensed from the OASYS suite of geotechnical modelling software from Arup. These programs are commonly used within the ground engineering industry and are considered to be appropriate tools for this analysis.

The X-Disp program has been used to predict ground movements likely to arise from the construction of the proposed basement. This includes the settlement of the ground (vertical movement) and the lateral movement of soil behind the proposed retaining walls (horizontal movement).

The analysis of potential ground movements within the excavation, as a result of unloading of the underlying soils, has been carried out using the Oasys P-Disp Version 19.3 – Build 12 software package and is based on the assumption that the soils behave elastically, which provides a reasonable approximation to soil behaviour at small strains.

For the purpose of these analyses, the corners have been defined by x and y coordinates, with the x-direction parallel with the orientation northeast-southwest, whilst the y-direction is parallel with the orientation of northwest-southeast. Vertical movement is in the z-direction.

The full outputs of all the analyses can be provided on request but samples of the output movement contour plots are included within the appendix.

10.1 Ground Movements Surrounding the Basement

For the X-Disp analysis, the soil movement relationships used for the embedded retaining walls are the default values within CIRIA report C580[16], which were derived from a number of historic case studies.

The ground movement curves for 'excavations in front of high stiffness wall in clay' have been adopted as being considered most appropriate for the proposed excavation and its support at this site.

The ground movement curves for 'installation of a planar diaphragm wall in stiff clay' have been adopted as being considered most appropriate for the proposed underpin phase at this site, whilst the ground movement curves for ''installation of contiguous bored pile wall in stiff clay' have been adopted for the proposed contiguous bored pile wall sections.

Due to the complex nature of the excavation and limitations of the software, the analysis was split into two models. One modelled the lowered basement floor, which covers the footprint of the basement beneath the existing building, and a second modelled the proposed deeper excavation which covers the remaining footprint of the existing building. The results of both were analysed and are presented in the section below.

[16] Gaba, A, Simpson, B, Powrie, W and Beadman, D (2003) *Embedded retaining walls – guidance for economic design* .CIRIA Report C580.

The results are presented to the degree of accuracy required to allow predicted variations in ground movements around the structure(s) to be illustrated, but may not reflect the anticipated accuracy of the predictions.

The predicted movements are based on the worst case of the individually analysed segments of 'hogging' and 'sagging' and are summarised in the tables below.

Lowering of existing basement floor

For the area where the existing basement level is being lowered, the analysis has indicated that the maximum vertical settlements that will result from underpin and contiguous piled wall installation are less than 5 mm, whilst any horizontal movements should also be less than 5 mm, as indicated in the table below.

Phase of Works	Wall Movement (mm)	
	Vertical Settlement	Horizontal Movement
Combined underpin and contiguous bored pile wall installation	5	5
Combined Movements	11	20

The movements arising from the combined underpin / contiguous piled wall and excavation are therefore not likely to exceed 15 mm vertical settlement, whilst the maximum horizontal movements are also anticipated to be equal to or less than 20 mm.

The movements calculated are considered to represent a worst case scenario, particularly as the movements resulting from basement excavation will be minimised due to control of the propping in the temporary works and a regime of monitoring.

New single level basement excavation

Phase of Works	Wall Movement (mm)	
	Vertical Settlement	Horizontal Movement
Combined underpin and contiguous bored pile wall installation	5	5
Combined movements with excavation	11	<20

The table above provides the results of the analysis on the area of the basement extension, which has indicated that the maximum vertical settlements that will result from underpin and contiguous piled wall installation are less than 5 mm, whilst any horizontal movements will also be less than 5 mm.

The movements arising from the combined underpin / contiguous piled wall and excavation are therefore not likely to exceed 15 mm vertical settlement, whilst the maximum horizontal movements are also anticipated to be equal to or less than 20 mm.

The estimated movements are considered to represent a worst case scenario, particularly as the movements resulting from basement excavation will be minimised due to control of the propping in the temporary works and a regime of monitoring.

10.2 Ground Movements within the Excavation (Heave)

Unloading of the London Clay will take place as a result of the demolition of the existing single-store kitchen and basement excavation. The reduction in vertical stress will cause heave to take place. Undrained soil parameters have been used to estimate the potential short term movements, which include the "immediate" or elastic movements as a result of the demolition of the existing building and basement excavation. Drained parameters have been used to provide an estimate of the total long-term movement.

The elastic analysis requires values of soil stiffness at various levels to calculate displacements. Values of stiffness for the soils at this site are readily available from published data and we have used a well-established method to provide our estimates. This relates values of E_u and E', the drained and undrained stiffness respectively, to values of undrained cohesion, as described by Padfield and Sharrock[17] and Butler[18] and more recently by O'Brien and Sharp[19]. Relationships of $E_u = 500\ C_u$ and $E' = 300\ C_u$ for the cohesive soils and 2000 x SPT 'N' for granular soils have been used to obtain values of Young's modulus. More recent published data[20] indicates stiffness values of 750 x Cu for the London Clay and a ratio of E' to Cu of 0.75, but it is considered that the use of the more conservative values provides a sensible approach for this stage in the design.

The proposed lowering of the existing basement floor, demolition of the existing kitchen and excavation of the new basement will result in a net unloading of roughly 60 kN/m² beneath the existing kitchen footprint, and 20 kN/m² beneath the existing building footprint, assuming a unit weight of overburden soil of 19 kN/m^3.

A rigid boundary for the analysis has been set at a depth of 70.0 m below existing ground level, where nearby BGS records indicate that the base of the Lambeth Group is likely to be present.

The P-Disp analysis indicates that the heave resulting from the excavation of the proposed basement and demolition of the existing building will be up to 16 mm within the centre of the deeper excavation, up to 9 mm within the centre of the shallower excavation and reducing to between 3 mm and 10 mm toward the edges. In the long term, a further 13 mm of heave is estimated as a result of long term swelling of the underlying London Clay within the centre of the deeper excavation, 7 mm within the centre of the shallower excavation and reducing to between 2 mm and 8 mm toward the edges. However due to the construction of the new six-storey building and installation of ground bearing piles it is likely that not all of this further movement will be realised, which will also reduce the total heave movements.

The results of the P-Disp analysis also indicate the likely impact of the proposed basement construction beyond the site boundaries. On the basis of the analysis, total vertical heave movements outside the proposed basement are unlikely to exceed 5 mm at a distance of approximately 5 m, reducing to approximately less than 2 mm at distances in excess of 10 m.

[17] Padfield CJ and Sharrock MJ (1983) *Settlement of structures on clay soils.* CIRIA Special Publication 27

[18] Butler FG (1974) *Heavily overconsolidated clays: a state of the art review.* Proc Conf Settlement of Structures, Cambridge, 531-578, Pentech Press, Lond

[19] O'Brien AS and Sharp P (2001) *Settlement and heave of overconsolidated clays - a simplified non-linear method.* Part Two, Ground Engineering, Nov 2001, 48-53

[20] Burland JB, Standing, JR, and Jardine, FM (2001) Building response to tunnelling, case studies from construction of the Jubilee Line Extension.. CIRIA Special Publication 200

The potential movements are summarised in the table below.

Location	Movement (mm)		
	Short-term Heave (Demolition and Excavation	Long-term Heave (Post Construction)	Total Heave
Centre of new deep excavation	16	13	29
Centre of new shallow excavation	9	7	16
Edge of excavations	4-10	3-8	7-18

The above figures are based on an unrestrained excavation as the model is unable to take account of the mitigating effect of the existing structures and proposed underpins, which in reality will combine to restrict these movements within the basement excavation. The movements predicted at or just beyond the site boundaries are unlikely to be fully realised and should not therefore have a detrimental impact upon any nearby structures.

In order to mitigate the effects of heave on the new building, the basement could be designed to transmit heave forces into the underpins.

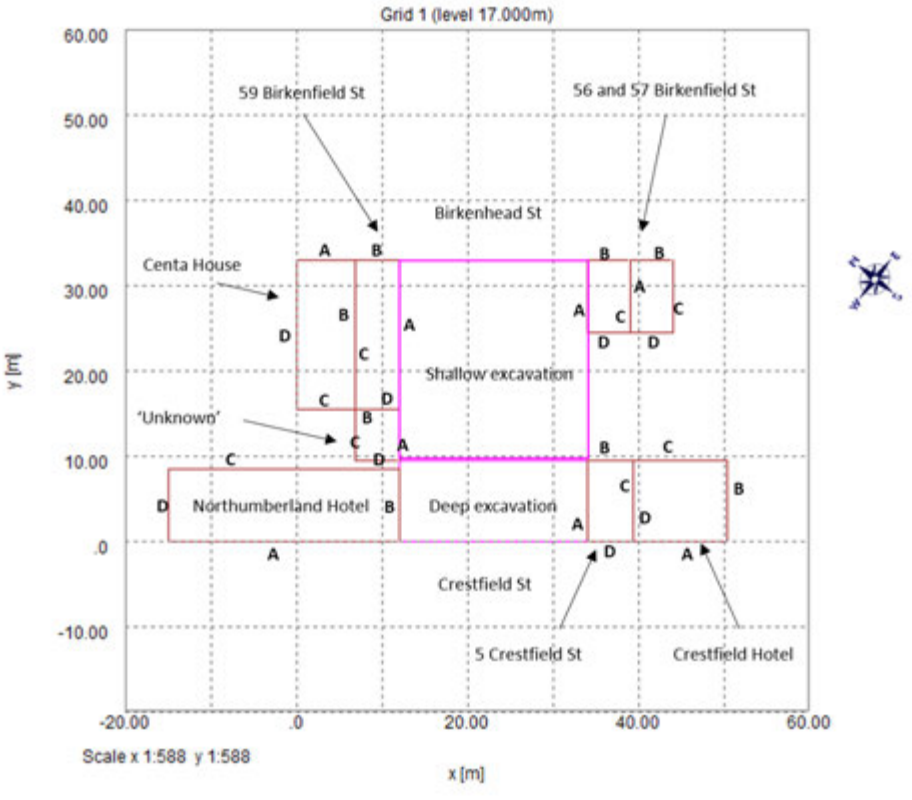
Alternatively, or in any case, a void or layer of compressible material should be incorporated into the design to accommodate these potential long term movements.

If a compressible material is used beneath the slab, it will need to be designed to be able to resist the potential uplift forces generated by the ground movements. In this respect potential heave pressures are typically taken to equate to around 30% to 40% of the total unloading pressure.

11.0 DAMAGE ASSESSMENT

In addition to the above assessment of the likely movements that will result from the proposed development, some of the neighbouring structures have been considered as sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 2.5 of C580[1]. These include the surrounding neighbouring properties which can be identified on the key plan in the appendix.

The sensitive structures outlined above have been modelled as lines in the analysis and are the lines along which the damage assessment has been undertaken. A plan of the sensitive structures is provided overleaf, and a key plan detailing the specific lines is included in the Appendix.



For the purpose of the analysis the below assumptions were made:

- ground level has been assumed to be consistent across the site at 17.0 m OD as per DWG drawing 'A 100 002 L 00 GF 150730', in order to keep the models consistent with each other with regard to excavation depth and assumed founding levels.
- neighbouring properties were drawn in the analysis from drawing 'A 100 002 L 00 GF 150730', along with information from Google Earth and OS plans provided by the consulting engineer.
- the 'unknown' structure, shown on the above plan, adjacent to the northwestern boundary of the site, is assumed to be part of Northumberland Hotel complex and so assumed the same structural information.
- founding levels of neighbouring properties were provided using the trial pit information gathered during the ground investigation, as shown on the trial pit logs within the appendix and summarised in Section 5.6 of this report.
- the basement founding level is 14.6 m OD as per drawing 'Elevations A110 150730' which was provided by the consulting engineer.
- building heights were derived from drawing 'Elevations A110 150730' which was provided by the consulting engineer.

11.1 Damage to Neighbouring Structures

The combined short term movements resulting from both retaining wall installation and basement excavation calculated using the X-Disp modelling software have been used to carry out an assessment of the likely damage to adjacent properties and the results are summarised in the table below. The detailed tabular output is included in the Appendix alongside a key plan for reference. As the analysis had to be split into two models, the worst case is presented below.

Building Damage Assessment		
Sensitive Structure	**Elevation**	**Category of Damage***
Northumberland Hotel	A	0 (Negligible)
	B	2 (Slight)
	C	1 (Very Slight))
	D	0 (Negligible
59 Birkenhead St	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)
56 Birkenhead St	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)
57 Birkenhead Street	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)
Centa House	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)
5 Crestfield St	A	0 (Negligible)
	B	0 (Negligible)

Building Damage Assessment		
Sensitive Structure	**Elevation**	**Category of Damage***
	C	0 (Negligible)
	D	0 (Negligible)
Crestfield Hotel	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)
Unknown address (assumed to be part of Northumberland Hotel complex)	A	0 (Negligible)
	B	0 (Negligible)
	C	0 (Negligible)
	D	0 (Negligible)

**From Table 2.5 of C580[1]: Classification of visible damage to walls.*

The building damage reports for sensitive structures, highlighted in the above table, predict that the damage to the neighbouring structures would generally be Category 0 (Negligible) and therefore within acceptable limits. However, there is a single area, along the elevations B and C of the Northumberland Hotel, are indicated by the assessment to fall within Category 1 (very slight) and Category 2 (Slight). These results are however based on individual building lines, or walls, which have been further divided up into a series of 2.0 m segments that can move independently of each other. In reality this is unlikely to be the case as the walls will behave as single stiff elements that are also joined continuously with the rest of the structure. The results therefore provide a conservative estimate of the behaviour of each of the sensitive structures, although they provide a useful indication of the most critical structures within the adjoining properties.

11.2 Monitoring of Ground Movements

The predictions of ground movement based on the ground movement analysis should be checked by monitoring of adjacent properties and structures. The structures to be monitored during the construction stages should include the neighbouring properties A and C.

Condition surveys of the above existing structures should be carried out before and after the proposed works.

The precise monitoring strategy will be developed at a later stage and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.

12.0 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
Is the site within 100 m of a watercourse or potential spring line?	The site is located 90 m to the south of the former line of the River Fleet. The river has however been culverted and whilst any groundwater is still likely to migrate towards the line of the river, at a distance of 90 m, it is not considered to pose a risk to the site from flooding. Furthermore the investigation has however indicated the absence of a groundwater table below the site and therefore the former river is not considered to have any influence over groundwater movements below the site.
Is the London Clay the shallowest stratum?	The investigation has confirmed that the site is underlain by the London Clay Formation.
Is the site within 5 m of a public highway or pedestrian right of way?	The investigation has not indicated any specific problems, such as weak or unstable ground, voids or a high water table that would make working within 5 m of public infrastructure particularly problematic at this site. The ground movement analysis has indicated that movements along the public highway are likely to be less than 5 mm and therefore within suitable limits.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	The investigation has indicated that the party walls are currently founded on conventional strip foundations bearing on the London Clay. As it is proposed to underpin these foundations as part of the basement construction, this will prevent differential founding depths and maintain structural stability. This has been confirmed by the results of the ground movement analysis which has indicated that any building damage is likely to be Category 0 and negligible, with only a single elevation possibly experiencing up Category 2 and slight damage.

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.

The Former River Fleet

The river has been culverted and whilst any groundwater is still likely to migrate towards the line of the river, at a distance of 90 m, it is not considered to pose a risk to the site from flooding. Furthermore the investigation has indicated the absence of a groundwater table below the site and therefore the former river is not considered to have any influence over groundwater movements below the site and it will not have an effect on the basement development. Furthermore, as the basement excavation will not extend below the groundwater table, it will not affect groundwater flows towards the former river course.

The London Clay is the shallowest stratum

The London Clay has been found to be the shallowest stratum at this site. The presence of the London Clay can give rise to a number of potential issues, with regards to excavation of a significant basement structure. These include slope instability on existing and new slopes greater than 7º, heave of the clay soils associated with the unloading from the basement excavation and shrinking and swelling of the clay soils due to the removal of trees. However, at this site no such slope angles already exist or will be created by the development and no trees are present to pose a risk of ongoing shrinking and swelling of the clay soils due to growth, removal or seasonal fluctuations of soil moisture. The results of the ground movement analysis have not indicated excess heave movements from the proposed basement excavation, with movements less than 18 mm occurring at the edges. This analysis has not however taken into consideration the existing loads applied by the building and therefore movements are likely to be less than those predicted.

Location of public highway

The proposed basement excavation will take place in close proximity of the footways to both Birkenhead Street and Crestfield Street. As indicated in the CMS produced by Conisbee, it is proposed to install a contiguous bored piled wall along both these elevations in order to maintain the stability of the footway structures. The ground movement analysis has indicated that movements along the public highway are likely to be less than 5 mm and therefore within normal tolerable limits.

Differential founding depths

The party walls are currently founded on conventional strip foundations bearing on the London Clay. As indicated in the CMS produced by Conisbee, these foundations will be underpinned as part of the basement construction, which will prevent differential founding depths and maintain structural stability. This has been confirmed by the results of the ground movement analysis which has indicated that any building damage is likely to be Category 0 and negligible, with only a single elevation possibly experiencing up to Category 2 and slight damage.

12.1 Non-Technical Summary of Evidence

This section provides a short summary of the evidence acquired and used to form the conclusions made within the BIA.

12.1.1 Screening

The following table provides the evidence used to answer the surface water flow and flooding screening questions.

Question	Evidence
1. Is the site within the catchment of the pond chains on Hampstead Heath?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report
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?	A site walkover confirmed that the site is currently entirely covered in hardstanding and the details provided on the proposed development indicate that this situation will remain once the development is complete.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	

Question	Evidence
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?	As above. As the site is currently covered in hardstanding, surface water does not discharge to the ground but discharges to the existing sewer system. This will remain and therefore there will also not be any changes in the quantity of surface water received by adjacent properties or watercourses.
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	
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?	Flood risk maps acquired from the Environment Agency as part of the desk study, Figure 15 of the Arup report, the Camden Flood Risk Management Strategy dated 2013 and the North London Strategic Flood Risk Assessment dated 2008.

The following table provides the evidence used to answer the subterranean (groundwater flow) screening questions.

Question	Evidence
1a. Is the site located directly above an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
1b. Will the proposed basement extend beneath the water table surface?	Previous nearby GEA investigations and BGS archive borehole records.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	A site walkover confirmed that the site is currently entirely covered in hardstanding and the details provided on the proposed development indicate that this situation will remain once the development is complete.
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)?	The details of the proposed development do not indicate the use soakaway drainage.
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?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report.

The following table provides the evidence used to answer the subterranean (groundwater flow) screening questions.

