3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, and given the practical constraints imposed by the existing building, a single borehole was advanced to a depth of 11.00 m using a breakdown opendrive percussive sampler rig. Additionally, ten trial pits were manually excavated to a maximum depth of 1.40 m to explore the existing foundations.

During boring, disturbed samples were obtained from the borehole and trial pits for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were carried out at regular intervals to provide additional quantitative data on the strength of soils encountered.

A single groundwater monitoring standpipe has been installed to a depth of 4.00 m to facilitate groundwater monitoring, which has been carried out on a single occasion to date, approximately two weeks after installation.

A selection of the samples recovered from the boreholes and trial pits was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

All of the above work was carried out under the supervision of a geotechnical engineer from GEA.

The borehole and trial pit records are appended, together with a site plan indicating the exploratory positions. The arbitrary datum (m TBM) levels on the borehole and trial pit records have been extrapolated from a drawing by Cadplan, provided by the consulting engineers (ref 11817-01, dated 22 June 2020). The survey drawing uses an arbitrary datum of 50 m TBM at internal finished ground floor level. Service plans obtained to facilitate the investigation show a street level around 100 m to the northeast of the site, in Gloucester Road, of 32.6 m OD.

3.1 Sampling Strategy

The trial pit and borehole locations were agreed with the consulting engineers, Morph Structures, in an initial site meeting with GEA.

Three samples of the made ground and a single sample of the natural ground have been tested for the presence of contamination. The analytical suite of testing was selected to identify a range of typical industrial contaminants for the purposes of general coverage. 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 samples were also screened for the presence of asbestos. The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

4.0 GROUND CONDITIONS

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

4.1 Made Ground

Beneath the concrete, the made ground generally comprised brown and grey very gravelly sand, or greyish brown and brown sandy gravelly clay, with occasional fragments of brick, coal and concrete. Occasional rootlets were encountered in Trial Pit No 1 to a depth of 1.00 m (47.44 m TBM). The made ground extended to depths of between 0.13 m (45.97 m TBM) and 1.20 m (46.78 m TBM).

Apart from the presence of fragments of extraneous material noted above, no visual or olfactory evidence of contamination was observed during the fieldwork. Four samples of the made ground have however been analysed for a range of contaminants as a precautionary measure and the results are detailed within Section 4.4.

4.2 London Clay

The London Clay generally comprised an initial horizon of firm fissured brown mottled grey slightly silty clay with selenite crystals, which extended to the base of the trial pits and to a depth of 10.50 m (37.48 m TBM) in Borehole No 1, whereupon stiff fissured greyish brown clay with grey veining was encountered to the full depth investigated, of 11.00 m (36.98 m TBM). Occasional claystone fragments were encountered in Borehole No 1 from 1.80 m to 2.00 m (46.18 m TBM to 45.98 m TBM).

The results of plasticity index tests indicate the clay to be of high volume change potential.

4.3 Groundwater

Groundwater was encountered in Trial Pit Nos 2, 3, 5, 7 and 8 and in some cases the groundwater level rose overnight. Comparison of the standing water level recorded in each pit shows that the depth to groundwater is not consistent, and thus confirms that the groundwater represents localised seepages.

A standpipe was installed to a depth of 4.00 m (43.98 m TBM) within the borehole and groundwater was monitored at a depth of 1.01 m (46.97 m TBM) on 11th February 2021, around two weeks after installation, and at a depth of 1.20 m (46.78 m TBM) on 11th March 2021, around six weeks after installation.

4.4 Soil Contamination

Three samples of the made ground and a single sample of the natural ground, taken from just below the made ground, have been tested for the presence of contamination. The table below sets out the values measured within the four samples analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	TP1 1.00 – 1.40 m (Made Ground)	TP2 0.20 m (Made Ground)	TP3 0.30 m (Made Ground)	TP5 0.15 m (London Clay)
pH	8.1	8.3	9.3	8.2
Arsenic	17	22	21	16
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	38	36	41	47
Lead	**360**	**940**	180	18
Mercury	0.8	1	< 0.3	< 0.3
Selenium	< 1.0	< 1.0	< 1.0	< 1.0
Copper	140	74	33	27
Nickel	26	26	49	44
Zinc	130	230	75	83
Total Cyanide	< 1	< 1	< 1	< 1
Total Phenols	< 1.0	< 1.0	< 1.0	< 1.0
Total PAH	< 0.80	3.28	2.92	< 0.80
Sulphide	< 1.0	**56**	< 1.0	< 1.0
Benzo(a)pyrene	< 0.05	0.37	0.24	< 0.05
Naphthalene	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a h)anthracene	< 0.05	< 0.05	< 0.05	< 0.05
TPH	< 10	< 10	< 10	< 10
Total Organic Carbon %	2.1	1.7	1.1	0.2
Note: Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report				

In addition, all four samples were screened for the presence of asbestos and none was detected.