Question	Evidence
1. Does the existing site include slopes, natural or manmade, greater than 7°?	Topographical maps and Figures 16 and 17 of the Arup report and confirmed during a site walkover
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	The details of the proposed development provided do not include the re-profiling of the site to create new slopes
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	Topographical maps and Figures 16 and 17 of the Arup report and confirmed during a site walkover
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	

Question	Evidence
5. Is the London Clay the shallowest strata at the site?	Geological maps and Figures 3, 5 and 8 of the Arup report
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?	A site walkover confirmed that there are no trees on site.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Knowledge on the ground conditions of the area were used to make an assessment of this, in addition to a visual inspection of the buildings carried out during the site walkover
8. Is the site within 100 m of a watercourse or potential spring line?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report
9. Is the site within an area of previously worked ground?	Geological maps and Figures 3, 5 and 8 of the Arup report
10. Is the site within an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
11. Is the site within 50 m of Hampstead Heath ponds?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report.
12. Is the site within 5 m of a highway or pedestrian right of way?	Aerial photography, site plans and the site walkover confirmed that the site is within 5 m of both Crestfield Street and Birkenhead Street.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Records of basements being present below neighbouring properties and the site walkover confirmed the position of the proposed basement relative the neighbouring properties. Planning records have also been consulted
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Maps and plans of infrastructure tunnels were reviewed, in addition to online infrastructure maps, showing exclusions zones, made available by Transport for London, as shown in Section 2.3 of this report.

12.1.2 Scoping and Site Investigation

The questions in the screening stage that there were answered 'yes', were taken forward to a scoping stage and the potential impacts discussed in Section 4.0 of this report, with reference to the possible impacts outlined in the Arup report.

A ground investigation was carried out, which has allowed an assessment of the potential impacts of the basement development on the various receptors identified from the screening and scoping stages. Principally the investigation aimed to establish the ground conditions, including the groundwater level, the engineering properties of the underlying soils to enable suitable design of the basement development and the configuration of existing party wall foundations. The findings of the investigation are discussed in Section 5.0 of this report and summarized in both Section 7.0 and the Executive Summary.

12.1.3 Impact Assessment

Section 9.0 of this report summarises whether or not, on the basis of the findings of the investigation, the potential impacts still need to be given consideration and identifies ongoing risks that will require suitable engineering mitigation. Section 8.0 of this report also provides recommendations for the design of the proposed development, whilst Part 3 provides the outcomes of a ground movement analysis and building damage assessment, which has also been used to provide a conclusion on any potential impacts from the proposed basement development.

13.0 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 may 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.

The ground movement analysis has concluded that the predicted damage to the neighbouring properties would generally be 'Negligible', with a single area of 'Slight' on the wall of a neighbouring property. On this basis, the damage that would inevitably occur as a result of such an excavation would fall within the acceptable limits.

It is recommended that movement monitoring is carried out on all structures prior to and during the proposed basement construction.

The separate phases of work, including excavation of the proposed maximum 2.5 m deep basement, will in practice be separated by a number of weeks during which time construction of permanent supports, basement slab and underpin curing will take place. This will provide an opportunity for the ground movements during and immediately after underpin and contiguous piled wall construction to be measured and the data acquired can be fed back into the design and compared with the predicted values. Such a comparison will allow the ground model to be reviewed and the predicted wall movements to be reassessed prior to the main excavation taking place so that propping arrangements can be adjusted if required.

These limited areas of risk should be drawn to the attention of prospective contractors and sufficient contingency should be provided to cover the outstanding risk.

APPENDIX

Borehole Records

SPT Summary Sheet

Trial Pit Records

Geotechnical Test Results

SPT & Cohesion/ Level Graph

Chemical Analyses (Soil)

Generic Risk Based Screening Values

Envirocheck Extracts

Historical Maps

Site Plan

X-DISP ANALYSIS

Basement Excavation
Contour Plots of Vertical Movements and Horizontal Movements for both Existing Basement and New Basement Analysis

Installation of underpins
Contour Plot of Vertical Movements and Horizontal Movements for both Existing Basement and New Basement Analysis

Basement Excavation and Underpin Analysis
Contour Plots of Combined Vertical Movements and Horizontal Movements for both Existing Basement and New Basement Analysis

P-DISP ANALYSIS
Short Term Movement
Total Movement

BUILDING DAMAGE ASSESSMENT (X-DISP)
Key Plan

Proposed basement and ground floor plans. Construction sequence.

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Number** **BH1**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Window Sampler		15.06	West London Mission	J14336
	Location	**Dates** 14/11/2014	**Engineer** Conisbee	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				14.97	(0.09)	Concrete		
				14.84	0.09			
					(0.13)	Made Ground (crushed brick and gravel)		
					0.22			
						Firm fissured brown CLAY with partings of bluish grey and orange-brown silt, bluish grey staining along fissures and selenite crystals		
1.00	D1							
2.00	D2							
					(4.28)			
						claystone fragments encountered at 2.5 m		
3.00	D3							
4.50	D4			10.56	4.50	Stiff fissured grey CLAY with pale grey veins, traces of selenite and fine shells		
					(1.70)			
5.50	D5							
				8.86	6.20			
						Terminated at 6.30m		

Remarks
Borehole advanced through the base of Trial Pit No 5 at a depth of 0.85 m.
Groundwater not encountered.
Borehole terminated due to the strength of the clay.

Scale (approx)	**Logged By**
1:50	ML

Figure No.
J14336.BH2

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW		**Borehole Number** **BH2**
Boring Method Cable Percussion	**Casing Diameter** 150mm cased to 3.00m	**Ground Level (mOD)** 17.16	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 14/11/2014-17/11/2014	**Engineer** Conisbee	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	Paving slab over concrete			
					16.86	0.30				
0.35 0.50	D1 B1						Made Ground (dark grey clayey sandy silt with gravel and crushed brick)			
1.20-1.65 1.20-1.65	CPT N=6 B2		DRY	1,0/1,2,1,2		(1.90)				
1.75	D2									
2.00-2.45 2.00-2.45	CPT N=14 B3	2.00	DRY	1,2/3,3,3,5	14.96	2.20				
2.75	D3						Firm becoming stiff fissured high strength brown silty CLAY with partings of bluish grey and orange-brown silt, bluish grey staining along fissures and selenite crystals			
3.00-3.45	U1									
3.75	D4									
4.00-4.45 4.00	SPT N=15 D5	3.00	DRY	1,3/3,3,4,5		(3.80)				
4.75	D6									
5.00-5.45	U2									
6.00	D7				11.16	6.00				
6.50-6.95 6.50	SPT N=25 D8	3.00	DRY	3,6/8,8,4,5			Stiff becoming very stiff fissured high stength to very high strength dark grey silty CLAY with pale grey veins, traces of selenite and occasional fine shells and pyrite nodules			
							claystone encountered at 6.50 m			
7.50	D9									
8.00-8.45	U3									
							claystone encountered at 8.30 m			
9.00	D10									
9.50-9.95 9.50	CPT N=18 D11	3.00	DRY	3,2/3,4,5,6						

Remarks
2 hrs spent manhandling drilling rig and tools into position.
Excavating services insepction pit to 1.2 m for 1 hr. Groundwater not encountered.
Groundwater monitoring standpipe installed to 6.00 m, see separate sheet for the monitoring results.
2 hrs spent removing spoil and washing down drilling area.

Scale (approx)	Logged By
1:50	ML

Figure No.
J14336.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Borehole Number** **BH2**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 3.00m	17.16	West London Mission	J14336
	Location	**Dates** 14/11/2014- 17/11/2014	**Engineer** Conisbee	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.50	D12									
11.00-11.45	U4									
12.00	D13									
12.50	D14			14/11/2014:DRY						
12.50-12.95	SPT N=24	3.00	DRY	17/11/2014:DRY 3,4/5,6,6,7						
13.50	D15									
14.00-14.45	U5									
15.00	D16									
15.50-15.95	SPT N=27	3.00	DRY	4,5/5,6,7,9						
16.50	D17									
17.00-17.45	U6					(18.00)				
18.00	D18						becoming slightly sandy with partings of pale grey fine sand below 18.00 m			
18.50-18.95 18.50	SPT N=31 D19	3.00	DRY	5,6/7,7,8,9						
19.50	D20									

Remarks

Scale (approx)	**Logged By**
1:50	ML

Figure No.
J14336.BH1

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Borehole Number** **BH2**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 3.00m	17.16	West London Mission	J14336
	Location	**Dates** 14/11/2014- 17/11/2014	**Engineer** Conisbee	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.00-20.45	U7						becoming extremely high strength from 20.00 m			
21.00	D21									
21.50-21.95	SPT N=33	3.00	DRY	5,6/7,8,9,9						
21.50	D22									
						(18.00)				
22.50	D23									
23.00	U8									
24.00	D24				-6.84	24.00	Very stiff fissured reddish brown and brown mottled orange-brown and grey silty sandy CLAY			
24.50-24.95	SPT N=30	3.00	DRY	4,5/6,6,8,10						
24.50	D25									
25.50	D26									
26.00-26.45	SPT N=40	3.00	DRY	4,6/8,8,11,13						
26.00	D27									
27.00	D28					(6.00)				
27.50-27.95	SPT N=44	3.00	DRY	2,6/8,9,12,15						
27.50	D29									
28.50	D30									
29.55-30.00	CPT N=50	3.00	DRY	11,50/50						
29.55	D31			17/11/2014:DRY						
					-12.84	30.00				

Remarks

Scale (approx)	**Logged By**
1:50	ML

Figure No.
J14336.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Borehole Number** **BH2**
Installation Type	**Dimensions**	**Client** West London Mission	**Job Number** J14336
	Location	**Ground Level (mOD)** 17.16	**Engineer** Conisbee	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			16.96	0.20	Concrete
			16.66	0.50	Bentonite Seal Gravel Filter
			15.16	2.00	Slotted Standpipe
			11.16	6.00	General Backfill
			-12.84	30.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
14/11/14	10:00			DRY		15:00	12.50	3.00	DRY	
17/11/14	9:00	12.50	3.00	DRY		14:00	30.00	3.00	DRY	

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	
25/11/14		DRY		
13/12/14		DRY		

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW	**Number** **BH3**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Window Sampler		17.55	West London Mission	J14336
	Location	**Dates** 14/11/2014	**Engineer** Conisbee	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				17.47	(0.08)	Brick block paving		
					0.08			
					(0.62)	Made Ground (brown clay with gravel, brick and abundant pottery fragments)		
				16.85	0.70			
					(1.00)	Made Ground (dark brown clayey sandy silt with gravel, brick, chalk, slate and pottery fragments)		
				15.85	1.70			
					(2.30)	Firm fissured brown CLAY with partings of bluish grey and orange-brown silt and selenite crystals		
				13.55	4.00			
					(1.30)	Stiff fissured dark grey CLAY with pale grey veins and traces of selenite		
				12.25	5.30			
						Terminated at 5.30m		

Remarks
Borehole advanced through the base of Trial Pit 6 at a depth of 1.5 m.
Groundwater not encountered.
Borehole terminated due to the strength of the clay.

Scale (approx)	**Logged By**
1:50	ML

Figure No.
J14336.BH3

GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware,Herts
SG12 7QE

Standard Penetration Test Results

Site : King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW

Client : West London Mission

Engineer : Conisbee

Job Number J14336

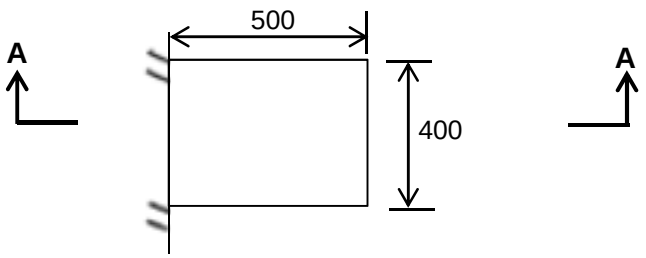
Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH2	1.20	1.35	1.65	CPT	1	0	1	2	1	2	N=6	
BH2	2.00	2.15	2.45	CPT	1	2	3	3	3	5	N=14	
BH2	4.00	4.15	4.45	SPT	1	3	3	3	4	5	N=15	
BH2	6.50	6.65	6.95	SPT	3	6	8	8	4	5	N=25	
BH2	9.50	9.65	9.95	CPT	3	2	3	4	5	6	N=18	
BH2	12.50	12.65	12.95	SPT	3	4	5	6	6	7	N=24	
BH2	15.50	15.65	15.95	SPT	4	5	5	6	7	9	N=27	
BH2	18.50	18.65	18.95	SPT	5	6	7	7	8	9	N=31	
BH2	21.50	21.65	21.95	SPT	5	6	7	8	9	9	N=33	
BH2	24.50	24.65	24.95	SPT	4	5	6	6	8	10	N=30	
BH2	26.00	26.15	26.45	SPT	4	6	8	8	11	13	N=40	
BH2	27.50	27.65	27.95	SPT	2	6	8	9	12	15	N=44	
BH2	29.55	29.70	30.00	CPT	11	50	50				N=50	

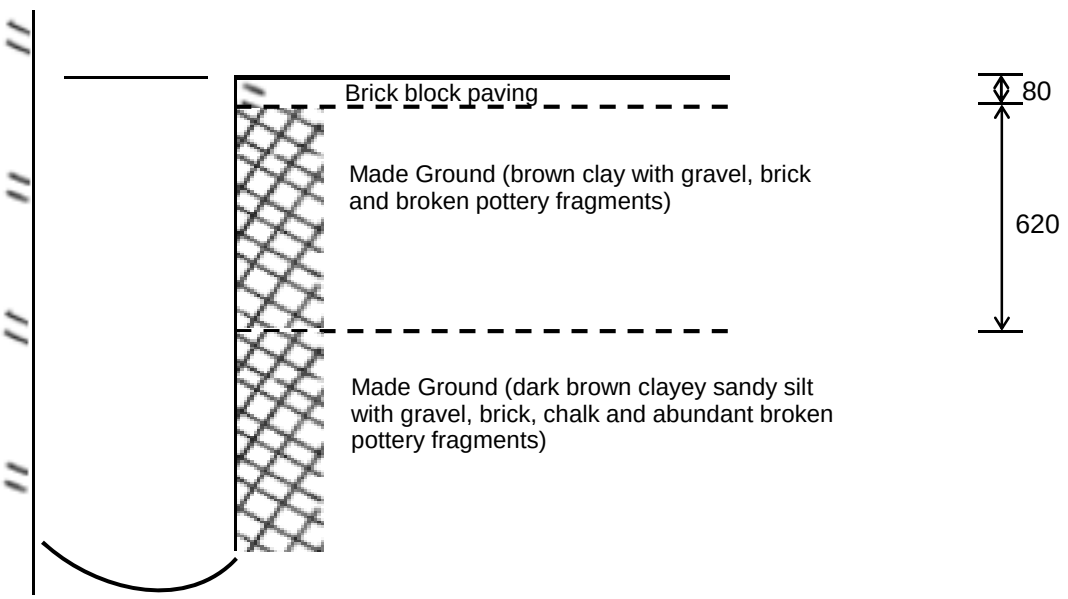
Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** 1

Excavation Method Manual	**Dimensions** 500 x 400 x 1300	**Ground Level (mOD)** 17.71	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 04/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:		Scale:
All dimensions in millimetres	Base of footing not proved.	1:20
Sides of trial pit remained stable during excavation	Borehole No 3 advanced through base of trial pit.	Logged by:
Groundwater: Not encountered		ML

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **1**

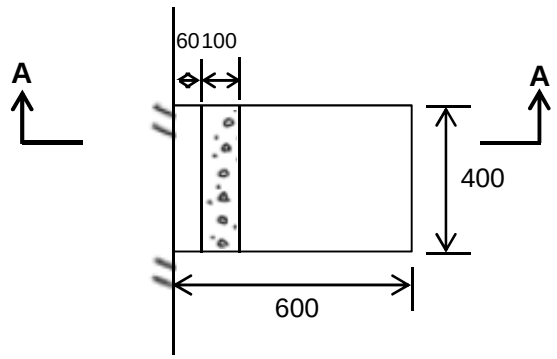
Excavation Method **Manual**	**Dimensions** 500 x 400 x 1300	**Ground Level (mOD)** 17.71	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 04/11/2014	**Engineer** Conisbee	**Sheet** 2 / 2

Remarks:		Scale:
All dimensions in millimetres	Base of footing not proved.	1:20
Sides of trial pit remained stable during excavation	Borehole No 3 advanced through base of trial pit.	Logged by:
Groundwater: Not encountered		ML

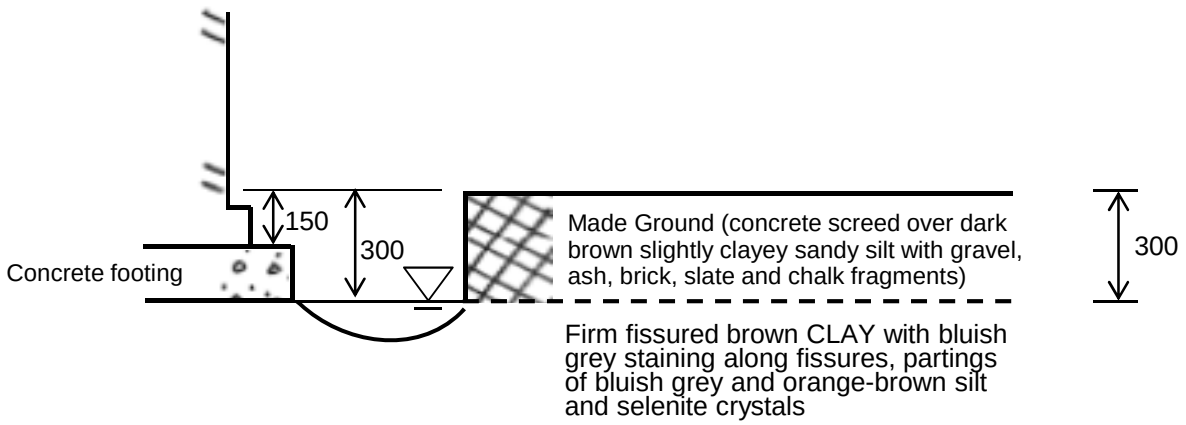
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **2**

Excavation Method **Manual**	**Dimensions** 600 x 400 x 400	**Ground Level (mOD)** 14.88	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:	Scale:
All dimensions in millimetres	1:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater: Standing at 0.30 m	ML

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **2**

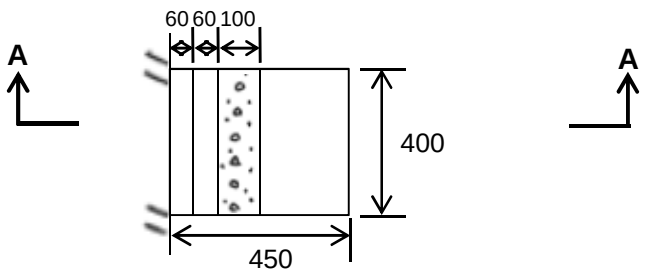
Excavation Method **Manual**	**Dimensions** 600 x 400 x 400	**Ground Level (mOD)** 14.88	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Remarks:	Scale:
All dimensions in millimetres	1:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater: Standing at 0.30 m	ML

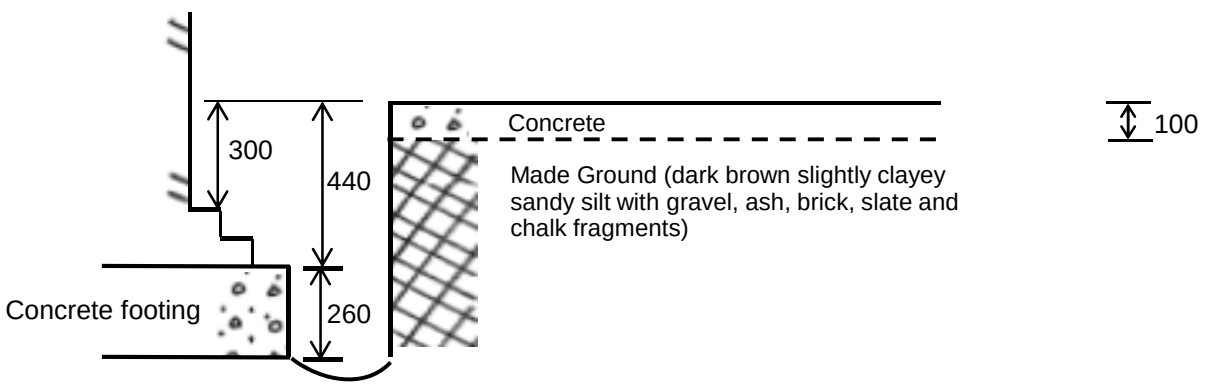
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **3**

Excavation Method **Manual**	**Dimensions** 450 x 400 x 800	**Ground Level (mOD)** 17.03	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:		Scale:
All dimensions in millimetres	Sample: 0.4 m	1:20
Sides of trial pit remained stable during excavation		Logged by:
Groundwater: Not encountered		ML

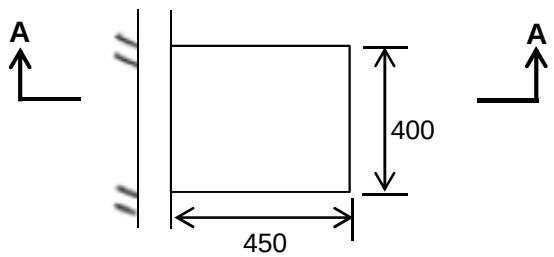
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **3**
Excavation Method **Manual**	**Dimensions** 450 x 400 x 800	**Ground Level (mOD)** 17.03	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Remarks:		Scale:
All dimensions in millimetres	Sample: 0.4 m	1:20
Sides of trial pit remained stable during excavation		Logged by:
Groundwater: Not encountered		ML

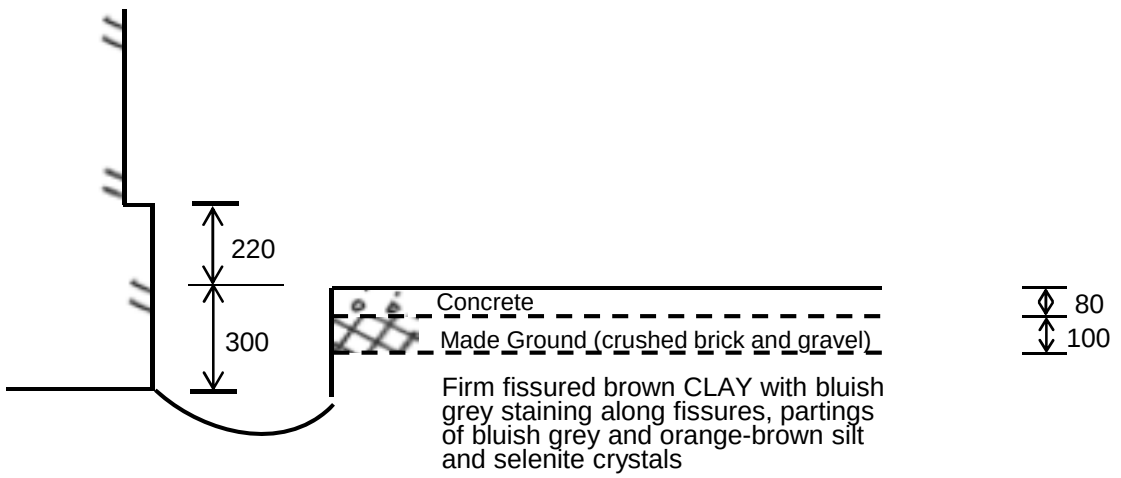
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** 4

Excavation Method Manual	**Dimensions** 450 x 400 x 450	**Ground Level (mOD)** 15.06	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 14/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:		Scale:
All dimensions in millimetres	Sample: 0.2 m	1:20
Sides of trial pit remained stable during excavation		Logged by:
Groundwater: Not encountered		ML

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **4**

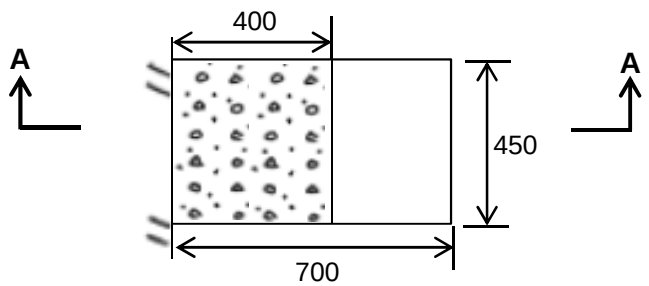
Excavation Method **Manual**	**Dimensions** 450 x 400 x 450	**Ground Level (mOD)** 15.06	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 04/11/2014	**Engineer** Conisbee	**Sheet** 2 / 2

Remarks:		Scale:
All dimensions in millimetres	Sample:0.4 m	1:20
Sides of trial pit remained stable during excavation		Logged by:
Groundwater: Not encountered		ML

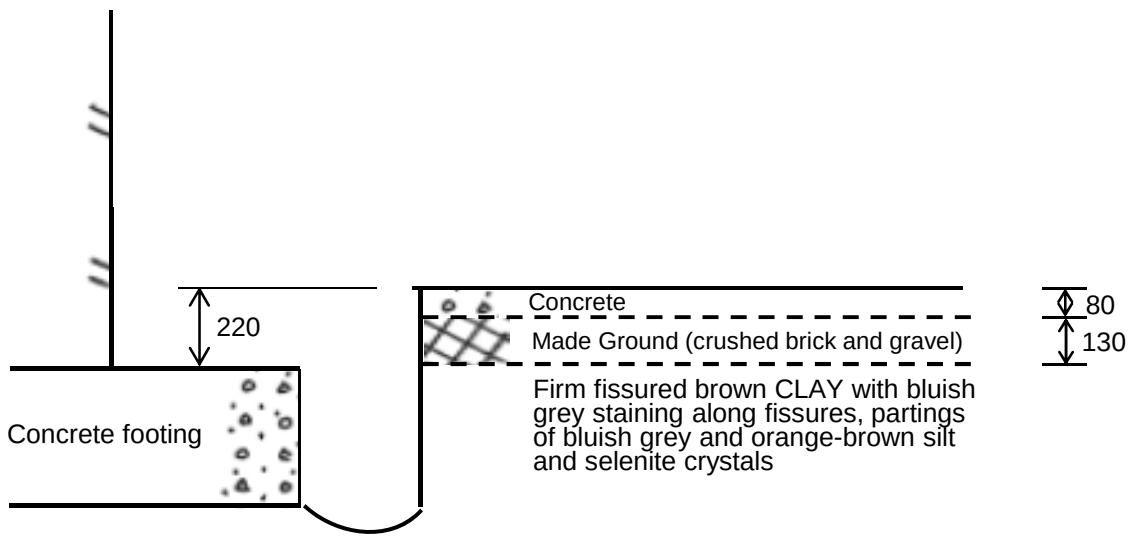
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **5**

Excavation Method **Manual**	**Dimensions** 700 x 450 x 650	**Ground Level (mOD)** 15.05	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:	Scale:
All dimensions in millimetres	1:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater: Not encountered	ML

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **5**

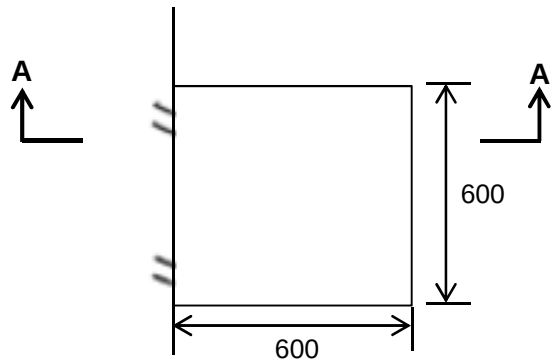
Excavation Method **Manual**	**Dimensions** 700 x 450 x 650	**Ground Level (mOD)** 15.05	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 2 / 2

Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Scale: 1:20 Logged by: ML

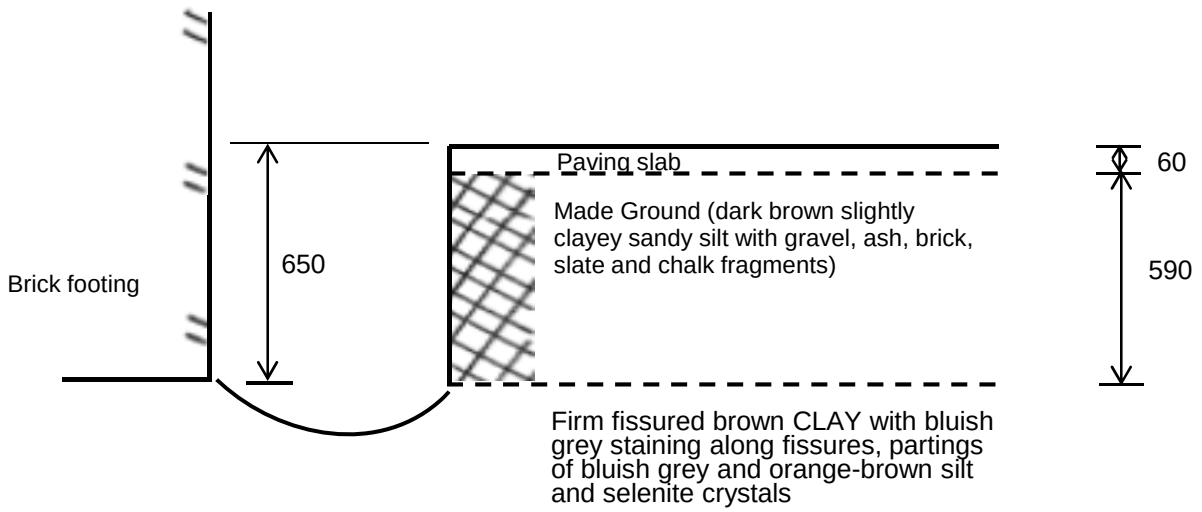
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **6**

Excavation Method **Manual**	**Dimensions** 600 x 600 x 650	**Ground Level (mOD)** 15.11	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 1 / 2

Plan: -



Section A - A: -



Remarks:		Scale:
All dimensions in millimetres	Sample: 0.2 m	1:20
Sides of trial pit remained stable during excavation		Logged by:
Groundwater: Not encountered		ML

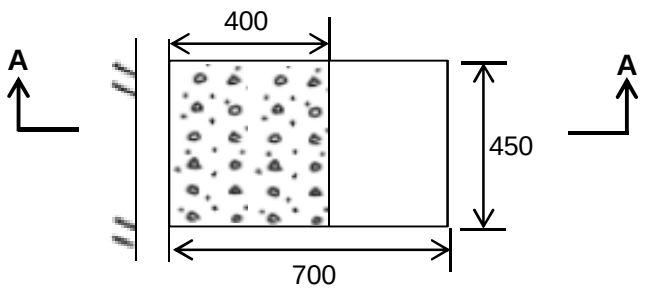
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG		**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **6**
Excavation Method **Manual**	**Dimensions** 600 x 600 x 650	**Ground Level (mOD)** 15.11	**Client** West London Mission	**Job Number** J14336
	Location	**Dates** 05/11/2014	**Engineer** Conisbee	**Sheet** 2 / 2

Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Sample: 0.2 m	Scale: 1:20 Logged by: ML

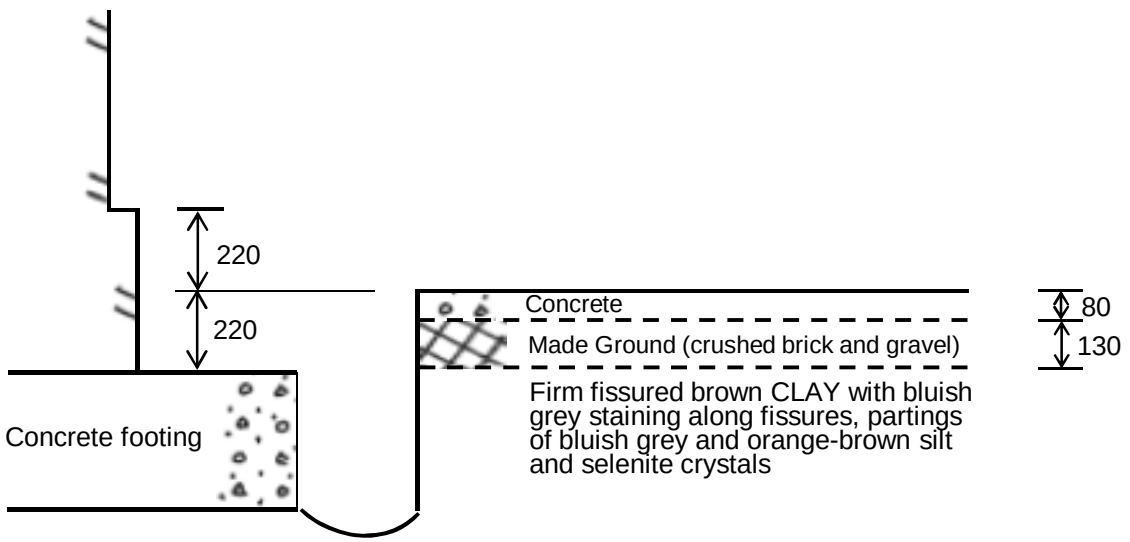
GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** 7

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	700 x 450 x 700	15.06	West London Mission	J14336
	Location	**Dates**	**Engineer**	**Sheet**
		04/11/2014	Conisbee	1 / 2

Plan: -



Section A - A: -



Remarks:		Scale:
All dimensions in millimetres	Sample: 0.3 m	1:20
Sides of trial pit remained stable during excavation	Borehole No 2 advanced through base of trial pit.	Logged by:
Groundwater: not encountered		ML

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	**Site** Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW	**Trial Pit Number** **7**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	700 x 450 x 700	15.06	West London Mission	J14336
	Location	**Dates**	**Engineer**	**Sheet**
		04/11/2014	Conisbee	2 / 2

Remarks:		Scale:
All dimensions in millimetres	Sample: 0.3 m	1:20
Sides of trial pit remained stable during excavation	Borehole No 2 advanced through base of trial pit.	Logged by:
Groundwater: not encountered		ML

Project Name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ	**Samples Received:**	24/11/2014
		Project Started:	24/11/2014
Client:	GEA	**Testing Started:**	03/12/2014
Project No:	J14336 **Our job/report no:** 17886	**Date Reported:**	04/12/2014

K4 SOILS

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH1	D3	2.75	Brown silty CLAY with traces of selenite crystals	34	73	26	47	100	
BH1	D7	6.00	Dark grey and occasional brown silty CLAY	33	79	30	49	100	
BH1	D25	24.50	Brown silty CLAY	26	80	29	51	100	
BH2	D2	2.00	Brown silty CLAY with traces of selenite crystals	32	76	24	52	100	

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.
BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved
Initials: K.P
Date: 04/12/2014

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Project Name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ				K4 SOILS
Client:	GEA		Project no: J14336		
			Our job no: 17886		

Borehole No:	Sample No:	Depth m	Description	pH	Sulphate content (g/l)
BH1	D4	3.75	Brown CLAY	7.8	3.19
BH1	D10	9.00	Dark grey slightly gravelly CLAY (gravel is fm and sub-angular to angular)	7.9	1.03
BH1	D17	16.50	Dark grey silty CLAY	7.9	1.13
BH1	D23	27.00	Reddish brown, blue grey and grey silty CLAY	8.1	0.43
BH2	D3	3.00	Grey brown silty CLAY with orange brown sandy pockets and selenite crystals	7.7	3.12

Date 04/12/2014

Summary of Test Results

BS 1377 : Part 3 :Clause 5 : 1990

Determination of sulphate content of soil and ground water : gravimetric method

Checked and Approved

Initials : kp

Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

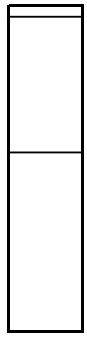
Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U1	**Depth (m):**	3.00

Soil Description: High strength fissured brown silty CLAY

Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	201.0
Diameter	mm	102.0
Moisture Content	%	28
Bulk Density	Mg/m³	1.98
Dry Density	Mg/m³	1.55

Position and orientation within the original sample

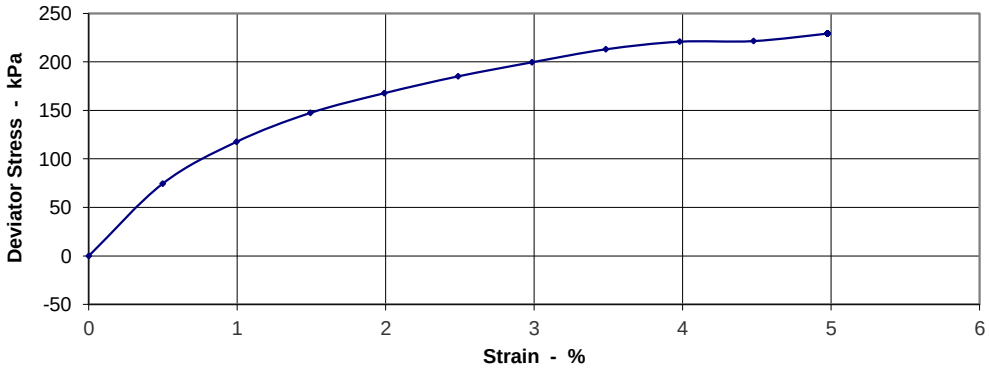


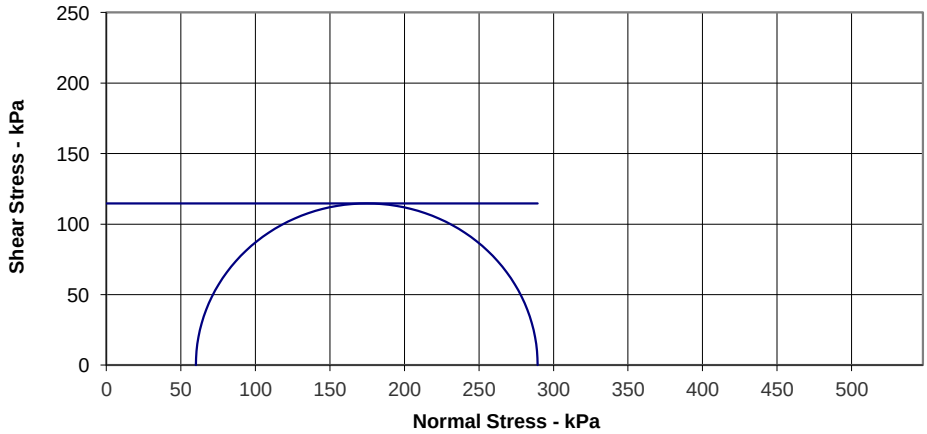
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.25
Rate of Axial Displacement	%/min	1.99
Cell Pressure	kPa	60
Strain at Failure	%	5.0
Maximum Deviator Stress	kPa	229
Shear Strength	kPa	115
Mode of Failure		Brittle