4.4.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. Contaminants of concern are those that have values in excess of generic human health risk-based guideline values, which are either the CLEA[3] Soil Guideline Values where available, the Suitable 4 Use Values[4] (S4UL) produced by LQM/CIEH calculated using the CLEA UK Version 1.06[5] software, or the DEFRA Category 4 Screening values[6], assuming a residential end use with plant uptake. The key generic assumptions for this end use are as follows:

- that groundwater will not be a critical risk receptor;

3 *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.

4 *The LQM/CIEH S4Uls for Human Health Risk Assessment* S4UL3065 November 2014

5 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.06 Environment Agency 2009

6 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

- that the critical receptor for human health will be young female children aged zero to six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of home grown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a two-storey small terraced house.

It is considered that these assumptions are 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.

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 results of the chemical analyses have indicated two of the samples tested to contain an elevated concentration of lead (concentrations of 360 mg/kg and 940 mg/kg in comparison to a screening value of 200 mg/kg) and a single sample to contain an elevated concentration of sulphide (a concentration of 56 mg/kg in comparison to a screening value of 50 mg/kg).

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

4.5 Existing Foundations

The findings of the trial pits are summarised in the table below. Sketches and photographs of each pit are included in the Appendix.

Trial Pit No	Structure	Foundation detail	Bearing Stratum
1	Front boundary wall	Brick corbel Top 1.30 m Base 1.35m. Lateral projection 100 mm from brick face	Unable to determine
2	Rear bay window	Mass concrete Top 0.25 m Base 0.80 m Lateral projection 270 mm	Firm brown mottled grey slightly silty CLAY with occasional rootlets

Trial Pit No	Structure	Foundation detail	Bearing Stratum
3	Front house wall	Brick corbels over mass concrete Top 0.30 m Base 0.75 m Lateral projection 120 mm	Unable to determine; beneath groundwater
	Internal wall	Mass concrete Top 0.30 m Base 0.75 m Lateral projection 100 mm	
4	West party wall	Concrete slab at least 450 mm thick	Base of foundation not reached
	Rear wall		
5	Front boundary wall	Mass concrete Top 0.30 m Base 0.75 m Lateral projection 100 mm	Up to 50 mm MADE GROUND assumed over firm brown mottled grey CLAY
	West party wall	Mass concrete Top GL Base 0.13 m Unable to determine lateral projection due to pipes.	
6	East party wall	Mass concrete Top 0.07 m Base 0.50 m Lateral projection 140 mm	Firm fissured brown CLAY
7	Internal wall	Unable to determine as beneath groundwater Top: brick corbel at 0.35 m Base not reached Lateral projection > 450 mm	Base of foundation not reached
8	Rear extension external	Mass concrete Top GL Base 0.90 m No lateral projection	Firm brown mottled grey CLAY with occasional decayed rootlets
9	Rear extension internal	Concrete slab at least 350 mm thick	Base of foundation not reached
10	Front house / lightwell	Concrete slab at least 450 mm thick	Base of foundation not reached

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 the proposed development.

5.0 INTRODUCTION

It is understood that it is proposed to lower the existing lower ground floor and construct a single-storey basement below, to provide a gym, changing room, cinema room and bar. Spread or raft foundations are the preferred solutions, but information is also required to facilitate piled foundation design.

The proposed lower ground floor will have a finished floor level around 3.00 m below the existing ground floor level, which is very similar to the existing situation, and the new basement will have an finished floor level of around 7.50 m below the existing ground floor, so will extend to around 4.50 m below the existing lower ground floor. Taking the existing ground floor as 50.00 m TBM, this gives an approximate lower ground floor finished floor level of 47.00 m TBM and a basement finished floor level of 42.50 m TBM. Foundation level for the basement is therefore assumed to be at around 42.00 m TBM.

The loads are not known but are anticipated to be light to moderate.

6.0 GROUND MODEL

The desk study has revealed that the site has not had a potentially contaminative history as it has been developed with the existing house since some time during the first half of the 19th Century and has remained in residential use throughout its history. 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 extends to the maximum depth of the investigation, of 11.00 m (36.98 m TBM);
- the made ground generally comprises brown and grey very gravelly sand, or sandy gravelly clay, with occasional fragments of brick, coal and concrete, and extends to depths of between 0.13 m (45.97 m TBM) and 1.20 m (46.78 m TBM);
- the London Clay initially consists of firm fissured brown mottled grey slightly silty clay with selenite crystals, which extends to a depth of 10.50 m (37.48 m TBM), whereupon stiff fissured greyish brown clay with grey veining is present and extends to the full depth of the investigation of 11.00 m (36.98 m TBM);
- groundwater is present as localised seepages only; and
- contamination testing has revealed elevated concentrations of lead and sulphide within the made ground.