Shear Strength Parameters		
C	115	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U2	**Depth (m):**	5.00

Soil Description: High strength fissured brown slightly blue grey mottled CLAY with selenite crystals

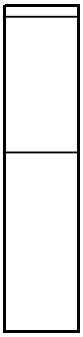
Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	32
Bulk Density	Mg/m³	1.97
Dry Density	Mg/m³	1.49

Test Details

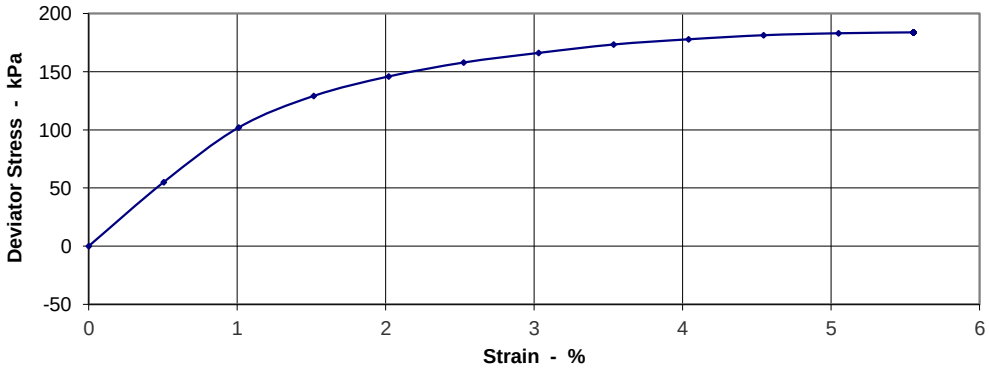
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.28
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	100
Strain at Failure	%	5.6
Maximum Deviator Stress	kPa	184
Shear Strength	kPa	92
Mode of Failure		Brittle

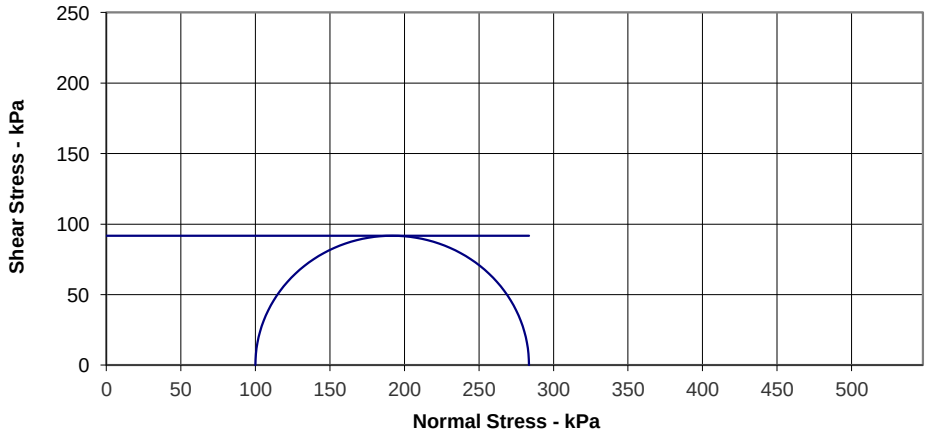
Position and orientation within the original sample



Shear Strength Parameters		
C	92	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING 2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

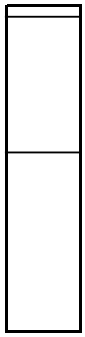
Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U3	**Depth (m):**	8.00

Soil Description: High strength fissured dark grey CLAY

Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	30
Bulk Density	Mg/m³	1.97
Dry Density	Mg/m³	1.51

Position and orientation within the original sample

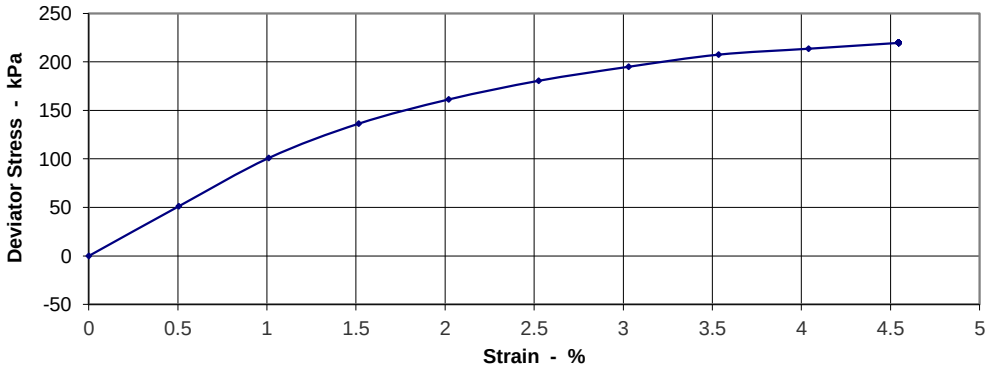


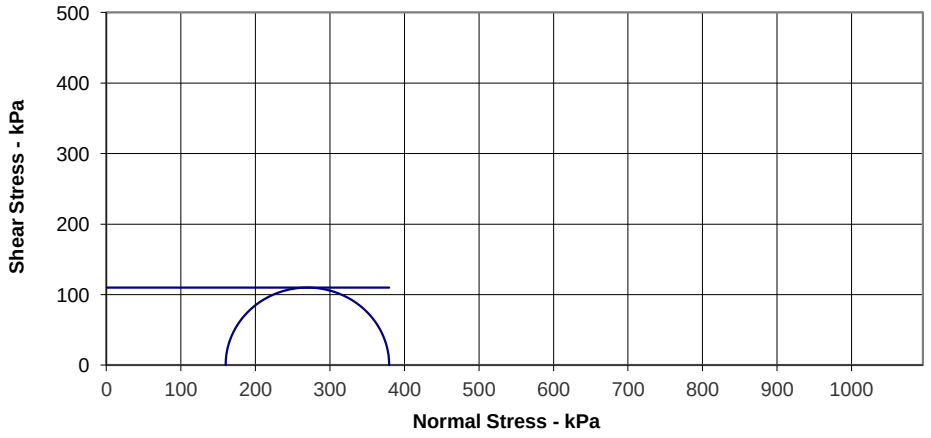
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.23
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	160
Strain at Failure	%	4.5
Maximum Deviator Stress	kPa	220
Shear Strength	kPa	110
Mode of Failure		Brittle

Shear Strength Parameters		
C	110	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

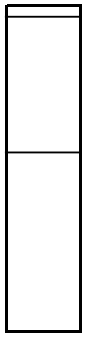
Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U4	**Depth (m):**	11.00

Soil Description: Medium strength fissured brown slightly blue grey mottled CLAY with brown fine sand partings

Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	32
Bulk Density	Mg/m³	1.95
Dry Density	Mg/m³	1.49

Position and orientation within the original sample



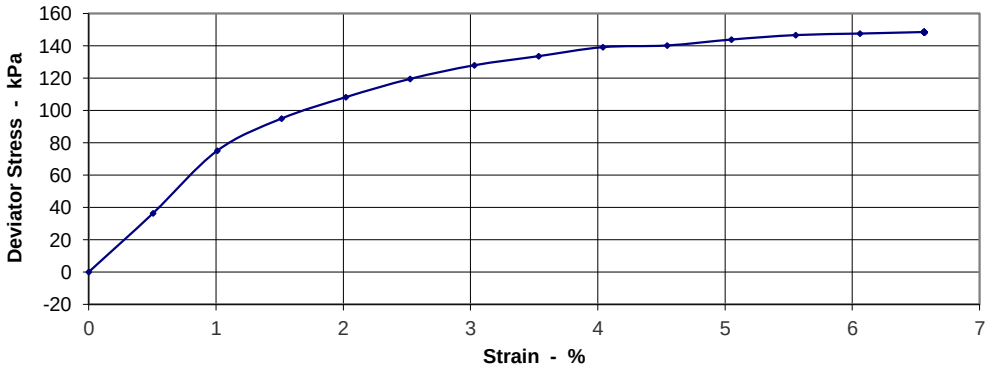
Test Details

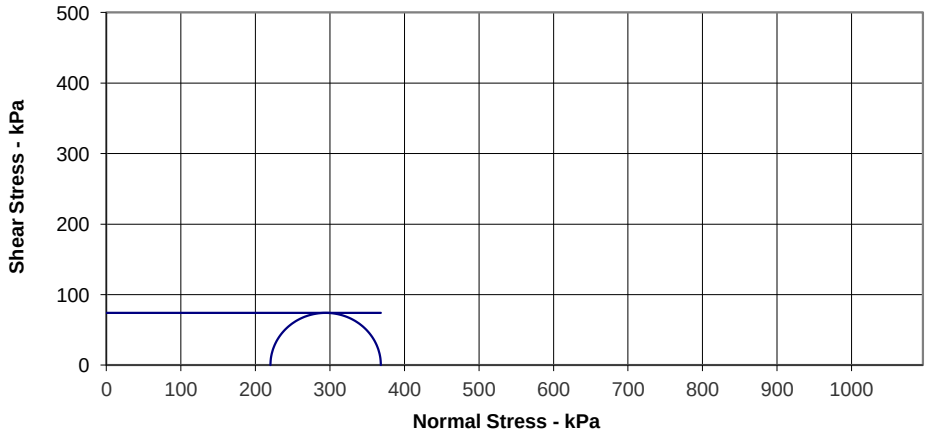
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.32
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	220
Strain at Failure	%	6.6
Maximum Deviator Stress	kPa	148
Shear Strength	kPa	74
Mode of Failure		Brittle

Shear Strength Parameters

C	74 kPa
Phi	0.0 °

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U5	**Depth (m):**	14.00

Soil Description: Very high strength fissured dark grey CLAY

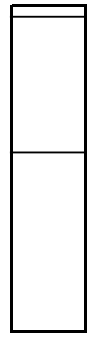
Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	27
Bulk Density	Mg/m³	2.04
Dry Density	Mg/m³	1.61

Test Details

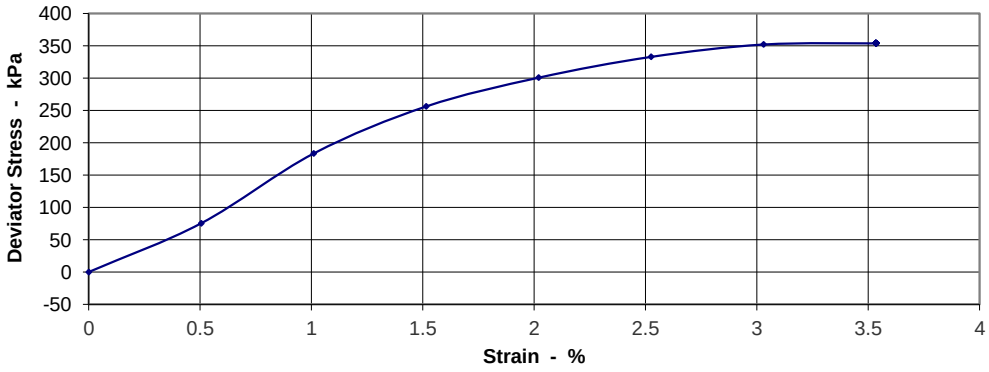
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.19
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	280
Strain at Failure	%	3.5
Maximum Deviator Stress	kPa	354
Shear Strength	kPa	177
Mode of Failure		Brittle

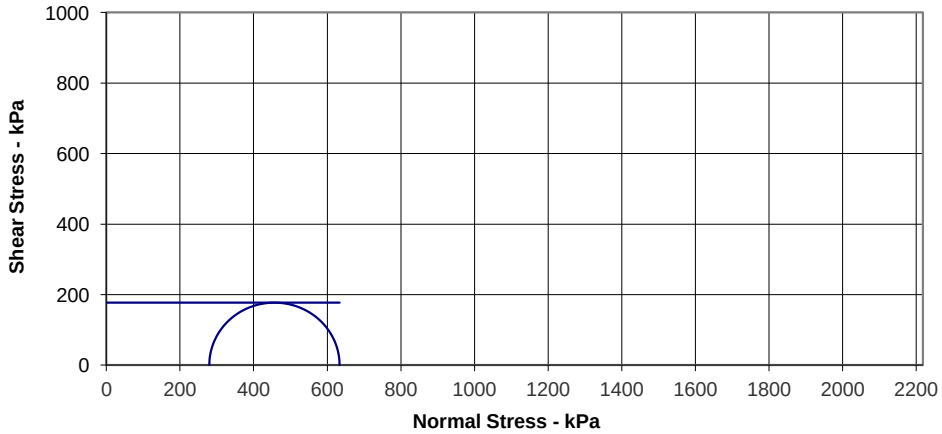
Position and orientation within the original sample



Shear Strength Parameters		
C	177	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U6	**Depth (m):**	17.00

Soil Description: Very high strength slightly fissured dark grey CLAY with light grey fine sand partings

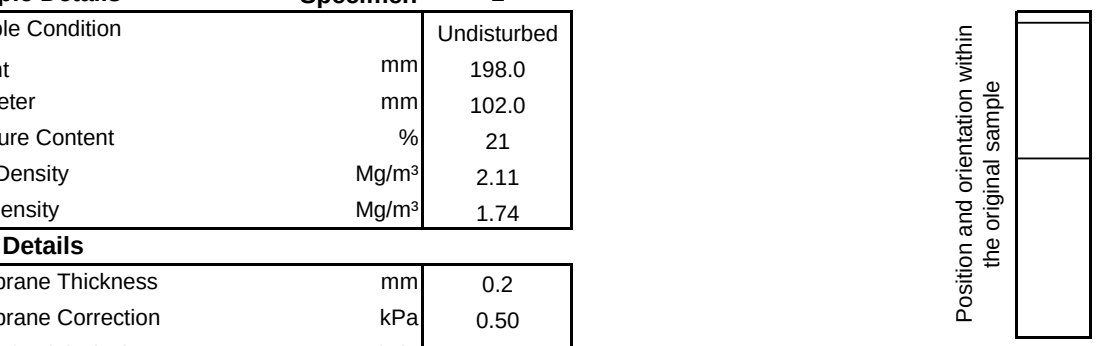
Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	21
Bulk Density	Mg/m³	2.11
Dry Density	Mg/m³	1.74

Test Details

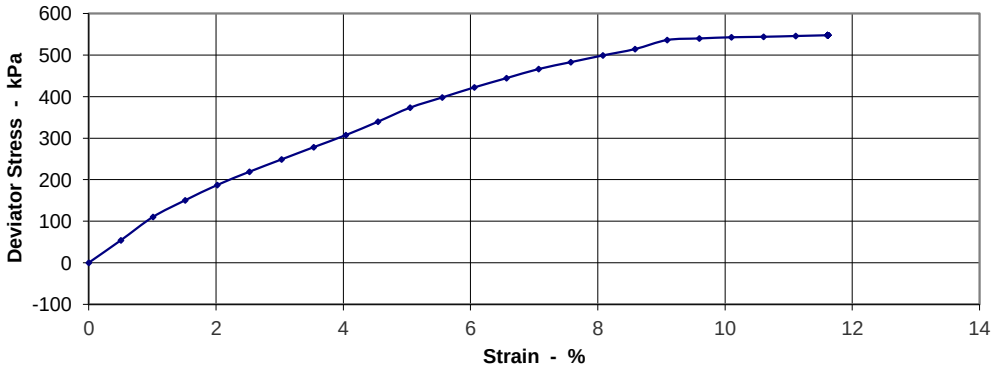
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.50
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	340
Strain at Failure	%	11.6
Maximum Deviator Stress	kPa	547
Shear Strength	kPa	274
Mode of Failure		Brittle

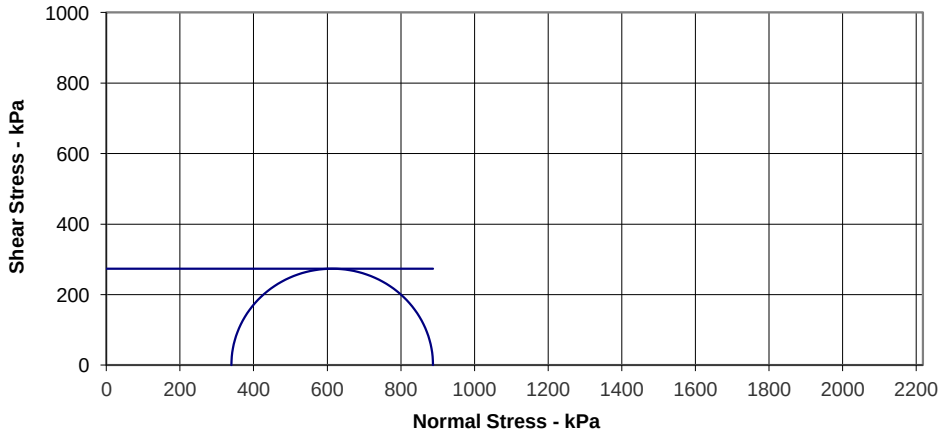
Position and orientation within the original sample



Shear Strength Parameters		
C	274	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U7	**Depth (m):**	20.00

Soil Description: Extremely high strength fissured dark grey CLAY with light grey fine sand partings

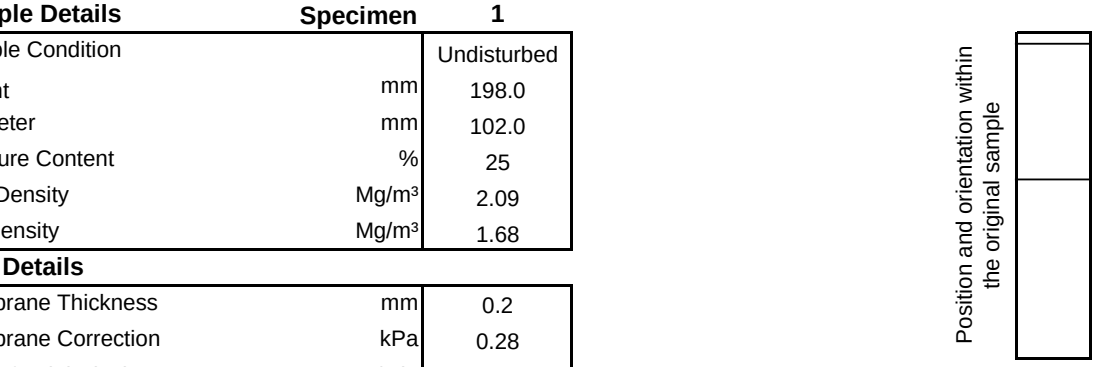
Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	25
Bulk Density	Mg/m³	2.09
Dry Density	Mg/m³	1.68

Test Details

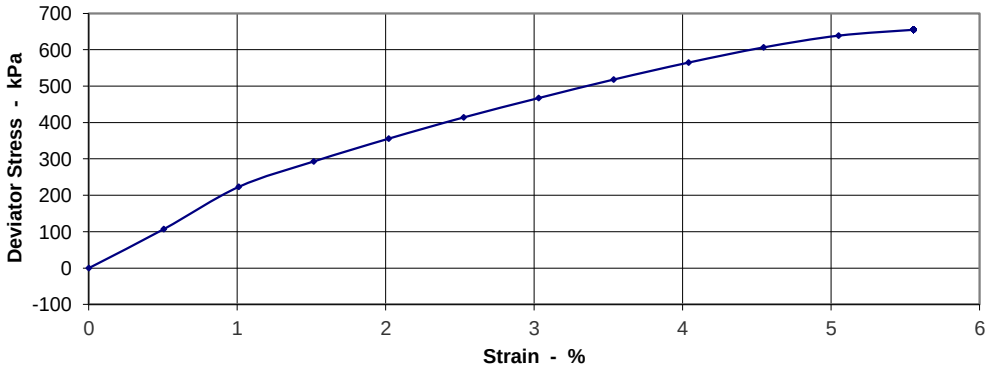
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.28
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	400
Strain at Failure	%	5.6
Maximum Deviator Stress	kPa	655
Shear Strength	kPa	327
Mode of Failure		Brittle

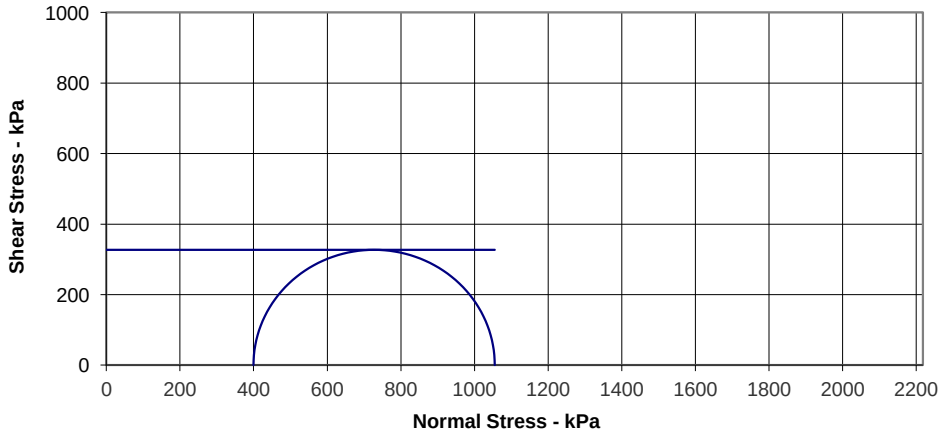
Position and orientation within the original sample



Shear Strength Parameters		
C	327	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING 2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	King's Cross Methodist Church, 58 Birkenhead Street, London W1U 2QJ			**Samples Received:**	24/11/2014
				Project Started:	24/11/2014
Client:	GEA			**Testing Started:**	03/12/2014
Project no:	J14336	**Our job /report no:**	17886	**Date Reported:**	04/12/2014
BH / TP no:	BH1	**Sample no:**	U8	**Depth (m):**	23.00

Soil Description: Very high strength fissured dark grey CLAY with light grey fine sand partings

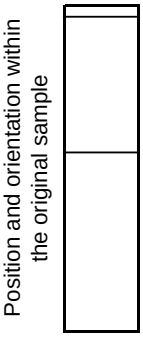
Sample Details — Specimen 1

Sample Condition		Undisturbed
Height	mm	198.0
Diameter	mm	102.0
Moisture Content	%	22
Bulk Density	Mg/m³	2.11
Dry Density	Mg/m³	1.73

Test Details

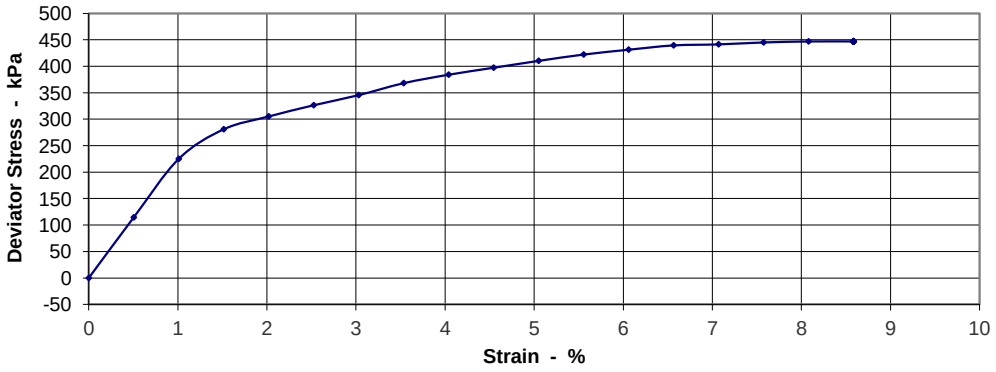
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.39
Rate of Axial Displacement	%/min	2.02
Cell Pressure	kPa	460
Strain at Failure	%	8.6
Maximum Deviator Stress	kPa	447
Shear Strength	kPa	224
Mode of Failure		Brittle

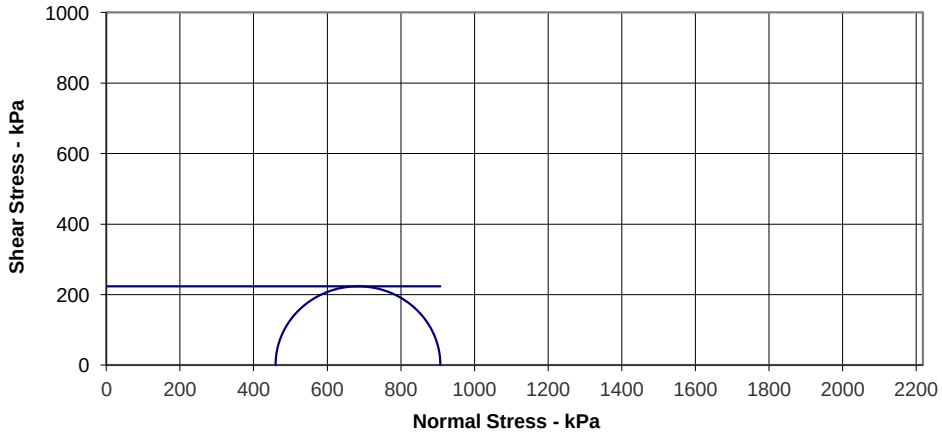
Position and orientation within the original sample



Shear Strength Parameters		
C	224	kPa
Phi	0.0	°

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 04/12/2014

UKAS TESTING

2519

Geotechnical & Environmental Associates

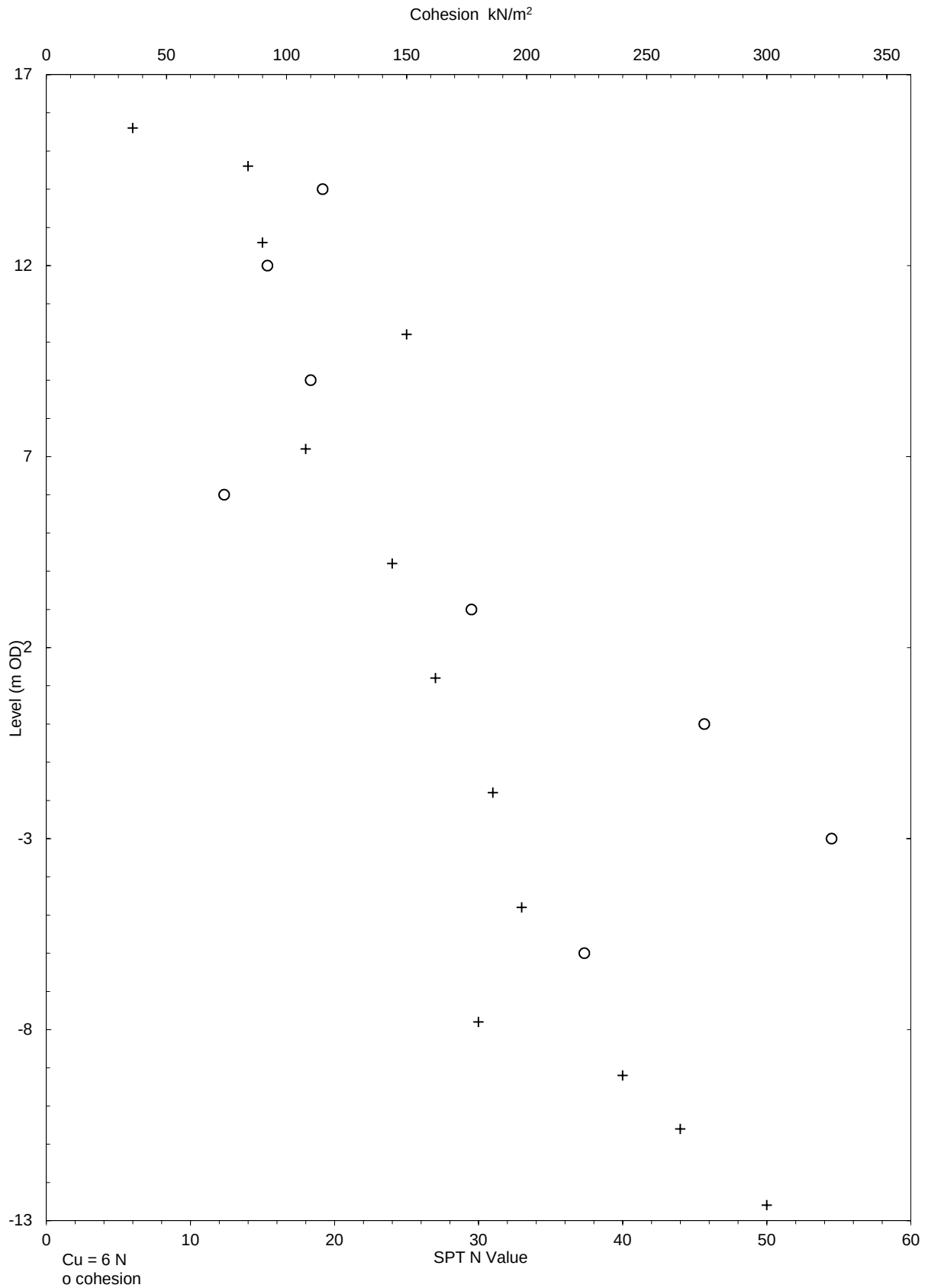
Tyttenhanger House
Coursers Road
St Albans
Herts AL4 0PG

SPT & Cohesion / Level Graph

Site	King's Cross Methodist Church, 58 Birkenhead Street, London WC1H 8BW
Client	West London Mission
Engineer	Conisbee

Job Number J14336

Sheet 1 / 1



Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report Number:	14-14697 Issue-1
Initial Date of Issue:	27-Nov-14
Client:	GEA
Client Address:	Tyttenhanger House Coursers Road Saint Albans Hertfordshire AL4 0PG
Contact(s):	Matt Legg
Project:	J14336 Kings Cross Methodist Church, Birkenhead St

Quotation No.:		**Date Received:**	20-Nov-14
Order No.:	J14336	**Date Instructed:**	20-Nov-14
No. of Samples:	4	**Results Due:**	27-Nov-14
Turnaround: (Weekdays)	3		
Date Approved:	27-Nov-14		

Approved By:

Details: Keith Jones, Technical Manager

Results Summary - Soil

Project: J14336 Kings Cross Methodist Church, Birkenhead St

Client: GEA					14-14697	14-14697	14-14697	14-14697
Quotation No.:				**Chemtest Sample ID.:**	71752	71753	71754	71755
Order No.: J14336				Client Sample Ref.:				
				Client Sample ID.:	TP1	TP3	TP4	TP5
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.2	0.4	0.4	0.3
				Bottom Depth(m):				
				Date Sampled:	14-Nov-14	14-Nov-14	14-Nov-14	14-Nov-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Moisture	N	2030	%	0.02	24	13	22	23
Stones	N	2030	%	0.02	< 0.020	< 0.020	< 0.020	< 0.020
Soil Colour	N				brown	brown	brown	brown
Other Material	N				stones	stones	none	none
Soil Texture	N				sand	sand	clay	clay
pH	M	2010			7.7	8.7	8.2	8.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.01	1.4	0.28		0.19
Chloride (Extractable)	U	2220	g/l	0.01	0.027	0.020	< 0.010	0.017
Cyanide (Total)	M	2300	mg/kg	0.5	5.4	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	2.3	2.0	2.2	1.9
Sulphate (Total)	M	2430	mg/kg	100	22000	7400	600	6000
Arsenic	M	2450	mg/kg	1	82	29	10	13
Cadmium	M	2450	mg/kg	0.1	3.5	0.11	0.12	0.15
Chromium	M	2450	mg/kg	1	56	24	45	48
Copper	M	2450	mg/kg	0.5	430	76	37	38
Mercury	M	2450	mg/kg	0.1	3.5	6.8	0.22	0.13
Nickel	M	2450	mg/kg	0.5	77	26	47	52
Lead	M	2450	mg/kg	0.5	3000	2100	50	33
Selenium	M	2450	mg/kg	0.2	0.99	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.5	1300	100	81	81
Total Organic Carbon	M	2625	%	0.2	7.7	1.7	0.50	0.51
TPH >C5-C6	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C6-C7	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C7-C8	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	4.6
TPH >C12-C16	N	2670	mg/kg	1	< 1.0	< 1.0	2.9	150
TPH >C16-C21	N	2670	mg/kg	1	27	6.9	5.3	250
TPH >C21-C35	N	2670	mg/kg	1	120	18	< 1.0	48
Total TPH >C5-C35	N	2670	mg/kg	10	150	25	< 10	450
Naphthalene	M	2700	mg/kg	0.1	0.23	< 0.10	< 0.10	0.13
Acenaphthylene	M	2700	mg/kg	0.1	0.40	0.16	< 0.10	0.21
Acenaphthene	M	2700	mg/kg	0.1	0.16	0.17	< 0.10	0.24

Results Summary - Soil

Project: J14336 Kings Cross Methodist Church, Birkenhead St

Client: GEA			**Chemtest Job No.:**		14-14697	14-14697	14-14697	14-14697
Quotation No.:			**Chemtest Sample ID.:**		71752	71753	71754	71755
Order No.: J14336			Client Sample Ref.:					
			Client Sample ID.:		TP1	TP3	TP4	TP5
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.2	0.4	0.4	0.3
			Bottom Depth(m):					
			Date Sampled:		14-Nov-14	14-Nov-14	14-Nov-14	14-Nov-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Fluorene	M	2700	mg/kg	0.1	0.16	0.12	< 0.10	0.40
Phenanthrene	M	2700	mg/kg	0.1	2.8	1.6	< 0.10	1.2
Anthracene	M	2700	mg/kg	0.1	0.61	0.32	< 0.10	0.23
Fluoranthene	M	2700	mg/kg	0.1	8.2	2.6	< 0.10	0.13
Pyrene	M	2700	mg/kg	0.1	10	2.8	< 0.10	0.22
Benzo[a]anthracene	M	2700	mg/kg	0.1	4.6	1.2	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.1	6.6	1.8	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	6.9	1.5	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	3.0	0.69	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.1	5.0	1.0	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	3.2	0.46	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	1.1	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	3.7	0.49	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2	57	15	< 2.0	2.8
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30	< 0.30

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Generic Risk-Based Soil Screening Values

Site	Kings Cross Mehtodist Church, Birkenhead Street, London WC1H 8BW
Client	West London Mission
Engineer	Conisbee

Job Number J14336

Sheet 1 / 1

Proposed End Use Commercial

Soil pH 8

Soil Organic Matter content % 6.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	640	C4SL
Cadmium	410	C4SL
Chromium (III)	30400	LQM/CIEH
Chromium (VI)	49	C4SL
Copper	71,700	LQM/CIEH
Lead	2330	C4SL
Elemental Mercury	170	SGV
Inorganic Mercury	3600	SGV
Nickel	1800	LQM/CIEH
Selenium	13000	SGV
Zinc	665,000	LQM/CIEH
Hydrocarbons		
Benzene	98	C4SL
Toluene	4400	SGV
Ethyl Benzene	48000	SGV
Xylene	2600	SGV
Aliphatic C5-C6	13000	LQM/CIEH
Aliphatic C6-C8	42000	LQM/CIEH
Aliphatic C8-C10	12000	LQM/CIEH
Aliphatic C10-C12	49000	LQM/CIEH
Aliphatic C12-C16	91000	LQM/CIEH
Aliphatic C16-C35	1,800,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	18000	LQM/CIEH
Aromatic C10-C12	34500	LQM/CIEH
Aromatic C12-C16	37800	LQM/CIEH
Aromatic C16-C21	28000	LQM/CIEH
Aromatic C21-C35	28000	LQM/CIEH
PRO (C_5 –C_{10})	89498	Calc
DRO (C_{12} –C_{28})	1,956,800	Calc
Lube Oil (C_{28} –C_{44})	1,828,000	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	0.5 g/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	10	Methanogenic potential
Total Cyanide	12000	WRAS
Total Mono Phenols	3200	SGV
PAH		
Naphthalene	1,100.00	Rev. LQM/CIEH
Acenaphthylene	100,000	LQM/CIEH
Acenaphthene	100,000	LQM/CIEH
Fluorene	71,000	LQM/CIEH
Phenanthrene	22,000	LQM/CIEH
Anthracene	540,000	LQM/CIEH
Fluoranthene	23,000	LQM/CIEH
Pyrene	54,000	LQM/CIEH
Benzo(a) Anthracene	97.0	Rev. LQM/CIEH
Chrysene	140	Rev. LQM/CIEH
Benzo(b) Fluoranthene	100.0	Rev. LQM/CIEH
Benzo(k) Fluoranthene	140.0	Rev. LQM/CIEH
Benzo(a) pyrene	76.00	C4SL
Indeno(1 2 3 cd) Pyrene	62.0	Rev. LQM/CIEH
Dibenzo(a h) Anthracene	13.00	Rev. LQM/CIEH
Benzo (g h i) Perylene	660	Rev. LQM/CIEH
Screening value for PAH	**1,085.7**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	3100	LQM/CIEH
tetrachloroethane (PCA)	590	LQM/CIEH
tetrachloroethene (PCE)	660	LQM/CIEH
trichloroethene (TCE)	55	LQM/CIEH
1,2-dichloroethane (DCA)	1.8	LQM/CIEH
vinyl chloride (Chloroethene)	0.12	LQM/CIEH
tetrachloromethane (Carbon tetra	15	LQM/CIEH
trichloromethane (Chloroform)	370	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these valuesindicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