7.0 ADVICE AND RECOMMENDATIONS

It is understood that the new basement will extend to a depth of approximately 4.50 m below the existing lower ground floor level, and with therefore have a foundation level of around 42.00 m TBM, within the firm London Clay, which will provide a suitable bearing stratum for underpinned moderate width strip or pad foundations. On the basis of the fieldwork and subsequent monitoring, groundwater is likely to be encountered as seepages of perched water only within the basement excavation. The proposed development will not result in any increased risk of exposure of end users to contaminants within the made ground.

7.1 Spread Foundations

Spread foundations, including underpinned foundations, bearing at around 42.00 m TBM in the London Clay may be designed to apply a net allowable bearing pressure of around 160 kN/m². This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits. The value should however be checked once the loads are known and the bases can be sized.

Foundations will need to be deepened in the vicinity of existing and proposed trees and National House Building Council (NHBC) guidelines should be followed in this respect. High shrinkability clays should be assumed. Where trees are to be removed the required founding depth should be determined on the basis of the existing tree height if it is less than 50% of the mature height and on the basis of full mature height if the current height is more than 50% of the mature height. Where a tree is to be retained the final mature height should be adopted. If trees are to be planted in close proximity to the new buildings founding depths should be deepened in accordance with NHBC guidelines and using the mature height of the tree. Notwithstanding NHBC guidelines, all foundations should extend beyond the zone of desiccation. In this respect it would be prudent to have all foundation excavations inspected by a suitably experienced engineer. Due allowance should be made for future growth of the trees.

7.2 Basement Construction

The formation level for the basement is likely to be within the London Clay at around 42.00 m TBM. Seepages of groundwater were encountered in many of the trial pits and perched water has subsequently been measured within the standpipe, but a general groundwater table is not present. On this basis, shallow inflows of perched water should be anticipated from the made ground. Ideally, a number of trial excavations should be carried out, to depths as close to the full basement depth as possible, to provide an indication of stability and the extent to which the excavation may be affected by groundwater inflows; this is however unlikely to be possible due to the access restrictions.

The design of basement support in the temporary and permanent conditions needs to take account of the necessity to maintain the stability of the surrounding structures and the possible requirement to control groundwater inflows.

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.

It is understood that the preferred option for the formation of new retaining walls is by underpinning, but a bored pile wall could be utilised to support the basement excavation and could have the advantage of being incorporated into the permanent works to provide support for structural loads. In view of the presence of perched groundwater only, a secant bored pile wall is not anticipated to be necessary.

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. In this respect the timing of the provision of support to the wall will have an important effect on movements. An assessment of the movements will need to be carried out during construction design and is beyond the scope of the present report.

7.2.1 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	1950	Zero	24

Monitoring of the standpipe should be continued to assess the design water level but at this stage it would appear that groundwater may be assumed to be below basement level; the advice in BS8102:2009[7] should also be followed in this respect.

7.2.2 Basement Heave

The 4.50 m deep excavation of the basement will result in a differential net unloading of around 85 kN/m^2, which will result in differential heave of the underlying London Clay. This will comprise immediate elastic movement, which will account for approximately 40 % 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 loads applied by the proposed development. However the ground movements associated with the proposed basement excavation and construction will need to be considered in more detail as part of a Ground Movement Assessment.

7.3 Hydrogeological Assessment

The results from the ground investigation have indicated that a groundwater table is not present, although perched groundwater is likely to be encountered within the basement excavation, especially around the existing foundations.

In conclusion, as the new basement does not close a pathway or create a cut-off within an existing aquifer, the basement should not, therefore, have any noticeable effect on groundwater flow.

7.4 Piled Foundations

For the ground conditions at this site a bored pile could be adopted. A conventional rotary augered pile could be utilised but consideration will need to be given to the possible instability and water ingress within the made ground. The use of bored piles installed using continuous flight auger (cfa) techniques may therefore be the most appropriate and the limited site access may be a factor in the selection of most appropriate pile type.

7 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 / depth graph in the appendix.

Stratum	Depth m below LGF [m TBM]	kN / m²
Ultimate Skin Friction		
Basement Excavation	LGF to 4.50 [47.00 to 42.50]	Ignore (Basement excavation)
London Clay	4.50 to 10.00 [42.50 to 37.00]	Increasing linearly from 35 to 55
Ultimate End Bearing		
London Clay	5.00 to 10.00 [42.00 to 37.00]	Increasing linearly from 650 to 1000

In the absence of pile tests, guidance from the London District Surveyors Association (LDSA)[8] 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, the following pile capacities have been estimated.

Pile diameter mm	Pile length	Safe Working Load kN
300	Pile length of 5 m (Basement foundation level taken as 42.00 m TBM with pile toe level of 37.00 m TBM)	110
450		185
600		275

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 and their attention should be drawn to the potential for claystones within the London Clay.