Rev LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health croiteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
61911674_1_1

Customer Reference:
J14336

National Grid Reference:
530330, 182900

Slice:
A

Site Area (Ha):
0.08

Search Buffer (m):
1000

Site Details:

Methodist Chaplaincy House
58a Birkenhead Street
LONDON
WC1H 8BW

Client Details:

Mr S Branch
GEA Ltd
Tyttenhanger House
Coursers Road
St Albans
Herts
AL4 0PG

Prepared For:

West London Mission

Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

Report Version v49.0

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1			4	2
Enforcement and Prohibition Notices	pg 2				2
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 2		2		18
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 5			Yes	
Pollution Incidents to Controlled Waters	pg 5			1	10
Prosecutions Relating to Authorised Processes	pg 7				1
Prosecutions Relating to Controlled Waters					
Registered Radioactive Substances	pg 7		5	10	81
River Quality	pg 23				1
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions	pg 23			4	6 (*29)
Water Industry Act Referrals					
Groundwater Vulnerability	pg 33	Yes	n/a	n/a	n/a
Bedrock Aquifer Designations	pg 33	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones	pg 33				3
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
Detailed River Network Lines	pg 34			Yes	n/a
Detailed River Network Offline Drainage					n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites					
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)	pg 35				4
Local Authority Recorded Landfill Sites					
Registered Landfill Sites					
Registered Waste Transfer Sites	pg 36			1	4
Registered Waste Treatment or Disposal Sites	pg 37				4
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)	pg 39			1	
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)	pg 39			1	
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					
Geological					
BGS 1:625,000 Solid Geology	pg 40	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 40	Yes	Yes	Yes	Yes
BGS Recorded Mineral Sites	pg 43				3
BGS Urban Soil Chemistry	pg 44			Yes	Yes
BGS Urban Soil Chemistry Averages	pg 47	Yes			
Brine Compensation Area			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities					
Natural Cavities	pg 47				1
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 47	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards				n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 47	Yes		n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 47		Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 47	Yes		n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Industrial Land Use					
Contemporary Trade Directory Entries	pg 49		21	77	n/a
Fuel Station Entries	pg 57		1		7
Sensitive Land Use					
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves	pg 59				1
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones					
Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**Discharge Consents** Operator: Bnp Paribas Jersey Trust Corporation Limited Property Type: Business Services Location: Gshp @ Regent Quarter Kings Cross London N1 9ee Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Eprzp3421xw Permit Version: 1 Effective Date: 5th February 2013 Issued Date: 5th February 2013 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Cooling Water Discharge Environment: Underground Water Receiving Water: Groundwaters Via Borehole **Status: New issued under EPR 2010** Positional Accuracy: Located by supplier to within 10m	A13NE (N)	319	3	530415 183233
1	**Discharge Consents** Operator: Anley Trustees Limited Property Type: Business Services Location: Gshp @ Regent Quarter Kings Cross London N1 9ee Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Eprzp3421xw Permit Version: 1 Effective Date: 5th February 2013 Issued Date: 5th February 2013 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Cooling Water Discharge Environment: Underground Water Receiving Water: Groundwaters Via Borehole **Status: New issued under EPR 2010** Positional Accuracy: Located by supplier to within 10m	A13NE (N)	319	3	530415 183233
2	**Discharge Consents** Operator: London Borough Of Camden Property Type: Office/Data Proc Equip Manufacture Location: Bidborough House 20 Mabledon Place London London Wc1h 9bf Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Npswqd005471 Permit Version: 2 Effective Date: 8th March 2013 Issued Date: 8th March 2013 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Cooling Water Discharge Environment: Into Land Receiving Water: Gw Via Re-Inject Borehole **Status: Varied under EPR 2010** Positional Accuracy: Located by supplier to within 10m	A12SE (SW)	392	3	529996 182673
2	**Discharge Consents** Operator: London Borough Of Camden Property Type: Office/Data Proc Equip Manufacture Location: Bidborough House 20 Mabledon Place London London Wc1h 9bf Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Npswqd005471 Permit Version: 1 Effective Date: 20th February 2009 Issued Date: 20th February 2009 Revocation Date: 7th March 2013 Discharge Type: Trade Discharges - Cooling Water Discharge Environment: Into Land Receiving Water: Gw Via Re-Inject Borehole **Status: New Consent (Water Resources Act 1991, Section 88 & Schedule 10 as amended by Environment Act 1995)** Positional Accuracy: Located by supplier to within 10m	A12SE (SW)	392	3	529996 182673

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
3	**Discharge Consents** Operator: National Grid Company Plc. Property Type: Sewerage Network - Sewers - Others Location: Copenhagen School Outlet, Pentonville, London Authority: Environment Agency, Thames Region Catchment Area: Not Given Reference: CTMR.0389 Permit Version: 1 Effective Date: 23rd March 1980 Issued Date: 23rd March 1980 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Cooling Water Discharge Environment: Canal Receiving Water: Grand Unioncanal **Status: Transferred from Rivers (Prevention of Pollution) Act 1951-1961** Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	620	3	530590 183490
4	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: Reservoir/Borehole Site Location: Claremont Square Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0076 Permit Version: 1 Effective Date: 15th September 1989 Issued Date: 15th September 1989 Revocation Date: 5th October 2000 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: River Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A14NE (E)	850	3	531200 183000
5	**Enforcement and Prohibition Notices** Location: The School of Pharmacy, 29/39 Brunswick Square, Camden, LONDON, WC1N 1AX Permit Reference: Not Given Enforcement Date: 27th February 1995 Details: Press Release HM156, Minor breaches of accumulation and disposal limits; substandard lab & storage facilities; under RSA93. Positional Accuracy: Unknown	A8NW (S)	586	3	530300 182300
6	**Enforcement and Prohibition Notices** Location: Gower Street, LONDON, WC1E 6BT Permit Reference: Not Given Enforcement Date: Not Supplied Details: Inadequate record system for radioactive waste; under RSA93, served 1994/95. Positional Accuracy: Unknown	A7NW (SW)	964	3	529569 182288
7	**Local Authority Pollution Prevention and Controls** Name: Alex 24hr Dry Cleaners Location: 289 Grays Inn Road, London, Wc1x 8qf Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC4 Dated: 26th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A13SE (E)	120	4	530467 182862
8	**Local Authority Pollution Prevention and Controls** Name: Adriana Dry Cleaners Location: 191 Kings Cross Road, London, Wc1x 9db Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC52 Dated: 1st January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A13NE (E)	232	4	530574 182981

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
23	**Local Authority Pollution Prevention and Controls** Name: Capri Cleaners Location: 148 Southampton Row, London, Wc1b 5ag Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC23 Dated: 24th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A8SW (S)	962	4	530303 181923
24	**Local Authority Pollution Prevention and Controls** Name: Royal Dry Cleaners Location: 46 Roseberry Avenue, London Authority: London Borough of Islington, Environmental Health Department Permit Reference: PPC/DC34/07 Dated: 5th July 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A9NE (SE)	965	5	531195 182430
25	**Local Authority Pollution Prevention and Controls** Name: Gaps Location: 22 Chapel Market, London Authority: London Borough of Islington, Environmental Health Department Permit Reference: PPC/DC24/07 Dated: 5th July 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A19SE (NE)	982	5	531242 183325
26	**Local Authority Pollution Prevention and Controls** Name: Holloway Dry Cleaners Location: 33-35 Exmouth Market, London Authority: London Borough of Islington, Environmental Health Department Permit Reference: PPC/DC27/07 Dated: 5th July 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Site Closed** Positional Accuracy: Manually positioned to the address or location	A9NE (SE)	996	5	531254 182476
	Nearest Surface Water Feature	A18SE (N)	426	-	530411 183343
27	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Crinan Street, ISLINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 23rd July 1998 Incident Reference: THNE1998039149 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SE (N)	482	3	530400 183400
28	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Kings Cross Authority: Environment Agency, Thames Region Pollutant: Chemicals - Unknown Note: Confirmed As A Pollution Incident Incident Date: 9th August 1990 Incident Reference: N1900459 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SE (N)	503	3	530500 183400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
54	**Registered Radioactive Substances** Name: University College London Location: Gower Street, London, WC1E 6BT Authority: Environment Agency, Thames Region Permit Reference: AC7952 Dated: 31st March 1991 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variationSuperseded** Positional Accuracy: Automatically positioned to the address	A7NW (SW)	940	3	529589 182302
54	**Registered Radioactive Substances** Name: Eisai London Research Laboratories Ltd Location: Bernard Katz Building,University College London,Gower Street, LONDON, WC1E 6BT Authority: Environment Agency, Thames Region Permit Reference: Bz9189 Dated: 9th December 2005 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation either revoked or cancelledCancelled** Positional Accuracy: Manually positioned to the address or location	A7NW (SW)	953	3	529563 182315
55	**Registered Radioactive Substances** Name: London School Of Hygiene And Tropical Medicine Location: St. Pancras Hospital, 4 St. Pancras Way, LONDON, Greater London, NW1 0PE Authority: Environment Agency, Thames Region Permit Reference: AC4503 Dated: 31st March 1991 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation either revoked or cancelledCancelled** Positional Accuracy: Unknown	A17NE (NW)	942	3	529689 183607
56	**Registered Radioactive Substances** Name: Eisai London Research Laboratories Ltd Location: Bernard Katz Building, University College London, Gower Street, LONDON, Greater London, WC1E 6BT Authority: Environment Agency, Thames Region Permit Reference: AP8276 Dated: 20th April 1995 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation either revoked or cancelledCancelled** Positional Accuracy: Unknown	A7SW (SW)	999	3	529650 182150
	River Quality Name: Guc (Regent'S Canal) GQA Grade: River Quality C Reach: Camden Road - Hertford Union Estimated Distance (km): 7.1 Flow Rate: Flow greater than 80 cumecs Flow Type: Canal Year: 2000	A18SW (N)	563	3	530169 183458
57	**Water Abstractions** Operator: London Borough Of Camden Licence Number: Th/039/0039/064 Permit Version: 1 Location: Borehole At Bidborough House, 20 Mabledon Place, London Authority: Environment Agency, Thames Region Abstraction: Other Industrial/Commercial/Public Services: Heat Pump Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Bidborough House, 20 Mabledon Place London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 16th April 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A13SW (SW)	321	3	530052 182718

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
57	**Water Abstractions** Operator: London Borough Of Camden Licence Number: Th/039/0039/001 Permit Version: 1 Location: Bidborough House 20 Mabledon Place London Authority: Environment Agency, Thames Region Abstraction: Other Industrial/Commercial/Public Services: Heat Pump Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Bidborough House, 20 Mabledon Place London Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 9th April 2009 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A13SW (SW)	321	3	530052 182718
58	**Water Abstractions** Operator: Bnp Paribas Jersey Trust Corp Ltd And Anley Trustees Ltd Licence Number: Th/039/0039/055 Permit Version: 2 Location: Regent Quarter - Borehole A Authority: Environment Agency, Thames Region Abstraction: Other Industrial/Commercial/Public Services: Heat Pump Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Regent Quarter, Kings Cross, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 25th June 2014 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	373	3	530368 183294
58	**Water Abstractions** Operator: Bnp Paribas Jersey Trust Corp Ltd And Anley Trustees Ltd Licence Number: Th/039/0039/055 Permit Version: 1 Location: Regent Quarter - Borehole A Authority: Environment Agency, Thames Region Abstraction: Other Industrial/Commercial/Public Services: Heat Pump Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 6th February 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	373	3	530368 183294
59	**Water Abstractions** Operator: British Waterways Licence Number: 28/39/39/0164C Permit Version: Not Supplied Location: Maiden Lane Bridge, LONDON, Nw1 Authority: Environment Agency, Thames Region Abstraction: Industrial Cooling (Cegb) Abstraction Type: Not Supplied Source: River Daily Rate (m3): 3840 Yearly Rate (m3): 1 Details: Annual Abstraction Total Aggregated To Another Licence For Quantity Purposes. Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A18SW (N)	580	3	530300 183500

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Capital And Counties Property Company Limited Licence Number: 28/39/39/0138 Permit Version: 100 Location: Walmer House, 296 Regent Street, London W1-Borehole B Authority: Environment Agency, Thames Region Abstraction: Commercial/Industrial/Public Services: Drinking; Cooking; Sanitary; Washing; (Small Garden) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Walmer House, 296 Regent Street, London W1 Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 26th November 1979 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A1SE (SW)	1926	3	529100 181400
	Water Abstractions Operator: City And Guilds Of London Institure Licence Number: Th/039/0039/084 Permit Version: 1 Location: Confined Chalk At City And Guilds Head Office Authority: Environment Agency, Thames Region Abstraction: Production of Energy: Mechanical Non Electrical: Heat Pump Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 23rd August 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5SE (SE)	1955	3	531748 181533
	Groundwater Vulnerability Soil Classification: Not classified Map Sheet: Sheet 40 Thames Estuary Scale: 1:100,000	A13SW (SW)	0	3	530335 182903
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13SW (SW)	0	2	530335 182903
	Superficial Aquifer Designations No Data Available				
62	**Source Protection Zones** Name: Various Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone II (Outer Protection Zone): Either 25% of the source area or a 400 day travel time whichever is greater.	A19SW (NE)	655	3	530774 183415
63	**Source Protection Zones** Name: Barnard Park Source: Environment Agency, Head Office Reference: Th350 Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A19SW (NE)	793	3	530871 183514
64	**Source Protection Zones** Name: Sadlers Well Source: Environment Agency, Head Office Reference: Th416 Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A14NE (E)	948	3	531303 182917
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Flood Defences None				
65	**Detailed River Network Lines** River Type: Extended Culvert (greater than 50m) River Name: Regent's Canal Hydrographic Area: D006 River Flow Type: Primary Flow Path River Surface Level: Below Surface Drain Feature: Not a Drain Flood Risk Management Status: Other Rivers Water Course Name: Not Supplied Water Course Reference: Not Supplied	A12SE (SW)	409	3	529958 182702
	Detailed River Network Offline Drainage None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
66	**Licensed Waste Management Facilities (Locations)** Licence Number: 80329 Location: 1 Camley Street, Camden, London, NW1 1UU Operator Name: Shanks Waste Services Ltd Operator Location: Not Supplied Authority: Environment Agency - Thames Region, North East Area Site Category: Household, Commercial And Industrial Transfer Stations **Licence Status: Surrendered** Issued: 16th February 1993 Last Modified: Not Supplied Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: 6th March 2001 IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	602	3	529975 183399
67	**Licensed Waste Management Facilities (Locations)** Licence Number: 80335 Location: 86 Pancras Road, London, NW1 1WJ Operator Name: Hall Ronald Herbert Charles Operator Location: Not Supplied Authority: Environment Agency - Thames Region, North East Area Site Category: Metal Recycling Sites (Mixed) **Licence Status: Issued** Issued: 20th November 1992 Last Modified: Not Supplied Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: Not Supplied IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	668	3	529829 183362
68	**Licensed Waste Management Facilities (Locations)** Licence Number: 80327 Location: 2 Camley Street, Kings Cross, London, NW1 Operator Name: Rutland (Waste Disposal) Ltd Operator Location: Not Supplied Authority: Environment Agency - Thames Region, North East Area Site Category: Household, Commercial And Industrial Transfer Stations **Licence Status: Surrendered** Issued: 17th February 1992 Last Modified: 15th July 1997 Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: 7th January 2000 IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	669	3	529928 183449
69	**Licensed Waste Management Facilities (Locations)** Licence Number: 80299 Location: Kings Cross Goods Depot, Goods Way, Kings Cross, London, NW1 Operator Name: GRS (Roadstone) Ltd Operator Location: Not Supplied Authority: Environment Agency - Thames Region, North East Area Site Category: Household, Commercial And Industrial Transfer Stations **Licence Status: Surrendered** Issued: 30th March 1993 Last Modified: 18th September 1997 Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: 15th October 2002 IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A17NE (NW)	932	3	529908 183746
	Local Authority Landfill Coverage Name: London Borough of Camden - Has no landfill data to supply		0	10	530335 182903
	Local Authority Landfill Coverage Name: London Borough of Islington - Has no landfill data to supply		66	5	530324 182986

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
70	**Registered Waste Transfer Sites** Licence Holder: Willment Ready Mixed Concrete Ltd Licence Reference: DL203 Site Location: BR Goods Yard, York Way, KINGS CROSS, London, N1 Operator Location: Howard H. 63 High Street, Teddington, RICHMOND, Surrey, TW11 8HA Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence lapsed/cancelled/defunct/not applicable/surrenderedCancelled Dated: 1st May 1985 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the road within the address or location Boundary Quality: Not Supplied Authorised Waste: Construction And Demolition Wastes Prohibited Waste: Biodegradable/Putrescible Waste Clinical Wastes Notifiable Wastes Special Wastes	A13NW (NW)	322	3	530200 183210
71	**Registered Waste Transfer Sites** Licence Holder: Kings Cross Iron & Steel Licence Reference: DL089 Site Location: 1 Camley Street, CAMDEN, London, NW1 Operator Location: As Site Address Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence lapsed/cancelled/defunct/not applicable/surrenderedCancelled Dated: 1st November 1981 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Commercial Waste Construction And Demolition Wastes Prohibited Waste: Biodegradable/Putrescible Waste Notifiable Wastes Special Wastes	A17SE (NW)	617	3	529950 183400
72	**Registered Waste Transfer Sites** Licence Holder: Shanks & Mc Ewan (Southern) Ltd Licence Reference: DL199 Site Location: Kings Cross Transfer Station, 1 Camley Street, CAMDEN, London, NW1 1UU Operator Location: Woodside House, Church Road, WOBURN SANDS, Buckinghamshire, MK17 8TA Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Large (Equal to or greater than 75,000 and less than 250,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence has completion certificateSurrendered Dated: 1st March 1985 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: L.W.R.A. Cat. A = Inert Wastes L.W.R.A. Cat. B = General Wastes L.W.R.A. Cat. C = Putresc.Waste (Some) Lwra Cat. E = Difficult Gen.W (Some) Max.Waste Permitted By Licence-Stated Prohibited Waste: Clinical - As In Coll/Disp.Regs Of '88 Special Wastes Waste N.O.S.	A17SE (NW)	625	3	529950 183410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
72	**Registered Waste Transfer Sites** Licence Holder: Rutland Waste Disposal Ltd Licence Reference: DL241 Site Location: 2 Camley Street, KINGS CROSS, London, NW1 Operator Location: 139 Watling Street, GILLINGHAM, Kent, ME7 2YY Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Large (Equal to or greater than 75,000 and less than 250,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence has completion certificateSurrendered Dated: 7th February 1992 Preceded By Licence: DL241 Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Lwra Cat. A = Inert Wastes Lwra Cat. Bi Gen.Non-Putresc Max.Waste Permitted By Licence-Stated Prohibited Waste: Clinical - As In Coll/Disp.Regs Of '88 Special Wastes	A17SE (NW)	675	3	529920 183450
73	**Registered Waste Transfer Sites** Licence Holder: Rutland (Haulage) Ltd Licence Reference: DL241 Site Location: 2 Camley Street, KINGS CROSS, London, NW1 Operator Location: 64 Pancras Road, Kings Cross, CAMDEN, London, NW1 Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Record supersededSuperseded Dated: 1st December 1986 Preceded By Licence: Not Given Superseded By Licence: DL241 Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Commercial Waste Construction Ind. Wastes Max.Waste Permitted By Licence(Stated) Prohibited Waste: Clinical Wastes Notifiable Wastes Putrescible Waste Special Wastes	A17SW (NW)	884	3	529620 183450
74	**Registered Waste Treatment or Disposal Sites** Licence Holder: R H C Hall t/a St Pancras Metals Licence Reference: DL414 Site Location: St Pancras Metals, 86 Pancras Road, CAMDEN, London, NW1 1WJ Operator Location: 13 Jeremy Bentham House, Pollard Street, LONDON, Greater London, E2 Authority: Environment Agency - Thames Region, North East Area Site Category: Scrapyard Max Input Rate: Very Small (Less than 10,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: May not be working (licence suspended)Suspended Dated: 20th November 1992 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Located by supplier to within 100m Boundary Quality: Not Supplied Authorised Waste: Electric Cable/Wire Lwra Cat Bii Gen. Scrap Metal Waste Max.Waste Permitted By Licence Prohibited Waste: Clinical - As In Control.Waste Regs'92 Special Wastes Waste N.O.S.	A17SE (NW)	666	3	529830 183360