Additional deeper investigation may be required if piled foundations are to be used,

7.5 Shallow Excavations

On the basis of the borehole findings, it is considered that it will be generally feasible to form relatively shallow excavations terminating within the Made Ground or London Clay without the requirement for lateral support, although localised instabilities may occur where more granular material or groundwater is encountered.

Significant inflows of groundwater into shallow excavations are not generally anticipated, although seepages may be encountered from perched water tables within the made ground, especially around existing foundations. Such inflows should be suitably controlled by sump pumping.

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

8 LDSA (2017) *Guidance notes for the design of straight shafted bored piles in London Clay*. LDSA

7.6 Basement / Lower Ground Floor Slab

Following the excavation of the basement, formation level will be within the London Clay below the zone of influence of existing trees and it should therefore be possible to adopt a moderately loaded ground bearing floor slab for the basement. Within the zone of influence of existing or proposed trees, the floor slab may need to be suspended over a void, in accordance with NHBC guidelines, although this requirement will depend on the depth of the slab below ground level.

7.7 Effect of Sulphates

Chemical analyses have revealed relatively low concentrations of soluble sulphate (72 mg/l to 1900 mg/l) and near-neutral pH (8.1 to 9.3) in accordance with Class DS-3 conditions of Table C2 of BRE Special Digest 1:SD Third Edition (2005). The measured pH values of the samples show that an ACEC class of AC-2s would be appropriate for the site. This assumes a static water condition at the site. The guidelines contained in the digest should be followed in the design of foundation concrete.

7.8 Contamination Risk Assessment

The desk study findings indicate that the site does not have a potentially contaminative history, as it has been developed with the existing house since sometime during the first half of the 19th Century and has remained in residential use throughout its history. The results of the chemical analyses have indicated two of the three samples of made ground tested to contain an elevated concentration of lead and a single sample of made ground to contain an elevated concentration of sulphide.

An elevated concentration of sulphide is only of interest with respect to construction materials and does not, of its own accord, pose a human health risk.

The source of the lead contamination is unknown, but the made ground in this location was noted as containing fragments of extraneous material including coal and it is considered likely that fragments of such material could account for the elevated concentrations. In addition, information contained within the Envirocheck report for the site indicates that the measured urban soil chemistry lead concentration is over 900 mg/kg, and a value of 1497.70 mg/kg is indicated close to the site. Given that the appropriate soil guideline value for lead is 200 mg/kg, it can be seen that the background level alone is sufficient for the soils within the site to exceed the guideline value. A significant proportion of the lead contamination may therefore be a result of background airborne pollution, particularly from the historical use of lead within vehicle exhaust emissions, and not specific to the site. Taking into account all of the above, the lead is not likely to be in a soluble state and should not, therefore, pose a risk to adjacent sites, groundwater or buried services.

It is proposed to excavate a basement beneath the site, and as a result, much of the made ground will be removed. End users will be effectively isolated from any potential contamination by the house and hardstanding, and no new areas of soft landscaping will be created. The proposed development will not affect the existing potential exposure pathway for end users within the soft landscaped areas of the rear garden. The contamination could pose a risk to site workers during the ground works. These risks are further assessed below.

7.8.1 Site Workers

Site workers should be made aware of the contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE and CIRIA[9] and the requirements of the Local Authority Environmental Health Officer.

7.9 Waste Disposal

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 classification is a staged process and this investigation represents the preliminary sampling exercise of that process. Once the extent and location of the waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[10] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[11] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the standard rate of £94.15 per tonne (about £175 per m^3) or at the lower rate of £3.00 per tonne (roughly £5.50 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the EA it is considered likely that the soils encountered during this ground investigation, as represented by the chemical analyses carried out, would be generally classified as follows;

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Current applicable rate of Landfill Tax
Made ground	Non-hazardous (17 05 04)	No	£94.15/tonne (Standard rate)
London Clay	Inert (17 05 04)	Should not be required but confirm with receiving landfill	£3.00 / tonne (Reduced rate for uncontaminated naturally occurring rocks and soils)

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[12] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus

9 CIRIA (1996) *A guide for safe working on contaminated sites* - Report 132, Construction Industry Research and Information Association
10 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
11 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2
12 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

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

The local waste regulation department of the Environment Agency (EA) 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.

8.0 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.

Ideally, trial excavations extending to as close to the full depth of the proposed basement as possible should be carried out to determine likely groundwater inflows into the basement excavation.

A quantitative assessment of the potential ground movements arising from the basement excavation and construction will need to be carried out during the construction design.

If during ground works any visual or olfactory evidence of contamination is identified, it is recommended that further investigation be carried out and that the risk assessment is reviewed.

These areas of doubt should be drawn to the attention of prospective contractors and further investigation will be required or sufficient contingency should be provided to cover the outstanding risk.