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
75	**Registered Waste Treatment or Disposal Sites** Licence Holder: G.R.S (Roadstone) Ltd Licence Reference: DL440 Site Location: Kings Cross Goods Depot, Goods Way, KINGS CROSS, London, NW1 Operator Location: Wolvey, HINCKLEY, Leicestershire, LE10 3HL Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer - with treatment Max Input Rate: Very Large (Equal to or greater than 250,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Operational as far as is knownOperational Dated: 1st September 1997 Preceded By Licence: DL440 Superseded By Licence: Not Given Positional Accuracy: Located by supplier to within 100m Boundary Quality: Not Supplied Authorised Waste: Lwra Cat. A = Inert Wastes Lwra Cat. Bi Gen.Non-Putresc Max.Storage In Licence Prohibited Waste: Waste N.O.S.	A17NE (NW)	931	3	529900 183740
75	**Registered Waste Treatment or Disposal Sites** Licence Holder: Galliford Roadstone Ltd Licence Reference: DL440 Site Location: Kings Cross Goods Depot, Goods Way, KINGS CROSS, London, NW1 Operator Location: Wolvey, HINCKLEY, Leicestershire, LE10 3HL Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer - with treatment Max Input Rate: Very Large (Equal to or greater than 250,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Record supersededSuperseded Dated: 1st March 1993 Preceded By Licence: Not Given Superseded By Licence: DL440 Positional Accuracy: Located by supplier to within 100m Boundary Quality: Not Supplied Authorised Waste: Sand,Excav.Road Metal Topsoil,Hardcore,Brick,Stone,Concrete, Prohibited Waste: Clinical - As In Control.Waste Regs'92 Special Wastes Waste N.O.S.	A17NE (NW)	931	3	529900 183740
76	**Registered Waste Treatment or Disposal Sites** Licence Holder: Wd Arbuckle t/a W J Arbuckle Licence Reference: T/NE/0484756 (ARB003) Site Location: 7-9 St Pancras Way, CAMDEN, London, NW1 0PB Operator Location: As Site Address Authority: Environment Agency - Thames Region, North East Area Site Category: Scrapyard Max Input Rate: Very Small (Less than 10,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Operational as far as is knownOperational Dated: 6th June 1997 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Electric Cable & Wire Lead/Acid Batteries Light Ferrous Metal Scrap Light Non-Ferrous Metal Scrap Non-Ferrous Metal Turnings & Swarf Non-Ferrous Metals Unsorted Scrap Metal Prohibited Waste: Clinical - As In Control.Waste Regs'92 Spec.Waste (Epa'90:S62/1996 Regs)N.O.S Waste N.O.S.	A17NW (NW)	999	3	529590 183590

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
77	**Control of Major Accident Hazards Sites (COMAH)** Name: London Borough of Camden Location: Bidborough House, 20 Mabledon St, LONDON, WC1H 9BT Reference: Not Supplied Type: Lower Tier **Status: Record Ceased To Be Supplied Under COMAH Regulations** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	356	6	530020 182703
78	**Notification of Installations Handling Hazardous Substances (NIHHS)** Name: Transco Location: St Pancras Holder Station, Battle Bridge Road, LONDON, NW1 2TR **Status: Active** Positional Accuracy: Located by supplier to within 100m	A18SW (NW)	450	6	530100 183300

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: London Clay	A13SW (SW)	0	2	530335 182903
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SW (SW)	0	7	530335 182903
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NW (N)	78	7	530335 183000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SW (SW)	240	7	530166 182706
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SW (W)	314	7	530000 182903
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NW (W)	329	7	530000 183000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SW (SW)	399	7	530000 182655

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Urban Soil Chemistry Averages Source: British Geological Survey, National Geoscience Information Service Sample Area: London Count Id: 7189 Arsenic Minimum Concentration: 1.00 mg/kg Arsenic Average Concentration: 17.00 mg/kg Arsenic Maximum Concentration: 161.00 mg/kg Cadmium Minimum Concentration: 0.30 mg/kg Cadmium Average Concentration: 0.90 mg/kg Cadmium Maximum Concentration: 165.20 mg/kg Chromium Minimum Concentration: 13.00 mg/kg Chromium Average Concentration: 79.00 mg/kg Chromium Maximum Concentration: 2094.00 mg/kg Lead Minimum Concentration: 11.00 mg/kg Lead Average Concentration: 280.00 mg/kg Lead Maximum Concentration: 10000.00 mg/kg Nickel Minimum Concentration: 2.00 mg/kg Nickel Average Concentration: 28.00 mg/kg Nickel Maximum Concentration: 506.00 mg/kg	A13SW (SW)	0	2	530335 182903
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Natural Cavities Easting: 530600 Northing: 182400 Distance: 557 Quadrant Reference: A8 Quadrant Reference: NE Bearing Ref: SE Cavity Type: Unknown x 1 Solid Geology Detail: London Clay Formation Superficial Geology Detail: Alluvium	A8NE (SE)	557	8	530600 182400
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	240	2	530166 182706
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903
	Radon Potential - Radon Affected Areas Affected Area: The property is in a lower probability radon area, as less than 1% of homes are above the action level Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	0	2	530335 182903

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
80	**Contemporary Trade Directory Entries** Name: Kings Cross Dry Cleaners Location: Kings Cross Post Office 17-21, Euston Road, London, NW1 2RY Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	27	-	530296 182882
81	**Contemporary Trade Directory Entries** Name: Paragon Document Solutions Ltd Location: 1, Euston Road, London, NW1 2SA Classification: Printers **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A13NW (N)	32	-	530322 182947
82	**Contemporary Trade Directory Entries** Name: G Thornfields Ltd Location: 319-321, Gray's Inn Road, London, WC1X 8PX Classification: Wallpapers & Wall Coverings **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	64	-	530411 182935
82	**Contemporary Trade Directory Entries** Name: Day By Day Art & Interiors Location: 319-321, Gray's Inn Road, London, WC1X 8PX Classification: Wallpapers & Wall Coverings **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	64	-	530411 182935
82	**Contemporary Trade Directory Entries** Name: Auto Audio Installations Location: 370, Gray's Inn Road, London, WC1X 8BB Classification: Telecommunications Equipment & Systems **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	81	-	530404 182975
83	**Contemporary Trade Directory Entries** Name: All Seasons Cleaning Location: 313, Gray's Inn Road, London, WC1X 8PX Classification: Laundries & Launderettes **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	77	-	530428 182930
84	**Contemporary Trade Directory Entries** Name: Ansaldo Sts Uk Ltd Location: Bravington House, 2, Bravingtons Walk, London, N1 9AF Classification: Engine Component Manufacturers **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A13NE (N)	97	-	530360 183017
85	**Contemporary Trade Directory Entries** Name: Alex Dry Cleaners Location: 289, Gray's Inn Road, London, WC1X 8QH Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (E)	120	-	530468 182863
85	**Contemporary Trade Directory Entries** Name: Stratstone Of Mayfair Location: 277a, Gray's Inn Road, London, WC1X 8QF Classification: Car Dealers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	122	-	530454 182833
85	**Contemporary Trade Directory Entries** Name: Follett Mazda Location: 277a, Gray's Inn Road, London, WC1X 8QF Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	122	-	530454 182833
85	**Contemporary Trade Directory Entries** Name: Stratstone Mayfair Location: 277a, Gray's Inn Road, London, WC1X 8QF Classification: Car Dealers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	122	-	530454 182833
86	**Contemporary Trade Directory Entries** Name: Eurostar Location: Times House, 5, Bravingtons Walk, London, N1 9AW Classification: Railways **Status: Active** Positional Accuracy: Automatically positioned to the address	A13NE (N)	153	-	530390 183068

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
87	**Contemporary Trade Directory Entries** Name: Edward Mortimer Ltd Location: Great Northern Hotel, Kings Cross Railway Station, Kings Cross, London, N1 9AN Classification: Printers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (NW)	161	-	530190 183005
88	**Contemporary Trade Directory Entries** Name: London Taxi Market Location: 19-21, Pancras Road, London, NW1 2QB Classification: Car Dealers - Used **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (W)	208	-	530112 182951
89	**Contemporary Trade Directory Entries** Name: Medical Optics Ltd Location: 52, Wicklow Street, London, WC1X 9HR Classification: Medical Equipment Maintenance & Repairs **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	213	-	530568 182906
90	**Contemporary Trade Directory Entries** Name: Daytona Motorcycles Location: Surety House, 25-28, Field Street, London, WC1X 9DA Classification: Motor Cycle Repairs **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	217	-	530564 182964
90	**Contemporary Trade Directory Entries** Name: Dodds The Printers Ltd Location: 193-195, King's Cross Road, London, WC1X 9DB Classification: Printers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	228	-	530569 182983
90	**Contemporary Trade Directory Entries** Name: Ariana Location: Flat 1, 191, King's Cross Road, London, WC1X 9DB Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	232	-	530574 182981
90	**Contemporary Trade Directory Entries** Name: Vail Printers Ltd Location: Leeke St,Kings Cross Rd, London, WC1X 9HU Classification: Printers **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A13NE (E)	236	-	530588 182943
90	**Contemporary Trade Directory Entries** Name: Digital Printing Location: Kingscross Business Centre,180-186 King'S Cross Rd, London, WC1X 9DE Classification: Digital Printing **Status: Active** Positional Accuracy: Manually positioned within the geographical locality	A13NE (E)	253	-	530590 182999
90	**Contemporary Trade Directory Entries** Name: Bed Bug Doctor Location: 180-187 King'S Cross Rd, London, WC1X 9DE Classification: Pest & Vermin Control **Status: Active** Positional Accuracy: Manually positioned to the road within the address or location	A13NE (E)	256	-	530597 182989
90	**Contemporary Trade Directory Entries** Name: Alux Location: 245 Pentonville Rd, London, N1 9NG Classification: Office Furniture & Equipment **Status: Active** Positional Accuracy: Manually positioned to the address or location	A13NE (NE)	257	-	530588 183012
91	**Contemporary Trade Directory Entries** Name: Chanda & Sons Location: Flat, 30, Caledonian Road, London, N1 9DT Classification: Hardware **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	218	-	530460 183106

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
132	**Contemporary Trade Directory Entries** Name: Ogki Designs Location: 56, Tavistock Place, London, WC1H 9RG Classification: Greeting Card Publishers & Wholesalers **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A8NW (S)	497	-	530168 182414
133	**Contemporary Trade Directory Entries** Name: Treadway Flow Control Location: 26-30, Cubitt Street, London, WC1X 0LS Classification: Pumps - Sales, Servicing & Repairs **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	490	-	530785 182669
134	**Contemporary Trade Directory Entries** Name: Equator Digital Ltd Location: 21-27, Chalton Street, London, NW1 1JD Classification: Photographic Processors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A12SE (W)	495	-	529842 182755
135	**Fuel Station Entries** Name: Bradkings Cross Location: 8 Pancras Road, Kings Cross, LONDON, NW1 2SY Brand: Unbranded Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Manually positioned to the road within the address or location	A13NW (NW)	157	-	530176 182976
136	**Fuel Station Entries** Name: St Pancras Service Station Location: 141-151 Euston Road, St Pancras, LONDON, NW1 2AU Brand: Obsolete Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Automatically positioned to the address	A12SE (SW)	504	-	529884 182639
137	**Fuel Station Entries** Name: Star Kings Cross Location: 71-91 Kings Cross Road, Clerkenwell, LONDON, WC1X 9LN Brand: Texaco Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	511	-	530802 182656
138	**Fuel Station Entries** Name: Goods Way Filling Station Location: Goods Way, London, N1C 4UR Brand: BP Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Manually positioned to the address or location	A18SW (N)	557	-	530305 183477
139	**Fuel Station Entries** Name: Shell Mount Pleasant Location: 39-43 Kings Cross Road, Cubitt Street, Clerkenwell, LONDON, WC1X 9LN Brand: OBSOLETE Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	630	-	530888 182568
140	**Fuel Station Entries** Name: Woburn Place Service Station Location: 3-16 Woburn Place, Coram Street, St Pancras, LONDON, WC1H 0LS Brand: Total Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Automatically positioned to the address	A8SW (S)	725	-	530077 182204
141	**Fuel Station Entries** Name: Co-Op Caledonian Location: 219-227 Caledonian Road, Twyford Street, Barnsbury, London, Greater London, N1 0SL Brand: TEXACO Premises Type: Petrol Station **Status: Open** Positional Accuracy: Manually positioned to the address or location	A19NW (N)	936	-	530690 183791

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
142	**Fuel Station Entries** Name: Former Garage Location: York Way, Barnsbury, LONDON, N1 Brand: Obsolete Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Located by supplier to within 10m	A18NW (N)	948	-	530265 183867

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
143	**Local Nature Reserves** Name: Camley Street Nature Park Multiple Area: N Area (m2): 8411.84 Source: Natural England Designation Date: 28th March 2012	A18SW (NW)	545	9	530043 183376

Data Suppliers

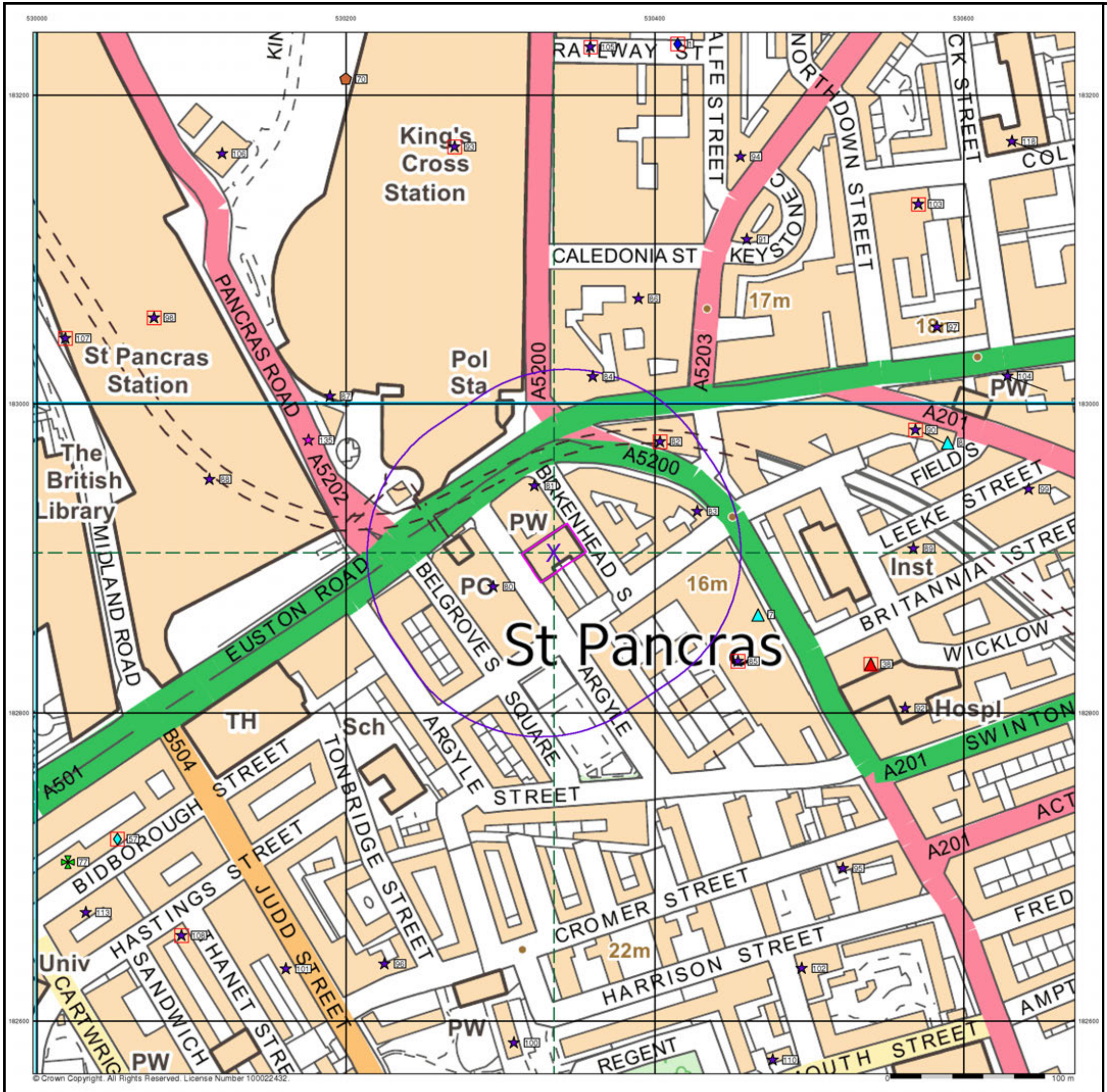
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	Ordnance Survey Licensed Partner
Environment Agency	Environment Agency
Scottish Environment Protection Agency	SEPA Scottish Environment Protection Agency
The Coal Authority	THE COAL AUTHORITY
British Geological Survey	British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
Centre for Ecology and Hydrology	Centre for Ecology & Hydrology NATURAL ENVIRONMENT RESEARCH COUNCIL
Natural Resources Wales	Cyfoeth Naturiol Cymru Natural Resources Wales
Scottish Natural Heritage	SCOTTISH NATURAL HERITAGE
Natural England	NATURAL ENGLAND
Public Health England	Public Health England
Ove Arup	ARUP
Peter Brett Associates	pba peterbrett

Useful Contacts

Contact	Name and Address	Contact Details
2	**British Geological Survey - Enquiry Service** British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
3	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 08708 506 506 Email: enquiries@environment-agency.gov.uk
4	**London Borough of Camden - Pollution Projects Team** Seventh Floor, Town Hall Extension, Argyle Street, London, WC1H 8EQ	Telephone: 020 7278 4444 Fax: 020 7860 5713 Website: www.camden.gov.uk
5	**London Borough of Islington - Environmental Health Department** 159 Upper Street, Islington, London, N1 1RE	Telephone: 020 7527 2000 Fax: 020 7477 3057 Website: www.islington.gov.uk
6	**Health and Safety Executive** 5S.2 Redgrave Court, Merton Road, Bootle, L20 7HS	Website: www.hse.gov.uk
7	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmark.co.uk Website: www.landmarkinfo.co.uk
8	**Peter Brett Associates** Caversham Bridge House, Waterman Place, Reading, Berkshire, RG1 8DN	Telephone: 0118 950 0761 Fax: 0118 959 7498 Email: reading@pba.co.uk Website: www.pba.co.uk
9	**Natural England** Suite D, Unex House, Bourges Boulevard, Peterborough, Cambridgeshire, PE1 1NG	Telephone: 0845 600 3078 Email: enquiries@naturalengland.org.uk Website: www.naturalengland.org.uk
10	**London Borough of Camden** Town Hall, Judd Street, London, WC1H 9JE	Telephone: 020 7974 4444 Fax: 020 7974 6866 Email: info@camden.gov.uk Website: www.camden.gov.uk
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



GEA Geotechnical & Environmental Associates

General

Specified Site · Specified Buffer(s) · Bearing Reference Point · Map ID

Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

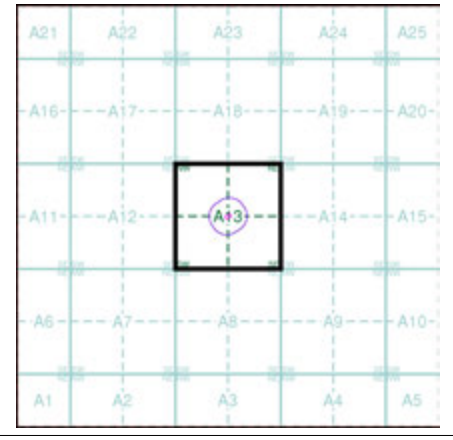
Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Segment A13



Order Details

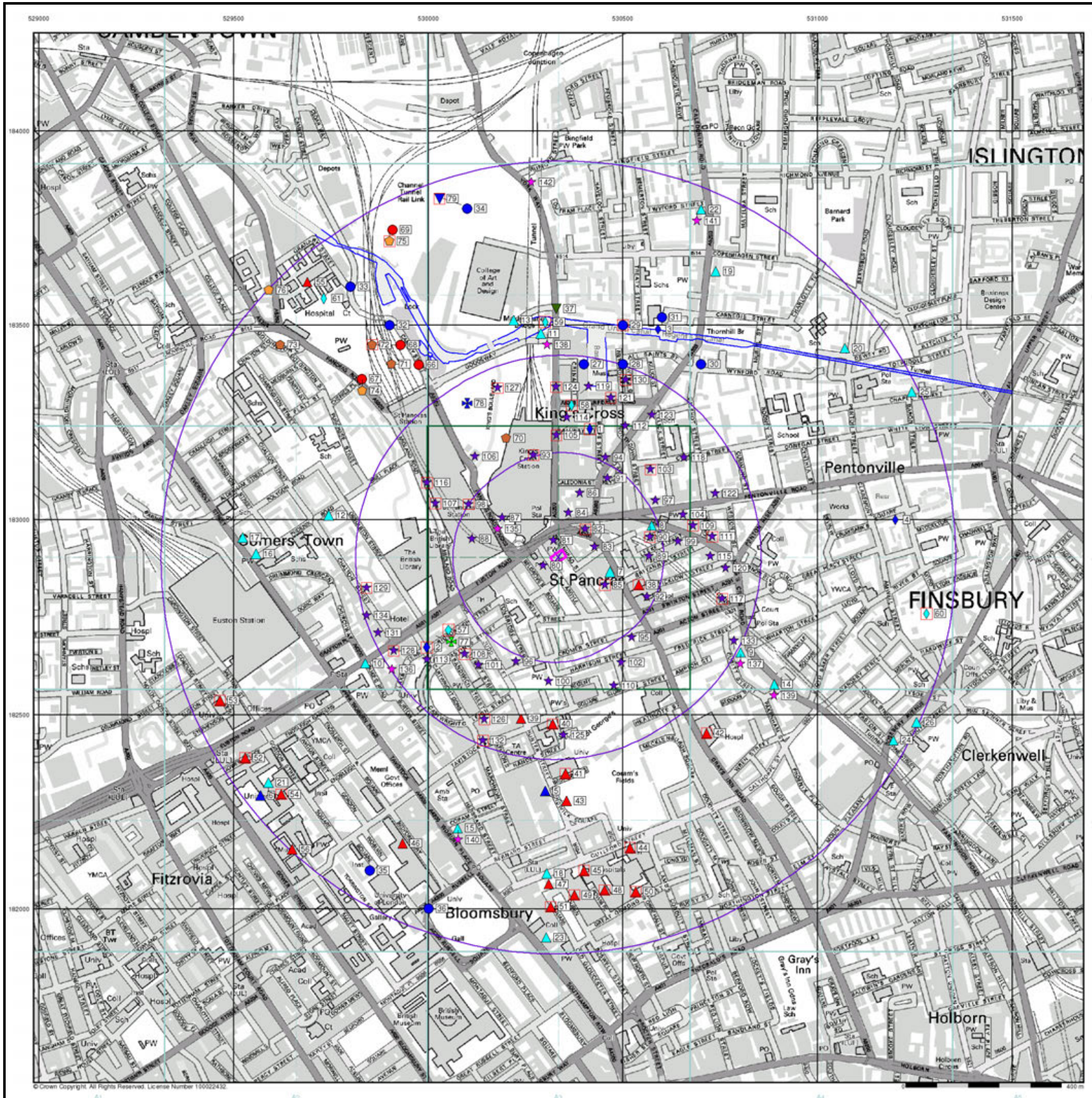
Order Number:	61911674_1_1
Customer Ref:	J14336
National Grid Reference:	530330, 182900
Slice:	A
Site Area (Ha):	0.08

Site Details

Methodist Chaplaincy House, 58a Birkenhead Street, LONDON, WC1H 8BW

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

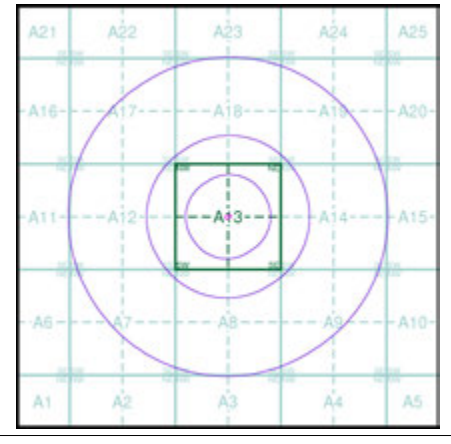
Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Slice A



Order Details

Order Number:	61911674_1_1
Customer Ref:	J14336
National Grid Reference:	530330, 182900
Slice:	A
Site Area (Ha):	0.08
Search Buffer (m):	1000

Site Details

Methodist Chaplaincy House, 58a Birkenhead Street, LONDON, WC1H 8BW

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

GEA Geotechnical & Environmental Associates

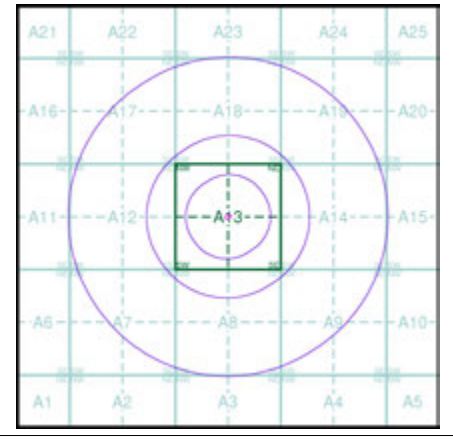
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

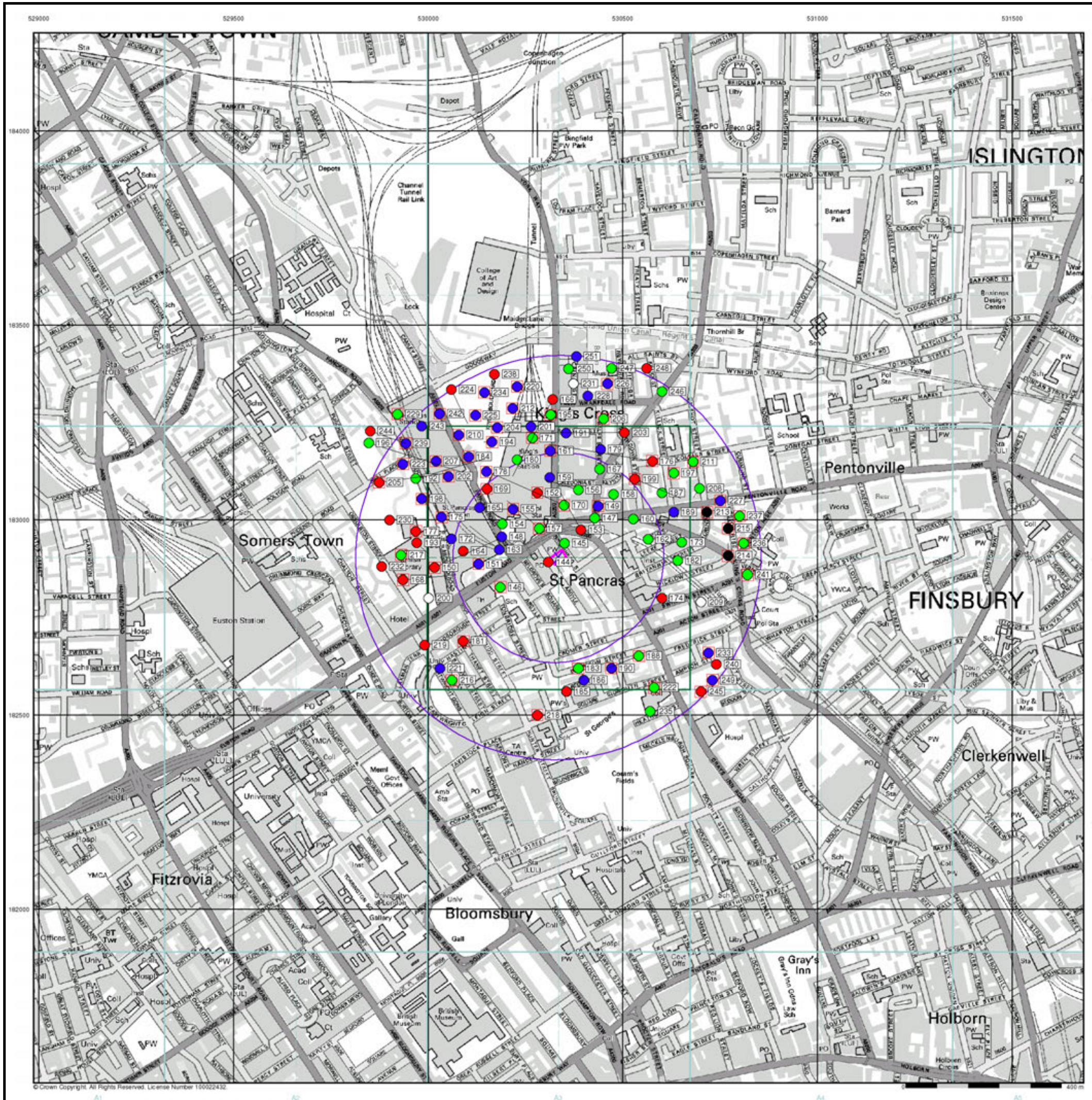
Order Number:	61911674_1_1
Customer Ref:	J14336
National Grid Reference:	530330, 182900
Slice:	A
Site Area (Ha):	0.08
Search Buffer (m):	1000

Site Details

Methodist Chaplaincy House, 58a Birkenhead Street, LONDON, WC1H 8BW

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

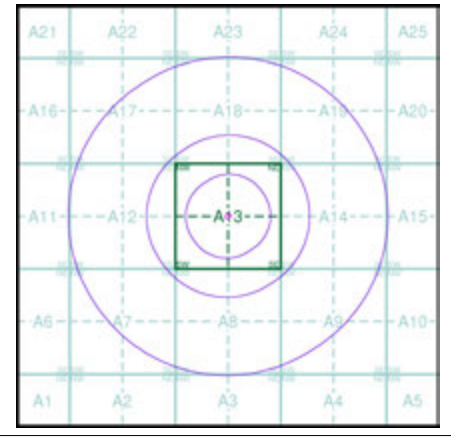
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A

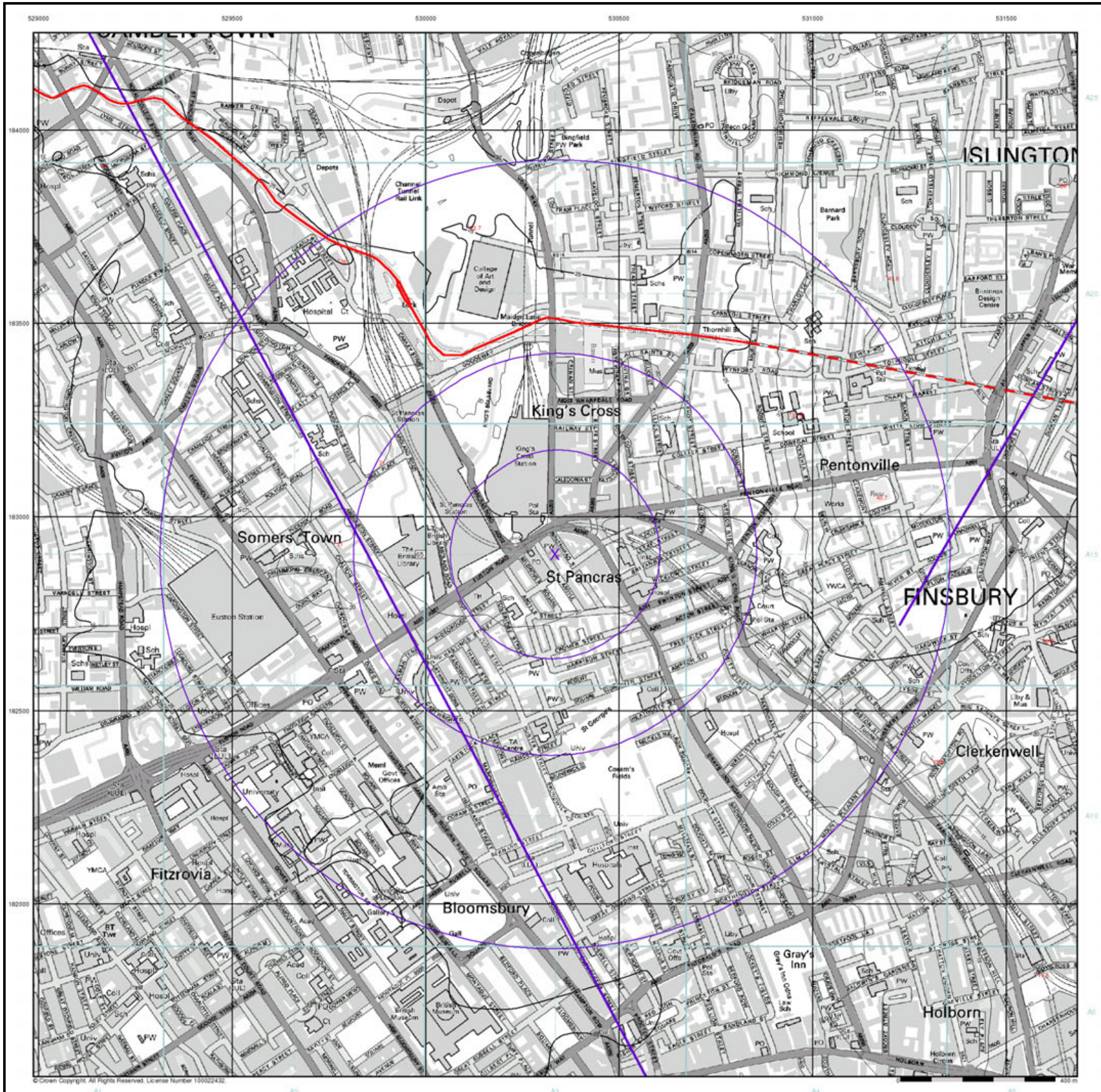


Order Details

Order Number:	61911674_1_1
Customer Ref:	J14336
National Grid Reference:	530330, 182900
Slice:	A
Site Area (Ha):	0.08
Search Buffer (m):	1000

Site Details

Methodist Chaplaincy House, 58a Birkenhead Street, LONDON, WC1H 8BW



GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- 8 Map ID

Detailed River Network Data

- Primary River
- Secondary River
- Tertiary River
- Canal
- Canal Tunnel
- Undefined River
- Lake/Reservoir
- Offline Drainage Feature
- Extended Culvert (greater than 50m)
- Underground River (inferred)
- Underground River (local knowledge)
- Downstream of High Water Mark
- Downstream of Seaward Extension
- Not assigned River feature

Contours (height in metres)

Standard Contour — 105 — 100 — 95

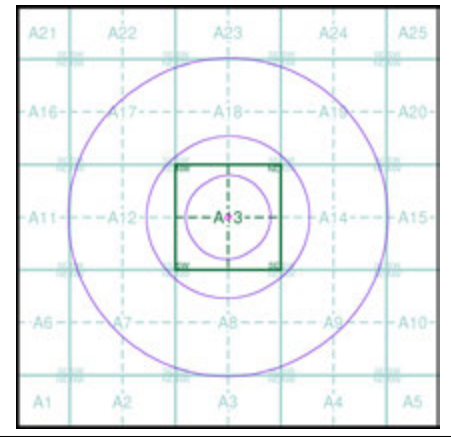
Master Contour

Spot Height *167.3

MLW Mean Low Water

MHW Mean High Water

EA/NRW Detailed River Network Map - Slice A



Order Details

Order Number:	61911674_1_1
Customer Ref:	J14336
National Grid Reference:	530330, 182900
Slice:	A
Site Area (Ha):	0.08
Search Buffer (m):	1000

Site Details

Methodist Chaplaincy House, 58a Birkenhead Street, LONDON, WC1H 8BW

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk